School of Accounting, Economics and Finance

Three Essays on the Impact of Climate Change Performance: Evidence from Australia

Faisal Alshahrani
0000-0003-3810-5345

This thesis is presented for the Degree of
Doctor of Philosophy of Accounting
of
Curtin University

January 2023

Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.
This thesis contains no material which has been accepted for award of any other degree or diploma at any university.

Faisal Alshahrani

4th January 2023

Abstract

Climate scientists and governments around the world have declared climate change to be a threat to human well-being, warning that we are running out of time to ensure a sustainable and liveable future for all (Slezak, 2022). Climate change is affecting the way we live and work, and practically all industries are endangered, either directly or indirectly, by the effects of climate change (Zurich, 2021). The portfolio manager at Munro Partners, Mr James Tsinidis, says that climate change is the next prime megatrend and that it is the greatest investment opportunity since the internet (Gluyas, 2021).

This thesis comprises three essays that examine the association between climate change disclosure performance and financial distress, audit fees, and firm risk. The key portions of the thesis are summarised in Chapter 1 along with the purpose and goals of this study. Chapter 2, which encompasses the first essay, investigates the relationship between climate change disclosure performance (*CCDP*) and financial distress as well as the moderating impact of litigation, the existence of a risk committee, the employment of Big4 auditing firms, and the level of audit fees. Utilising a sample of the top 300 Australian public listed non-financial firms over the period 2008–2019, it is found that higher levels of *CCDP* are related to lower levels of financial distress. Furthermore, the significant association between *CCDP* and financial distress is manifested in firms with low litigation risk, firms with a risk committee, firms that employ Big4 auditing firms, and firms that incur a higher level of audit fees. Additional tests that mitigate self-selection and endogeneity, such as propensity score matching (PSM) and the system generalised method of moments (GMM), show that our findings are robust.

The second essay is reported in Chapter 3. This study investigates the relationship between *CCDP* and fees paid to the external auditor as well as the moderating impact of corporate governance characteristic**s** on that relationship. Using the sample of the top 300 Australian public listed non-financial firms over the period 2008–2019, *CCDP* is found to be significantly positively related to external auditor fees. In addition, the significant association between *CCDP* and audit fees is manifested in firms with a larger board of directors, higher level of board independence, larger audit committees, and in firms with audit committees that are proportionately more independent. Our findings are robust to a difference-in-difference (*DID*) test which mitigates potential endogeneity concerns.

Chapter 4 presents the third essay of this thesis, which investigates the association between *CCDP* and firm risk, as well as the moderating effects of institutional ownership and auditor tenure on that relationship. We find that higher levels of *CCDP* are associated with lower levels of firm risk in our sample of the top 300 Australian public listed non-financial firms from 2008 to 2019. Furthermore, firms with lower levels of institutional ownership and those that employ external auditors with a shorter-term tenure moderate significantly the relation between *CCDP* and firm risk. The findings are robust to potential self-selection bias and endogeneity concerns, demonstrated via tests that include PSM.

Finally, Chapter 5 concludes the thesis by outlining the conclusions, limitations, and recommendations for future research.

Acknowledgements

I first and foremost express my appreciation to my sponsor, King Khalid University, the Ministry of Education, and the Saudi Arabian Cultural Mission for their valuable contribution to making this study a success. My deepest gratitude and appreciation go to my supervisors (Professor Grantley Taylor, Dr Lien Duong, and Dr Baban Eulaiwi), and the chair of my thesis committee (Dr Brian Perrin) for their valuable contributions in helping refine my ideas and make my PhD journey a success. You have inspired and supported me throughout, and I am much indebted to you.

My appreciation also goes to all my PhD colleagues, especially Abdullah Munawir Almutairi, for their wonderful support. Furthermore, I thank all my family members who continuously provided me with emotional support and courage throughout my PhD programme.

Dedication

I dedicate this thesis to all my family members for their prayers, patience, and best wishes.

Publications Arising from This Research

Refereed Journal Articles

Alshahrani, F., Eulaiwi, B., Duong, L., &Taylor, G. (2022). Climate change performance and financial distress. Business Strategy and the Environment, 1–23. https://doi.org/10.1002/bse.3298

Table of Contents

List of Tables

List of Appendices

List of Abbreviations

AASB	Australian Accounting Standards Board
ASP/PS 2	Practice Statement 2
ASX	Australian Securities Exchange
AUASB	Auditing and Assurance Standards Board
BIG4	Big Four accounting firms
CAPM	Sharpe–Lintner Capital Asset Pricing Model
CCDP	Climate change disclosure performance
CPA	CPA Australia
CSR	Corporate Social Responsibility
DID	Difference-in-difference test
EP	Environmental pillar of Thomson Reuters ESG scores
ESG	Environmental, social, and governance performance
G20	Group of Twenty, an intergovernmental forum comprising 19 countries and the European Union
GHG	Greenhouse gas
GMM	Gneralised method of moments
GOV	Governance information of climate change disclosure performance
IGCC	Investor Group on Climate Change
MT	Metrics and targets information of climate change disclosure performance
OLS	Ordinary least squares
PSM	Propensity score matching
RM	Risk management information of climate change disclosure performance
ROA	Return on assets
STR	Strategy information of climate change disclosure performance
TCFD	Task Force on Climate-Related Financial Disclosures

Chapter 1 Introduction

This thesis investigates the relationship between climate change disclosure performance (*CCDP*) and financial distress, audit fees, and firm risk, respectively.

1.1 Background and Motivation

Climate change has piqued the scientific community's interest due to the numerous effects it has on ecosystems and, as a result, human lives (Giannarakis et al., 2017). While firms are shifting towards the requirement of providing climate change disclosure to assist public decision-making (Andrew & Cortese, 2011), academic research on this topic is still in its early stages (Cooper & Pearce, 2011; Solomon et al., 2011). As an outcome, conducting necessary research presents challenges and opportunities concerning a wide range of accounting and accountability issues related to climate change, greenhouse gas (*GHG*) emissions, environmental reporting, assurance, emissions management, and *GHG* reductions (Gulluscio et al., 2020).

The final recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD), which were published in 2017, are designed to provide various stakeholders with 'consistent, comparable, clear, and reliable' information on the diverse firms' climate change risks and opportunities (Maji & Kalita, 2022). It suggests a comprehensive framework of four broad areas (i.e., governance, strategy, risk management, and metrics) with the goal of meeting the increased demands of transparency from stakeholders in addressing climate change vulnerabilities (Demaria & Rigot, 2021; Edwards et al., 2020). Recently, the TCFD has established itself as a standard measure of the disclosure of climate change (KPMG, 2020). The TCFD's recent global status report reveals that disclosure is rising; however, there is an urgent need to improve the quantity and quality of climate change disclosures (TCFD, 2021). Similarly to the global trend, Australian firms are increasingly disclosing climate risks in accordance with the TCFD recommendations, but more quantity and quality are required (Florence, 2021). Hence, investigating Australian firms' disclosure practices regarding climate change and its impact on firms is urgently needed.

According to a United Nations report prepared by the world's climate scientists, climate change will cost the Australian economy hundreds of billions of dollars in the upcoming decades due to the loss of life and physical damage caused by droughts, heatwaves, fires, floods

and other natural disasters (Foley, 2022). According to Deloitte, if climate change is not considered adequately, the Australian economy will lose more than $3 trillion and 880,000 jobs over the next 50 years (Calderwood, 2020). The 2022 Deloitte CxO Sustainability Report, which surveyed 102 leaders of Australian business, shows that nearly three quarters of them believe that the world has reached a tipping point regarding climate change response (Ransley, 2022). In addition, the 2022 Deloitte CxO Sustainability Report polled 2,000 business leaders from 21 countries and showed that Australia was among the top ten countries in the world in terms of climate change concern. According to Deloitte modelling for the Business Council of Australia, ignoring climate change may cost the economy $3.4 trillion by 2070; however, the rapid focused action may grow the economy by $890 billion, adding approximately 200,000 jobs in the same period (Deloitte, 2022). As part of its environmental policies, the Australian Government has required entities producing large amounts of carbon emissions to disclose a variety of information, including glasshouse gas emissions and energy production and consumption, under the National Greenhouse and Energy Reporting Scheme (NGERS) since 2007.[1] There is an urge for further climate change research as a means to broaden one's thinking and integrate more theoretical and conceptual evidence from the economic, finance, and accounting disciplines (Dietz et al., 2020; Flammer et al., 2021; Maji & Kalita, 2022). Thus, this thesis sheds light on the major features of climate change outcomes as well as how climate-related risks are connected to firm's performance.

The relationship between financial performance and climate change has received increased attention. Prior research has investigated whether there are financial incentives for improving environmental performance (Arslan-Ayaydin & Thewissen, 2016; Zhang & Chen, 2017). Some studies have investigated the impact of corporate social responsibility (CSR) disclosure on financial performance (Beck et al., 2018; Platonova et al., 2018), environmental disclosure on financial performance (Haninun et al., 2018; Li et al., 2017; Nor et al., 2016), carbon disclosure and financial performance (Alsaifi et al., 2020), sustainability disclosure and financial performance (Nugroho & Arjowo, 2014), and environmental performance and financial distress (Jia & Li, 2022; Shahab et al., 2018). The environmental performance of businesses is becoming more important to investors and creditors, as poor environmental performance tends to have negative financial consequences (Jia & Li, 2022). According to managerial stakeholder theory, effective environmental performance assists firms in

[1] https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Carbonriskdisclosure45/Report/c03

maintaining sound relationships with their stakeholders, and these relationships boost stakeholder trust and collaboration with firms, acting as a 'cushion' against adverse financial events (Jia & Li, 2022). The objective of **Chapter 2** of this thesis is to investigate the relationship between climate change disclosure and financial distress.

A research by Truong et al. (2020) is one of limited studies within the auditing literature to illustrate that audit fees are influenced by climate change. Company reports should contain not only financial information but also the disclosure of non-financial information that is required for decision-making (Shakhatreh et al., 2020). Brammer and Pavelin (2008) state that the quality of environmental disclosure is related to its value relevance to a diversity of interested outside parties and that it is audited by external audit. It is determined by the utility of environmental information to users in making better decisions (Ane, 2012). Dunn and Mayhew (2004) documented that selecting auditors is a part of companies' comprehensive disclosure strategy. Hence, it is expected that firms that do have a climate impact disclosure performance and provide substantial disclosures are likely to employ higher quality auditors to satisfy stakeholders and investors by providing a reliable and high-quality financial and social report. Thus, the primary objective of **Chapter 3** is to investigate the relationship between *CCDP* and audit fees.

Climate change and transitions of energy have emerged as prime social and financial issues, as reflected in current regulatory reforms motivated by the concerns of various stakeholder groups (Haque, 2017). As more responsibility falls on corporations to enhance their environmental strategies, corporations are increasingly prioritising their strategy of climate change as part of their overall business strategy (Lewandowski, 2017). Moreover, attention to business risk arising from climate change, including regulatory and market effects, has increased exponentially among institutional investors and other stakeholders, putting increasing pressure on corporate management to prioritise the assessment and reporting of such risks and related opportunities (Matsumura et al., 2014). Environmental disclosure at an appropriate level and quality fosters firm transparency, decreases information asymmetry, and simplifies improved economic decision-making in environments of higher trust and confidence for firms and investors (Benlemlih et al., 2018). Environmental risk management practices that are improved relieve societal pressures, reduce the governmental regulation threat, and lower market risk (Salama et al., 2011) as well as the firm's cost of capital (Dhaliwal et al., 2011). Consequently, **Chapter 4** of this thesis examines the relationship between *CCDP* and firm risk.

1.2 Climate Change in Australia

Australia is one of the world's largest emitters of greenhouse gases per capita because of its iron, uranium, coal, and natural gas sectors (Goodman, 2020). The high concentration of energy, mining, and industry has significant direct sustainability implications (Bachoo et al. (2013). Climate change strategies in Australia are being assessed for their effectiveness in meeting emission reduction targets as well as their implementation efficiency. To meet its responsibilities under the Paris Agreement, Australia has been encouraged to implement a toolkit of policies outlined by the Climate Change Authority in 2016.[2] In 2017, the Australian Government evaluated the success of the country's emission reduction actions in meeting the 2030 target and the Paris Agreement commitments.[3] This is in line with the 'ratchet mechanism' of the Paris Agreement, which uses a five-year review cycle to steadily increase countries' ambitions to keep global warming well below two degrees Celsius. The first global stocktake on climate mitigation, adaptation, and finance is to be held in 2023, with countries' revised emission reduction targets due by 2025.[4]

Assessing Australia's energy policies in 2018, the International Energy Agency suggested that the Commonwealth government needed to create a robust, long-term national energy and climate policy framework.[5] The Organisation for Economic Co-operation and Development (OECD) published a report on Australia's environmental performance in January 2019, which included energy efficiency and carbon intensity. It discovered that Australia is one of the OECD's most carbon-intensive countries, that it has taken a piecemeal approach to cutting emissions, and that its climate change strategy needs revision.[6]

Individual policies in Australia to reduce emissions have also been examined on a regular basis. The Climate Change Authority, for example, assessed the Australian Government's Emissions Reduction Fund in 2017 and the National Greenhouse and Energy Reporting Law in 2018. According to their reviews, both the Emissions Reduction Fund and

[2] See:https://www.climatechangeauthority.gov.au/special-review/towards-climate-policy-toolkit-special-review-australias-climate-goals-and
[3] See: https://www.industry.gov.au/sites/default/files/2020-07/australias-emissions-projections-2018.pdf
[4] See: https://www.climatechangeauthority.gov.au/sites/default/files/2020-07/Australian%20climate%20change%20policies%20-%20stocktake.pdf
[5] See: https://iea.blob.core.windows net/assets/fd84879e-c950-4da0-ad6f-60d2b8cf0098/EnergyPoliciesofIEACountriesAustralia2018Review.pdf
[6] See: https://www.oecd.org/australia/oecd-environmental-performance-reviews-australia-2019-9789264310452-en.htm

the National Greenhouse and Energy Reporting Law are working well and meeting their objectives. The assessments also indicated a number of areas where incremental refinements may be made.[7]

A study by Deloitte[8] in December 2018 showed that the Renewable Energy Finance Corporation (CEFC) was effective in stimulating higher flows of financing into the clean energy sector. The Australian Government reacted by complimenting the TCFD's final report and asked stakeholders to think about its recommendations carefully. The government also urged the Australian Securities Exchange (ASX) Corporate Governance Council to keep the principles and recommendations, as well as the guidance materials under review to ensure that they continue to provide an acceptable framework for ASX-listed firms' corporate governance.[9]

The Investor Group on Climate Change (IGCC)[10] stated in their 2020 report that investors expect to see more evidence from companies relating to their climate-related impacts, such as emissions footprints, business model assumptions, and executive level expertise, as well as more disclosure regarding the methodologies and input used in scenario analyses, and a higher level of coherence between climate-related risks and opportunities. Further, in response to these requirements, the IGCC has advocated for widespread adoption of the TCFD framework in Australia and New Zealand for better disclosure alignment.

The Long-Term Emissions Reduction Plan for Australia, which was released in December 2021, outlines how the country will achieve net-zero emissions by 2050.[11] Because a goal without a strategy is meaningless, the plan focuses on the 'how', on taking action to turn ambition into success. It will achieve net-zero emissions by 2050 in a feasible and responsible manner, allowing it to capitalise on new economic opportunities while continuing to serve their old export markets. This plan is not based on taxes, and it will not jeopardise industries, regions, or jobs. The actions and policies of the Commonwealth Government under the plan will not result in the loss of any Australian jobs.

Since resuming power in May 2022, the Australian Labour Party has been very active with its climate change policies and actions. A new federal department (Department of Climate Change, Energy, the Environment and Water) was formed on 1 July 2022 to deliver the

[7] See: https://www.climatechangeauthority.gov.au/sites/default/files/2020-07/Australian%20climate%20change%20policies%20-%20stocktake.pdf
[8] See: https://www.cefc.com.au/media/402001/cefc-statutory-review-deloitte-october-2018.pdf
[9] See: https://igcc.org.au/wp-content/uploads/2021/06/ConfusiontoClarity_APlanforMandatoryTCFDalignedDisclosureinAus.pdf
[10] See: https://igcc.org.au/wp-content/uploads/2020/09/IGCCReport_Full-Disclosure_FINAL.pdf
[11] Australia's long-term emissions reduction plan (industry.gov.au)

government's climate change and energy agenda, and to protect Australia's environment and water resources. The Australian Government first introduced the *Climate Change Bill 2022* in late July 2022, and its legislation was passed on 8 September 2022. The bill enacts the nation's commitment to reduce GHG emissions by 43% below 2005 levels by 2030, and net zero by 2050. This is a substantial increase on the commitment to cut GHG emissions by 26–28% below 2005 levels by 2030 under the 2015 Paris Agreement. As a result of the rising pressure for increased climate-related disclosure and advocacy for the widespread adoption of the TCFD framework by Australian institutional investors, and the commitment of Australian Government to climate change, the choice of Australia as the study's sample is warranted.

1.3 Summary of Key Findings

Chapter 2 investigates the relationship between *CCDP* and financial distress. In addition, the moderating impact of litigation, the existence of a risk committee, the employment of Big4 auditing firms, and the level of audit fees on this association are also examined. Utilising a sample of the top 300 ASX-listed non-financial firms over the period 2008–2019, it is found that higher levels of *CCDP* are related to lower levels of financial distress. Additionally, the significant association between *CCDP* and financial distress is manifested in firms with low litigation risk, firms with a risk committee, firms that employ Big4 auditing firms, and firms that incur a higher level of audit fees. Additional tests that mitigate self-selection and endogeneity, such as propensity score matching (PSM) and the system generalised method of moments (GMM), show that our findings are robust.

Chapter 3 investigates the relationship between *CCDP* and fees paid to the external auditor as well as the moderating impact of corporate governance characteristics on that relationship. Using a sample of the top 300 ASX-listed non-financial firms over the period 2008–2019, *CCDP* is found to be significantly positively related to external auditor fees. Additionally, the significant association between *CCDP* and audit fees is manifested in firms with a larger board of directors, a higher level of board independence, larger audit committees, and in firms with audit committees that are proportionately more independent. Our findings are robust to a difference-in-difference (*DID*) test, which mitigates potential endogeneity concerns.

Chapter 4 investigates the association between *CCDP* and firm risk, as well as the moderating effects of institutional ownership and auditor tenure on that relationship. We find

that higher levels of *CCDP* are associated with lower levels of firm risk in our sample of the top 300 ASX-listed non-financial firms from 2008 to 2019. Furthermore, firms with lower levels of institutional ownership and those that employ external auditors with a shorter-term tenure moderate significantly the relation between *CCDP* and firm risk. The findings are robust to potential self-selection bias and endogeneity concerns demonstrated via tests that include PSM.

Table 1.1: Summary of Key Findings

Chapter	Essay	Hypothesis	Findings
2	ONE	H2.1.There is a relationship between climate change disclosure performance (CCDP) and financial distress. H2.2. Litigation moderates the association of CCDP and financial distress. H2.3. The presence of a risk committee moderates the association of CCDP and financial distress. H2.4. Big4 auditing firms moderate the association of CCDP and financial distress. H2.5.The level of audit fees moderates the association of CCDP and financial distress.	H2.1. Higher levels of CCDP are associated with lower levels of financial distress. H2.2 – H2.5. The significant association between CCDP and financial distress is manifested in firms with low litigation risk, firms with a risk committee, firms using Big4 auditing firms, and firms incurring a higher level of audit fees.
3	TWO	H3.1. There is an association between CCDP and external auditor fees. H3.2a, H3.2b, H.3.3a, and H3.3b. Boards of directors, board independence, audit committees, and audit committees moderate the association between CCDP and external auditor fees.	H3.1. There is a positive association between CCDP and external auditor fees. H3.2a, H3.2b, H.3.3a, and H3.3b. Larger boards of directors, a higher level of board independence, larger audit committees, and audit committees that are proportionately more independent show a significant association between CCDP and audit fees.
4	THREE	H4.1. There is a relationship between CCDP and firm risk. H4.2 and H.4.3. Institutional ownership and auditor tenure moderate the association between CCDP and firm risk	H4.1. Higher levels of CCDP are associated with lower levels of firm risk H4.2 and H.4.3. Firms with lower levels of institutional ownership and those that use external auditors with a shorter tenure moderate the relationship between CCDP and firm risk significantly.

1.4 Contributions of this Thesis

Chapter 2 provides a number of significant findings. First, it makes a methodological contribution by using the TCFD framework and recommendations to ascertain the degree to which corporations adopt climate change reports. Although prior research (Daromes, 2019; Saka & Oshika, 2014) has primarily focused on CO_2 emission reporting, which is only one side of the TCFD framework, our assessment of climate change behaviour is more extensive since it includes all TCFD aspects. This research highlights a substantially negative link between *CCDP* and financial distress, meaning that enterprises are less likely to face financial difficulty if they recognise and report the financial consequences of climate change upon their organisation. Second, this study adds new mechanisms that might influence the link between *CCDP* and financial difficulty. We show that the degree of litigation risk, the presence of a risk committee, Big4 auditor personnel, and audit pricing all amplify the adverse connection between *CCDP* and financial distress. Third, this study contributes to the existing literature by investigating the link between *CCDP* and financial distress in general, as well as suggesting that *CCDP* is a set of risk management approaches and procedures that influence a broad range of stakeholders. This connection is valuable to investors in assessing risk premiums related to the cost of resources and future earnings and forecasting the likelihood of a corporation experiencing financial distress. This study supplements the body of data addressing the impact of *CCDP* on financial risk management in companies. This is particularly necessary given that the environmental, social, and economic performance shapes the fundamental operations of listed corporations in Australia.

The results in Chapter 3 provide a number of significant contributions to the literature. First, considering that climate change poses significant pressure on the economy and society, it is critical to analyse how enterprises manage these concerns (Dietz et al., 2016; Lesk et al., 2016). Furthermore, investors must be informed of the consequences of climate change, the assessment of future climate change, and how businesses combat climate change in their respective risk management procedures. Additionally, we measure the influence of climate change reporting behaviour on auditor risk evaluations through audit fees. This study presents inquiries and applies models produced by auditing theories and risk assessment, demonstrating how auditing research might apply to climate issues specifically.

Second, Chapter 3 sheds light on the major factors of climate change outcomes as well as how climate-related risks are connected to audit fees. The greater part of audit-pricing

research has concentrated on examining various risk attributes of businesses valued by auditors while turning a blind eye to how these risk attributes shift as a direct consequence of external costs from climate-related effects and hazards (Truong et al., 2020). In 2018, CPA Australia concentrated on important climate change audit implications to verify that companies complied with current accounting policies and legislation. The CPA was increasingly apprehensive that little had been accomplished to assess climate change and, as a result, auditors' professional liability risk, considering that climate change posed significant financial hazards to client organisations. We demonstrate how climate change impacts a company's business risk and how auditors consider such concerns when calculating audit risk. Third, as one of the first studies to employ the TCFD framework and recommendations as an indicator for business climate change reporting behaviour, we provide a methodological contribution. Consequently, the results of this analysis allow us to make recommendations to managers and auditors on how companies can successfully manage climate risks. Ultimately, the study's conclusions have significant consequences for policymakers, administrators, shareholders, and accountants.

Chapter 4 contributes to the literature in various ways. Firstly, it adds a methodological dimension to environmental and climate reporting by applying the TCFD framework and recommendations to establish how far corporations are willing to go in sharing global change facts. In comparison to previous studies, our analysis of climate change behaviour is more comprehensive because it includes all components of the TCFD framework (Daromes, 2019; Saka & Oshika, 2014). The results of Chapter 4 show that there is a statistically significant negative association between *CCDP* and company risk, implying that organisations that recognise and report the financial and shareholder effects of climate change on their organisation are less likely to face company risk. Second, we identified other channels that may impact the relationship between *CCDP* and company risk. We find that lower levels of institutional ownership and shorter-term external auditors amplify the negative relationship between *CCDP* and business risk. Third, by examining the relationship between the *CCDP* and firm risk, this study expands prior research on the causes of climate change hazards. Our results show that the *CCDP* is a set of risk management regulations and processes that affect a broader number of stakeholders. As a direct consequence of this link, investors should be able to predict risk premiums related to the cost of assets and future profits and the likelihood and extent of business risk. Our study includes components like carbon pricing, *GHG* emissions, energy, and how certain factors respond to a varied stakeholder cohort, and it contributes to the current understanding of the impact of the *CCDP* on financial risk management, especially concerning

climate change activities and reporting. This is especially important since measurements of sustainability practices govern the core activities of publicly listed companies in Australia.

1.5 Structure of the Thesis

This thesis is divided into three essays and includes five chapters. Chapter 2 provides the first essay, entitled 'Climate Change Disclosure Performance and Financial Distress: Evidence from Australia', which investigates the relationship between *CCDP* and financial distress. Chapter 3 presents the second essay, entitled 'Climate Change Disclosure Performance and Audit Fees: Evidence from Australia', which investigates the relationship between *CCDP* and audit fees. Chapter 4 reports the third essay, entitled 'Climate Change Disclosure Performance and Firm Risk: Evidence from Australia', which explores the relation between *CCDP* and firm risk. Chapter 5 offers the conclusion and directions for future research.

Chapter 2
Climate Change Disclosure Performance and Financial Distress: Evidence from Australia

2.1 Introduction

Climate change is often regarded as one of the most pressing concerns confronting governments, industry, and civil society in the twenty-first century (Okereke et al., 2012). Climate-related risk is one of the most important risks recognised by firms, according to a KPMG survey of corporate responsibility reporting (KPMG, 2017). Mercer (2015) defines climate-related risk as a substantial source of portfolio risk for institutional investors. The impact of climate change on business operations is increasingly becoming a source of concern for investors, as the associated risks may have an impact on their investment returns (Ko & Tai, 2019).

Australia introduced the *Climate Change Bill 2022* on 8 September 2022.[12] It is the first climate change legislation in the recent decade, which sets the national targets of cutting emissions by at least 43% by 2030, compared to 2005 levels, and reaching net zero by 2050. Under the National Climate Resilience and Adaption Strategy, firms are required to anticipate, adapt, and report climate change risks and how they are managing those risks in the context of net-zero emissions targets. The Australian Accounting Standards Board (AASB) Practice Statement 2 'Making Materiality Judgements' (APS/PS 2) requires that, when preparing financial statements, 'material' risks must be disclosed. The AASB (2019) shows that regulators, policymakers, and shareholders are putting increasing pressure on firms to report climate change risks and effects globally. Additionally, other stakeholders, such as suppliers, customers, and the general public, require higher levels of climate change risk disclosure (Kouloukoui et al., 2019). The AASB and the Auditing and Assurance Standards Board (AUASB) expect directors and auditors to consider APS/PS 2 when preparing and auditing financial statements (Li et al., 2019).

[12] See: https://www.aph.gov.au/Parliamentary_Business/Bills_Legislation/Bills_Search_Results/Result?bId=r6885

The TCFD was established by the Financial Stability Board to produce recommendations for more effective climate-related disclosures around the world. The TCFD is made up of 31 members[13] from across the G20 countries, including both preparers and users of financial disclosures. Since 2017, the TCFD has published model frameworks and recommendations on climate-related financial disclosures, including climate-related financial risk disclosure (Muldowney & Colquhoun, 2019). These frameworks and recommendations consist of 11 items, which are divided into four groups: governance, strategy, risk management, metrics and targets. The TCFD advises entities to follow its recommendations for reporting and disclosing climate risks and opportunities (TCFD, 2019). The TCFD framework is used as an objective metric of climate change disclosure performance assessment in this study.

Stakeholder theory and risk management theory can explain the possible link between *CCDP* and financial distress. According to stakeholder theory, positive engagement in terms of CSR or environmental action can be a proxy for high-quality management (Attig & Cleary, 2015), which leads to a diminished likelihood of firms falling into a state of financial distress. From risk management perspectives (Hoi et al., 2013; Minor & Morgan, 2011), higher levels of climate change disclosure are likely to reduce the management's propensity to make risky financial decisions because of the increased stakeholder involvement through the consideration of climate change risks, which will hence diminish the probability of financial distress. Together, we posit that there is a link between financial distress and a firm's climate change disclosure performance.

The final sample of this study consists of 212 non-financial firms listed on the ASX, providing 1,978 firm-year observations. We test the relationship between *CCDP* and financial distress using OLS regression analysis with fixed effects. In addition, the moderating impact of litigation, the existence of a risk committee, the employment of a Big4 auditing firm, and the audit fees on this relationship are also investigated. We find that *CCDP* is negatively related to financial distress; that is, firms with better climate change disclosure performance are less likely to experience financial distress. Moreover, the negative relationship between *CCDP* and financial distress is magnified in firms with lower levels of litigation risk, firms that have a risk committee, firms that employ Big4 auditors, and firms with a higher level of audit fees.

This study makes several important contributions. First, it provides a methodological contribution through its application of the TCFD framework and recommendations as a

[13] See: https://www.fsb-tcfd.org/members/

measure of the extent to which firms embrace climate change disclosures. While previous studies (Daromes, 2019; Kelvin

et al., 2019; Saka & Oshika, 2014) mostly focus on carbon emission disclosure, which is only one component of the TCFD framework, our measure of climate change performance is more comprehensive since it incorporates all the TCFD elements. This study finds a significant negative relationship between *CCDP* and financial distress, implying that firms are less likely to experience financial distress if they materially embrace and disclose the financial and stakeholder implications of climate change on their business. Our results are supported by theoretical frameworks from stakeholder and risk management perspectives. Second, this study provides additional channels that potentially affect the relationship between *CCDP* and financial distress. We provide empirical evidence that the level of litigation risk, existence of a risk committee, Big4 auditor employment, and audit pricing magnify the negative relationship between *CCDP* and financial distress. Third, this study adds to the body of literature through its examination of the relationship between *CCDP* and financial distress in general as well as by arguing that *CCDP* constitutes a collection of risk management methods and techniques that affect a wide variety of stakeholders. This relationship is expected to be useful to investors in estimating risk premiums related to the cost of capital and future cash flows as well as determining the possibility of a firm facing financial distress. This study provides important evidence regarding *CCDP*'s effect on firms' financial risk management. This is especially significant considering that sustainability and social and environmental performance shape the core activities of listed firms in Australia.

The remainder of this essay is structured as follows. Section 2 provides an overview of climate change in Australia. Section 3 reviews the literature on climate change disclosure performance and presents the hypotheses. The sample selection, regression model, and variables are discussed in Section 4. The empirical results are presented in Section 5, with the results of additional analyses provided in Section 6. Finally, Section 7 offers some concluding remarks on the study.

2.2 Literature Review and Hypothesis Development

2.2.1 Disclosure of Climate Change Information

Climate change is one of the most universal environmental issues confronted in recent decades (Ko & Tai, 2019). Climate change risks are reshaping the business environment of

firms around the world (Begg et al., 2018). The Financial Stability Board recognised the importance of climate change reporting in 2015 when it established the TCFD to promote and make recommendations for effective climate change disclosure (Melloni, 2020). Businesses throughout the world are urged to be more transparent about climate change risks by following the best-practice recommendations of the worldwide TCFD (Siew, 2020).

The influence of *CCDP* on firms in terms of accounting and financial elements is explored in a limited number of recent studies (Borghei, 2021; Bui et al., 2020; Cowan & Deegan, 2011; Eleftheriadis & Anagnostopoulou, 2015; He et al., 2022; Kelvin et al., 2019; Linnenluecke et al., 2015; Saka & Oshika, 2014). Alsaifi et al. (2020) find robust evidence that the disclosure of voluntary carbon emissions as a strategic decision-making matter is positively correlated with a firm's financial performance. Huynh et al. (2020) show that drought risk and the cost of equity capital have a significant positive relationship. Do et al. (2021) document that banks charge drought-affected borrowers a higher loan spread. Kelvin et al. (2019) demonstrate that carbon emission disclosure has a negative relationship with the cost of equity but a positive relationship with abnormal stock returns. Daromes (2019) finds that the disclosure of *GHG* emissions has a positive and significant impact on a firm's reputation. Saka and Oshika (2014) conclude that carbon management disclosure and equity market value are positively associated and that this association is stronger with an increasing level of carbon emissions.

Eleftheriadis and Anagnostopoulou (2015) find a positive relationship between firm size and climate-related corporate disclosures but no relationship between climate-related disclosures and profitability or firm leverage. Kouloukoui et al. (2019) document that corporate climate risk disclosures, firm size, and financial performance exhibit a significant positive relationship. Ziegler et al. (2011) find that the disclosure of corporate responses to *CCDP* and stock performance have a positive relationship for U.S. energy firms due to the implicit institutional demand regarding global warming. Busch and Lewandowski (2018) show that strength in carbon emissions' reduction performance is mostly positively associated with financial performance strength.

Prior studies mostly focus on carbon emission disclosure, which is only one component of the TCFD model framework, and recommendations for climate-related financial disclosure. Using the full TCFD framework, this study assesses the role of a firm's governance, strategy, risk management, metrics and targets in the disclosure of climate change. Accordingly, it provides a more nuanced approach to the assessment of *CCDP*.

2.2.2 Financial Distress

According to Altman and Hotchkiss (1993), ‘corporate financial distress’ is an ambiguous phrase that can refer to any of four generic categories that are widely used in business research: bankruptcy, insolvency, failure, and default. Failure occurs when the realised rate of return on invested capital, after taking risk into account, is consistently lower than the prevailing rates on similar investments, when the revenues are insufficient to cover the costs, or when the average return on investment is consistently lower than the firm’s cost of capital.

Financial distress crucially increases the incentives for shareholders and their agents, that is, firms’ management, to engage in risk shifting (Eberhart & Senbet, 1993; Maksimovic & Titman, 1991). In fact, risk-shifting behaviour increases in times of financial distress (Campello et al., 2011, 2012; Campello et al., 2010; Eberhart & Senbet, 1993; Maksimovic & Titman, 1991). Nugroho et al. (2021) demonstrate a specified indirect impact; the stock return is significantly affected by financial distress through profitability and systematic risk. Financially distressed companies have higher capital costs, less access to external funding sources, lower credit ratings, and, in general, a greater tendency on the part of managers to take on more risk (Edwards et al., 2013). Nevertheless, credit-constrained companies are focused on the need to conserve cash, maintain credit ratings, meet debt covenant requirements, and remain a going concern. In addition, a company in financial distress may face serious negative consequences, such as increased political/media pressure, loss of executive/firm reputation, possible fines and penalties, and possible consumer/creditor reprimands. A corporation will engage in social and environmental activities in equilibrium if the marginal advantages of doing so outweigh the marginal costs. As the potential consequences of financial distress rise, business tactics designed to reduce financial distress will become increasingly tempting and viable. To mitigate the risks and costs connected with financial distress, the corporate management may be forced to implement risk mitigation initiatives related to climate change. While there are various approaches to reducing risk-shifting behaviour, more traditional strategies (such as the use of social and environmental disclosure performance) have not yet been examined adequately, thus providing the motivation for this study.

2.2.3 Climate Change Disclosure Performance and Financial Distress

Prior research studies the relationship between environmental and financial performance to determine whether environmental preservation provides a competitive edge for businesses (Alexopoulos et al., 2018; Artiach et al., 2010; Aslam et al., 2021; Elkington, 1994; Gallego-Álvarez et al., 2014; Hart, 1995; Nor et al., 2016; Partalidou et al., 2020; Porter & Van der Linde, 1995; Schmidheiny & Timberlake, 1992; Shabbir & Wisdom, 2020; Shrivastava, 1995; Tzouvanas et al., 2020; Wagner et al., 2002). Utilising the resource-based view of the company, the literature has shown that companies should not focus solely on financial success since they rely on both their internal and their external surroundings to be competitive (Barney, 1991; Conner, 1991; Grant, 1991; Hart, 1995).

Previous literature has shown mixed findings when investigating the relationship between environmental performance and firm outcomes. On the one hand, some empirical studies demonstrate a positive association between financial and environmental performance (Aslam et al., 2021; Ayu et al., 2020; Griffin & Mahon, 1997; Judge & Douglas, 1998; Klassen & McLaughlin, 1996; Partalidou et al., 2020; Preston & O'bannon, 1997; Russo & Fouts, 1997; Secinaro et al., 2020; Shabbir & Wisdom, 2020; Wang et al., 2020). On the other hand, other research reports that there is no positive association between firm outcomes and environmental performance (Cordeiro & Sarkis, 1997; Gilley et al., 2000; Hibiki & Managi, 2010; Link & Naveh, 2006; Marcus, 1989; Newton & Harte, 1997; Wagner et al., 2002). Some authors have found no association but acknowledge that if there is one, it is too complicated to be identified (Margolis & Walsh, 2003; Ullmann, 1985).

There is a noticeable paucity of research on the relationship between corporate social performance and financial difficulties. Goss (2009) finds a strong impact of socially responsible firm ratings in determining the distress level among U.S. firms. Gupta and Krishnamurti (2018) find that social and environmental engagement benefits enterprises in the U.S. that are already bankrupt. They discover that both moral capital and exchange capital boost a company’s chances of recovering from bankruptcy, with moral capital having greater potential to pull the company out of a bad situation than exchange capital. Wu et al. (2020) indicate that CSR and firm financial performance have a significant positive relationship, which is manifested in more stable firms. Al-Hadi et al. (2019) report that positive social activities significantly reduce the financial distress of Australian companies.

Stakeholder theory (Freeman, 2010; Roberts, 1992) contends that managers communicate with various stakeholders through the use of GHG disclosures as a channel (Cormier et al., 2005; Gray et al., 1995; Jaggi et al., 2018; Leung & Philomena, 2013; Nichita et al., 2021; Retolaza, 2016; Sprengel & Busch, 2011). Firms have a strong incentive to react to stakeholder requests for information about their operations that result in pollution since doing so will show that they are living up to their expectations. Large organisations have greater funds to dedicate to climate disclosures (Belal, 2001) and are committed to cultivating a favourable reputation with their stakeholders. According to Halkos and Skouloudis (2016), the rhetoric surrounding climate change can be used to influence stakeholders' decision-making. When businesses maintain positive relationships with their stakeholders, they are better able to seek capital from socially conscious investors (El Ghoul et al., 2011). According to the perspectives of stakeholder theory, strong environmental performance can result in better relationships with stakeholders and less financial distress. For instance, businesses with a better performance in terms of environment issues might have worthy intangible assets (e.g. the capacity to attract and keep high-quality employees, as well as greater customer loyalty) (Malik, 2015), which lowers a firm's likelihood of financial distress by boosting its competitive advantages and profitability.

Another perspective to support the link between environmental performance and financial distress is risk management theory. Firms that engage in activities that reduce GHG emissions would serve the interests of shareholders and are less likely to make risky financial decisions, which ultimately reduce the probability of financial distress (Hoi et al., 2013; Minor & Morgan, 2011). Godfrey et al. (2009) find that participating in CSR activities creates moral capital for the firms, and it provides an insurance-like protection when negative events occur. It is also found that firms with skilled management who utilise resources effectively are less likely to experience financial distress (Jia & Li, 2022).

Firm management that ensures firms' participation in and disclosure of climate change effects is likely to contribute to more positive returns and lower levels of financial distress. A firm's consideration of climate change impacts and its disclosure of such effects can directly affect the probability of bankruptcy because such disclosures can assist that firm in maintaining its market share and in remaining competitive through stakeholder engagement and agreement. Firms that disclose climate change effects are also more likely to use resources pertaining to operating, investing, and financing activities effectively to influence the outcome of economic fundamentals (e.g. cash flows, solvency-related risks, and continuity as a going concern). We conjecture that firms' engagement in and signals of enhanced climate change adjustments and

disclosures will create an insurance-type cushion, thereby diminishing their level of financial distress. In light of the previous discussion, our first hypothesis is stated as follows:
H2.1*: CCDP is negatively associated with financial distress.*

2.2.4 The Moderating Role of Litigation Risk

Litigation risk is defined as the risk derived from litigation claims from parties that maintain some degree of disadvantage, such as creditors and investors (Utami, 2011). Firms that are involved in litigation witness a considerable drop in their firm value (Cao & Narayanamoorthy, 2006). Litigation risk becomes an external consideration since investors and creditors are legally protected individuals, who can file lawsuits against the company to safeguard their rights or interests (Sari, 2020).

Nelson and Pritchard (2007) argue that firms with a higher risk of lawsuits publish more cautionary language, update it more frequently from year to year, and use more accessible language. They suggest that companies establish disclosure rules to reduce litigation costs. Further, Houston et al. (2019) show that litigation risk changes affect the practices of corporate voluntary disclosure. Wuqing et al. (2020) indicate that litigation claims for significant sums of money are related to low profitability, whereas litigation risk raises the operational costs of firms susceptible to lawsuits and lowers their operating profitability. Material litigation loss contingency may be experienced by lawsuit firms as a result of a loss of customers and suppliers. Firms' financial stability can potentially be damaged by the litigation loss contingency when a class action lawsuit has been filed against them, resulting in product quality deterioration and insufficient investments in supplier–customer relationships in the short term (Titman & Wessels, 1988). Furthermore, the loss of reputation derived from litigation may damage the public image, resulting in a reduction in the long-term operating performance of firms facing lawsuits (Johnson et al., 2014).

Trade-off theory states that increasing risk should be correlated with lower debt levels (Malm & Krolikowski, 2017). As a result, businesses in litigious environments would be motivated to take steps to lower their risk of bankruptcy. Less debt financing may be used by businesses with a high risk of litigation in their capital structure to reduce the costs associated with bankruptcy. This is due to the possibility that future cash flows will not be sufficient to repay loan holders. Based on the above discussion, a greater incidence of litigation can negatively affect a firm's reputation, value, and profitability. Climate change disclosure

performance is considered to be a major factor in reducing the likelihood of litigation, ultimately diminishing the probability of financial distress. Thus, the following hypothesis is developed.

H2.2*: Litigation risk moderates the relationship between CCDP and financial distress.*

2.2.5 The Moderating Role of Audit Quality

Wallace et al. (1994) suggest that annual reports and financial statements are not only audited but also influenced by auditors. Following the work of DeAngelo (1981), it has been widespread practice to distinguish between audit firms according to their brand name (i.e. big vs small audit firms), and audit firms with a brand name tend to have better disclosure. Marwa et al. (2020) find that there is a higher level of voluntary disclosure of environmental information when firms are audited by Big4 auditing firms. Similarly, Palmer (2008) shows that firms that are audited by higher-quality auditors provide more disclosure in terms of both extent and quality.

In line with agency theory, the more firms are audited by a Big4 auditor, the better their financial performance. Ado et al. (2020) find that the size of the auditor has a significant positive correlation with the return on assets (ROA). A recent study by Ashari and Krismiaji (2020) also indicates that Big4 auditing firms have a positive impact on a firm's financial performance. Therefore, hiring *Big4* auditing firms will enhance a firm's quality of disclosure, which may include, for instance, *CCDP*. Thus, employing Big4 auditors is likely to moderate the relationship between *CCDP* and financial distress. Consequently, the following hypothesis is developed.

H2.3*: The employment of Big4 auditing firms moderates the relationship between CCDP and financial distress.*

2.2.6 The Moderating Role of Risk Committee

The risk committee, as a critical risk-monitoring instrument, is in charge of the primary task of risk management. One of the risk committee's responsibilities is to present investors with sufficient and appropriate risk information, which decreases the chance of the corporation being devalued by investors (Jia et al., 2019). Thus, the risk committee is likely to have a substantial impact on risk management disclosure practices (Jia et al., 2019). As a risk

monitoring tool, the risk management committee is expected to improve the level of risk monitoring, resulting in lower agency costs and less information asymmetry (Jensen & Meckling, 1976). Ishak and Yusof (2014) and Subramaniam et al. (2009) argue that a risk management committee could improve the quality of internal risk monitoring for firms. Nahar et al. (2020) indicate that the existence of various risk committees and a unit for risk management has a positive relationship with risk disclosure. Jia et al. (2019) reveal that the existence of a separate risk management committee is positively correlated with higher risk management disclosure quality. Al-Hadi et al. (2016) find that firms with a stand-alone risk committee have more market risk disclosures.

Halim et al. (2017) find that a risk management committee has an impact on firm performance and that it operates as an intervening variable in the relationship between corporate governance, firm size, and risk of financial reporting. The existence of a risk management committee could help a firm to control the quality of financial reporting risks more effectively. Bhuiyan et al. (2021) state that corporate risk-taking is found to be much lower in firms with a stand-alone risk committee than in ones with a joint audit and risk committee. They also find the existence of a stand-alone risk committee to be positively related to firm value.

According to stakeholder theory, financial institutions could create a risk committee to improve interactions and information sharing with various stakeholders (Al-Hadi et al., 2016; Barakat & Hussainey, 2013). Similarly, based on agency theory, corporate governance mechanisms allow, to some extent, the interests of executives to align with those of shareholders, which leads to business performance (Baklouti et al., 2016). Based on the above discussion, the existence of a risk committee plays an important role as an internal monitor in increasing the financial reporting quality and risk disclosure, such as climate change risk disclosure, and in reducing any risks related to the firm's investors. Thus, the existence of a risk committee will help to moderate the relationship between *CCDP* and financial distress. Consequently, the following hypothesis is developed.

H2.4*: The existence of a risk committee moderates the relationship between CCDP and financial distress.*

2.2.7 The Moderating Role of Audit Fees

Audit fees are fees paid to audit firms by the customer as reimbursement for their efforts in providing services. Depending on the customer size and risk, the level of fees paid is usually related to the auditor's efforts. Thus, such fees may be discretionary, and, if they are not consistent with the auditor's efforts, they may damage its independence and, as a result, the report's quality (Bakar & Ahmad, 2009). Shakhatreh et al. (2020) suggest that audit fees positively and significantly affect disclosure quality. Their findings imply that audit fees have a significant influence on determining the independence of an auditor as a result of the economic bonding with the client, which has an impact on audit and financial reporting quality.

Ado et al. (2020) and Moutinho et al. (2012) show that audit fees have a positive but insignificant association with ROA. Furthermore, Ado et al. (2020) find a positive association between auditor independence and financial performance, implying that audit monitoring increases in proportion to the amount paid in audit fees. Their findings also suggest that auditors' fees for audit services provide them with a strong sense of commitment and determination to ensure that the firm receives the most value for money by providing the best audit service possible.

Theories on the effect of audit fees on the financial reporting quality differ. For example, using agency theory, Michael and William (1976) argue that the audit is a monitoring instrument of the management designed to decrease agency costs; in other words, the more work required, the higher the audit fees. According to economic theory based on DeFond et al. (2002), the higher the audit fees, the greater the incentive for auditors to tolerate financial misstatements so as to retain their profitable client. Thus, higher fees are expected to have a negative impact on the quality of financial statements.

Based on the above results and theoretical points of view, the fees paid for auditing services will potentially moderate the relationship between *CCDP* and financial distress. Consequently, the following hypothesis is developed:

H 2.5*: Audit fees moderate the relationship between CCDP and financial distress.*

2.3 Methodology and Research Design

2.3.1 Data and Sample

We start with the top 300 firms listed on the ASX over the period 2008–2019. We exclude 77 financial and real estate firms and 11 firms with missing data. Our final sample consists of 212 non-financial firms with 1,978 firm-year observations. Data on climate change

disclosure and corporate governance are manually collected from firms' annual reports, which are available from the Morningstar database. Other financial data are from the Connect4 database. All audit-related data are obtained from the Global Audit Analytic database. Table 2.1 shows that 24.05% of our sample is from the materials industry sector, followed by consumer discretionary firms (18.86%), and industrial firms (13.67%).

Table 2.1: Firms by industry

ASX industry	No. of firms	Observations	Percentage
Consumer Discretionary	40	377	18.86%
Consumer Staples	20	172	9.43%
Energy	16	160	7.54%
Health Care	21	199	9.90%
Industrials	29	273	13.67%
Information Technology	23	172	10.84%
Materials	51	503	24.05%
Utilities	6	70	2.83%
Telecommunication Services	6	52	2.81%
Total	212	1,978	100.00%

This table shows our data sample according to industry classifications. Our sample covers firms from the top 300 ASX-listed non-financial sectors over the period from 2008 to 2019.

2.3.2 Dependent Variable

Following the prior literature (Al-Hadi et al., 2019), our dependent variable, financial distress, is measured with three widely used proxies: Berger et al.'s (1996) model (*BOS_Dis*), Altman's (1968) model *(AltmanZ*) and Almeida and Campello's (2007) model (*AC_Dis*). These financial distress models are defined in Appendix 2.B. Higher values of the distress proxies indicate lower levels of financial distress for all three measures.

2.3.3 Independent Variable

In this study, *CCDP* is measured using the 11 items of the TCFD recommended disclosures.[14] The TCFD has developed a framework to help public companies and other organizations more effectively disclose climate-related risks and opportunities through their existing reporting processes. The TCFD recommendations on climate-related financial disclosures are widely

[14] See: https://www.fsb-tcfd.org/wp-content/uploads/2019/06/2019-TCFD-Status-Report-FINAL-053119.pdf

adoptable and applicable to organizations across sectors and jurisdictions. They are designed to solicit decision-useful, forward-looking information that can be included in mainstream financial filings. Our independent variable is *CCDP*, which is measured as the average score of all 11 items disclosed in the *CCDP* index. We equally weight each of the 11 items that make up the CCDP score and assign each item a value of 1 to each item if present.

They are divided into four groups: governance (*GOV*), strategy (*STR*); risk management (*RM*); and metrics and targets (*MT*). The list of 11 items that make up the *CCDP* index is shown in Appendix 2.A. Our independent variable is *CCDP*, which is measured as the average score of all 11 items disclosed in the *CCDP* index as we equally weighted all 11 items and assign each item a value of 1 if a firm presents an item.

.

2.3.4 Moderation Variables

This study uses four different moderator variables. First, litigation (*LITIGATION*) is defined as an indicator variable that is equal to 1 if the firm has recorded at least one lawsuit and 0 otherwise. Second, the existence of a risk committee (*RISK_COM*) is measured as an indicator variable that is equal to 1 if the firm has a risk committee and 0 otherwise. Third, Big4 (*BIG4*) is an indicator variable that is equal to 1 if the firm employs a Big4 auditor and 0 otherwise. Fourth, audit fees (*AFEE*) are measured as the natural logarithm of the total audit fees.

2.3.5 Control Variables

Following the prior literature (Al-Hadi et al., 2019; Boubaker et al., 2020; Farooq et al., 2021), we adopt a number of control variables in our study. Firm size (*SIZE*) is measured as the natural logarithm of the total assets, and it is expected to show a significant and positive relationship between *CCDP* and financial distress (Al-Hadi et al., 2019; Boubaker et al., 2020; Farooq et al., 2021). We control for firm leverage (*LEV*), which is measured as the long-term debt divided by the total assets, and cash holding (*CASH*), which is defined as cash and marketable securities scaled by the total assets. In addition, the market-to-book ratio (*MTB*), which is calculated as the ratio of the market value and the book value of firm equity, is controlled. Following Al-Hadi et al. (2019), we also control for the return on assets (*ROA*),

which is measured as the net income divided by the total assets, and the quick ratio (*QUICK*), which is calculated as the cash and receivables scaled by the current liabilities, and firm loss (*LOSS*), which is a binary variable for negative net income. The ratio of research and development expenses scaled by the lagged total assets (*RD*) and the firm age (*AGE*) are controlled in our regression. Appendix 2.B defines all the variables used in the study.

2.3.6 Regression Model

Following prior literature (Alsaifi et al., 2020; Eulaiwi et al., 2022; Shahab et al., 2018), this ordinary least square (OLS) regression model, which controls for year and industry fixed effects, is performed to test our first hypothesis (H1):

$$DIS_{i,t} = \gamma_0 + \gamma_1 CCDP_{i,t} + \gamma_2 SIZE_{i,t} + \gamma_3 LEV_{i,t} + \gamma_4 ROA_{i,t} + \gamma_5 MTB_{i,t} + \gamma_6 CASH_{i,t} + \gamma_7 QUICK_{i,t} + \gamma_8 RD_{i,t} + \gamma_9 LOSS_{i,t} + \gamma_{10} AGE_{i,t} + Year\ Dummies + Ind\ Dummies + e_{i,t} \quad (1)$$

To examine the other hypotheses (H2, H3, H4, and H5), we run equation (1) separately for each of the moderation variables. The two subsamples are delineated above or below the median value of the audit fees, and the existence of litigation, a risk committee, and employment of a Big4 audit firm. The incorporation of moderating variables in our models based on high (above the median) and low (below the median) values of those variables provides us with an indication of what sort of conditions (e.g. high litigation risk environment) are important in sustaining significance between *CCDP* and financial distress (Chaihanchanchai & Anantachart, 2022; Li & Ramanathan, 2020; Zhu et al., 2022).

We measure DIS (financial distress), our dependent variable, following the procedure of Al-Hadi et al. (2019) by using three widely used proxies: the Berger et al. (1996) model (*BOS_Dis*), the Altman (1968) model (*AltmanZ*) and the Almeida and Campello (2007) model (*AC_Dis*). *CCDP* is measured as the average score of all 11 items based on the TCFD recommended disclosures. The control variables in our equation are firm size (*SIZE*), leverage (*LEV*), the return on assets (*ROA*), the market-to-book ratio (*MTB*), cash holding (CASH), the quick ratio (*QUICK*), the ratio of research and development expenses (*RD*), firm loss (*LOSS*), and firm age (*AGE*), which are used in the prior literature (Al-Hadi et al., 2019; Boubaker et al., 2020; Farooq et al., 2021). Details of the variables are in Appendix 2.B.

2.4 Results

2.4.1 Descriptive Statistics

Table 2.2 reports the descriptive statistics of the variables included in this study. The means of the dependent variable financial distress (*DIS*) for each of the three different measures *BOS_Dis, AC_Dis* and *AltmanZ* are 0.27, 0.41, and 0.86, respectively. These values are consistent with the figures reported in the previous literature (Al-Hadi et al., 2019). The mean value of the independent variable, *CCDP*, is 0.21, and those of its other four attributes, which are governance (*GOV*), strategy (*STR*), risk management (*RM*), and metrics and targets (*MT*), are 0.23, 0.12, 0.23, and 0.27, respectively. The mean value indicates that the majority of the sample firms are financially viable and operating as a going concern. *CCDP* firms with a higher mean value are more financially stable and less likely to suffer financial distress. The means of the moderator variables – litigation (*LITIGATION*), risk committee (*RISK_COM*), Big4 (*BIG4*) and audit fees (*AFEE*) – are 0.13, 0.76, 0.85, and 13.14, respectively. On average, 13% of our sample firms have recorded at least one lawsuit, 76% of them have established a risk committee, 85% of them have a Big4 auditing firm, and they pay around $509,000 in audit fees. The average values for the control variables are as follows: 6.89 for firm size (*SIZE*), 0.17 for firm leverage (*LEV*), 0.03 for return on assets (*ROA*), 1.71 for firm market value scaled by book value (*MTB*), 0.14 for firm cash holding (*CASH*), 0.49 for quick ratio (QUICK), 0.02 for research and development expense ratio (*RD*), 0.21 for firm loss (*LOSS*), and 2.54 for firm age (*AGE*).

Table 2.2: Descriptive statistics

Variables	N	Mean	S.D.	25th	Median	75th	skewness	kurtosis
BOS_Dis	1,978	0.27	0.14	0.16	0.29	0.39	0.03	0.00
AC_Dis	1,978	0.41	0.17	0.28	0.42	0.52	0.00	0.81
AltmanZ	1,978	0.86	0.77	0.43	0.71	1.13	0.00	0.00
CCDP	1,978	0.21	0.27	0.00	0.09	0.27	0.00	0.00
GOV	1,978	0.23	0.36	0.00	0.00	0.50	0.00	0.02
STR	1,978	0.12	0.27	0.00	0.00	0.00	0.00	0.00
RM	1,978	0.23	0.33	0.00	0.00	0.33	0.00	0.02
MT	1,978	0.27	0.32	0.00	0.33	0.33	0.00	0.02
LITIGATION	1,978	0.13	0.33	0.00	0.00	0.00	0.00	0.00
RISK_COM	1,978	0.76	0.43	1.00	1.00	1.00	0.00	0.00
BIG4	1,978	0.85	0.35	1.00	1.00	1.00	0.00	0.00
AFEE	1,978	13.14	1.21	12.35	13.06	13.88	0.00	0.00
SIZE	1,978	6.89	1.85	5.75	6.93	8.27	0.00	0.11
LEV	1,978	0.17	0.16	0.01	0.15	0.27	0.00	0.00
ROA	1,978	0.03	0.26	0.01	0.05	0.10	0.00	0.00
MTB	1,978	1.71	1.93	0.63	1.05	1.93	0.00	0.00
CASH	1,978	0.14	0.17	0.03	0.07	0.17	0.00	0.00
QUICK	1,978	0.49	3.02	-0.18	-0.02	0.16	0.00	0.00
RD	1,978	0.02	0.05	0.00	0.00	0.00	0.00	0.00
LOSS	1,978	0.21	0.40	0.00	0.00	0.00	0.00	0.00
AGE	1,978	2.54	0.97	1.95	2.64	3.18	0.00	0.11

This table presents the descriptive statistics for variables used in the analysis. All variables are defined in Appendix 2.B.

2.4.2 Correlation Analysis

Table 2.3 reports the Pearson's correlation matrix among the variables used in this study. It shows a significant positive association between firms with *CCDP* and two measures of financial distress (*BOS_Dis* and *AltmanZ*) at $p < 0.01$ and $p < 0.05$, respectively, which support H1 indicating that higher *CCDP* is significantly associated with lower financial distress. Moreover, all of the control variables have significant correlation with the dependent variable.

Table 2.3: Pearson's correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
BOS_Dis	1												
AC_Dis	0.41***	1											
AltmanZ	0.40***	0.08***	1										
CCDP	0.27***	0.01	0.05**	1									
SIZE	0.35***	-0.26***	0.18***	0.52***	1								
LEV	0.18***	-0.27***	-0.05**	0.18***	0.44***	1							
ROA	0.16***	-0.11***	0.58***	0.06**	0.44***	0.06***	1						
MTB	-0.24***	0.29***	-0.05**	-0.16***	-0.40***	-0.25***	-0.09***	1					
CASH	-0.42***	0.63***	-0.26***	-0.20***	-0.45***	-0.42***	-0.22***	0.49***	1				
QUICK	-0.32***	0.30***	-0.19***	-0.11***	-0.11***	-0.23***	0.02***	0.18***	0.29***	1			
RD	-0.17***	0.21***	-0.08***	-0.16***	-0.15***	-0.20***	-0.20***	0.36***	0.15***	-0.02***	1		
LOSS	-0.20***	0.15***	-0.37***	-0.11***	-0.47***	-0.15***	-0.32***	0.06***	0.27***	0.10***	0.09***	1	
AGE	0.22***	0.01	0.03	0.22***	0.40***	0.02	0.09***	-0.12***	-0.16***	-0.18***	-0.02	-0.12***	1

This table reports correlation coefficients among all variables used in this study. Definitions of variables are in Appendix 2.B. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

2.4.3 Regression Results

2.4.3.1 CCDP and Financial Distress

Table 2.4 presents the regression results regarding the relationship between *CCDP* and financial distress (H.2.1). We found that the coefficients of *CCDP* are significantly positive in all three measures of financial stress (at $p < 0.01$), implying that a higher level of *CCDP* is significantly associated with a lower level of financial distress, which confirmed the study's main hypothesis. Our result is consistent with those of previous studies: Al-Hadi et al. (2019) and Boubaker et al. (2020) both showed that higher CSR activities and outputs significantly reduce firms' level of financial distress. This is similar to the result obtained by Shahab et al. (2018), which showed Chinese firms with good environmental policies tend to have a decreased level of financial distress. Regarding the economic significance of our model, based on regression coefficients for *CCDP* of 0.053, 0.038, and 0.218, a one-unit increase, on average, in *CCDP* equates to a 19.62%, 9.27%, and 25.35% decline in the probability of financial distress, respectively.[15] Firms with higher *CCDP* are exposed to a reduced level of financial distress.

Our results support stakeholder theory. According to this theory, firms that maintain a high level of climate change (or equivalent) performance exhibit effectiveness in their dealings with stakeholders, thereby facilitating stakeholders' trust and collaboration. Such a relationship can act as a 'cushion' against unfavourable financial occurrences, thereby reducing the likelihood of financial distress. Our results are consistent with prior studies (Chang et al., 2013; Jia & Li, 2022) that find a significant relationship between a firm's sustainability and environmental performance, and financial distress.

Regarding the control variables, our results are mostly consistent with those of previous studies (Al-Hadi et al., 2019; Boubaker et al., 2020; Farooq et al., 2021). There is a significantly positive ($p < 0.05$ or better) relationship between *SIZE* and all the measures of financial distress. Moreover, the coefficient of *ROA* is significantly positive ($p < 0.05$ or better) for all three measures of financial distress. Firm leverage is significantly and negatively related to financial

[15] The mean values of BOS_Dis, AC_Dis, and AltmanZ (in Table 2.4) are 0.27, 0.41, and 0.86, respectively. Therefore, the economic significance is calculated as 0.053/0.27 = 19.62%, 0.038/0.41 = 9.27%, and 0.218/0.86 = 25.35%.

distress for *AltmanZ* (at $p < 0.01$). The coefficient of the *MTB* variable is significantly positive ($p < 0.01$) for *AltmanZ*. The coefficient of *CASH* is significantly positive ($p < 0.01$) for *AC_Dis* and significantly negative ($p < 0.01$) for *BOS_Dis* and *AltmanZ*. The coefficient of *QUICK* is significant and negative ($p < 0.01$), while the coefficient of RD is significant and positive ($p < 0.01$) when financial distress is measured using *BOS_Dis* and *AC_Dis*. LOSS is negatively associated with all the measures of financial distress ($p < 0.01$). The coefficient of AGE is significantly negative ($p < 0.01$) for *AltmanZ*. Finally, the adjusted R-square figures in Table 2.4 are from 0.312 to 0.480, indicating that our regression models that contain the *CCDP* variable can explain up to 48% of the variation in the probability of financial distress.

Table 2.4: The relationship between CCDP and financial distress (H2.1)

	Model 1	*Model 2*	*Model 3*
	BOS Dis	**AC Dis**	**AltmanZ**
CCDP	**0.053*** **	**0.038*** **	**0.218*** **
	(4.18)	**(2.81)**	**(3.59)**
SIZE	0.006***	0.007***	0.028**
	(2.70)	(2.95)	(2.39)
LEV	0.012	-0.015	-0.933***
	(0.54)	(-0.63)	(-8.97)
ROA	0.025***	0.019**	1.167***
	(2.97)	(2.10)	(12.35)
MTB	0.000	0.002	0.025***
	(0.21)	(1.04)	(2.69)
CASH	-0.155***	0.750***	-0.428***
	(-7.21)	(23.12)	(-4.12)
QUICK	-0.005***	-0.003***	-0.006
	(-7.37)	(-4.27)	(-1.47)
RD	0.224***	0.183***	-0.154
	(3.74)	(2.67)	(-0.52)
LOSS	-0.026***	-0.028***	-0.144***
	(-3.30)	(-3.31)	(-3.46)
AGE	0.004	0.003	-0.072***
	(1.21)	(0.84)	(-3.92)
Constant	0.193***	0.205***	1.342***
	(9.60)	(9.11)	(13.60)
Observations	1,978	1,978	1,978
Adj. R^2	0.312	0.480	0.461
Year FE	YES	YES	YES
Ind FE	YES	YES	YES

This table reports results of the relationship between climate change disclosure performance (CCDP) and financial distress. A positive coefficient of the CCDP variable means a negative association of CCDP and financial distress. All variables are defined in Appendix 2.B. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.4.3.2 The Moderating Role of Litigation

To test for the moderating role of litigation risk in the relationship between *CCDP* and financial distress (H2.2), we divide the sample into two subsamples – firms that face a lawsuit (subsample 1) and firms that are not subject to a lawsuit (subsample 0). As shown in Table 2.5, the coefficient of the *CCDP* variable is only significantly positive (at $p < 0.01$) for *BOS_Dis* and *AC_Dis* when firms have no legal claims against them. However, when financial distress is measured using *AltmanZ*, the coefficient of the *CCDP* variable is always significantly positive, regardless of whether firms have (at $p < 0.10$) or do not have (at $p < 0.01$) lawsuits against them. To determine whether the impact of *CCDP* is different in firms with litigation and firms without litigation when financial distress is measured using *AltmanZ*, we perform a *t*-test of the *AltmanZ* score between the two groups. This shows that firms with no legal claims against them experience a lower level of financial distress than their counterparts, and the difference is statistically significant (*t*-stat = -1.88 and *p*-value = 0.06).

Climate change disclosure performance is considered to be a major factor in reducing the likelihood of litigation, ultimately diminishing the probability of financial distress. Firms that are more likely to disclose climate change performance attributes to stakeholders are meeting the required disclosures in accordance with the requirements of the Australian Securities and Investment Commission, as well as based on best practice governance, environmental and social disclosure related recommendations. Hence, firms which are able to communicate such impacts in a transparent manner are less likely to face litigation. Firms are able to then continue to operate in existing markets and will have sufficient reputational capital so as to operate in new markets. Ultimately, such firms are less likely to face financial distress. Thus, our results indicate that the association of *CCDP* and financial distress is significant in firms that do not face lawsuits. These regression results are consistent with the trade-off theory (Malm & Krolikoski, 2017) and previous studies (Houston et al., 2019; Nelson & Pritchard, 2007; Wu et al., 2020), in which litigation risk, litigation costs, and low profitability encourage firms to disclose more extensively. The highest adjusted R-square figure in Table 2.5 is 0.544, suggesting that our regression models that contain the *CCDP* variable can explain 54.4% of the variation in the likelihood of going to financial distress.

Table 2.5: The moderating impact of litigation on the relationship of CCDP and financial distress (H2.2)

	Model 1		Model 2		Model 3	
	BOS_Dis		AC_Dis		AltmanZ	
	Litig = 1	Litig = 0	Litig = 1	Litig = 0	Litig = 1	Litig = 0
CCDP	**0.021**	**0.056*** **	**-0.044**	**0.047*** **	**0.259***	**0.196*** **
	(0.73)	**(3.78)**	**(-1.28)**	**(2.95)**	**(1.71)**	**(2.83)**
SIZE	0.027***	0.004	0.037***	0.004	0.011	0.033***
	(3.86)	(1.62)	(4.62)	(1.59)	(0.29)	(2.70)
LEV	-0.026	0.013	-0.036	-0.013	-1.068***	-0.937***
	(-0.47)	(0.55)	(-0.53)	(-0.54)	(-4.16)	(-8.31)
ROA	-0.137**	0.027***	-0.163**	0.022**	0.288	1.181***
	(-2.09)	(3.10)	(-2.49)	(2.26)	(1.03)	(12.32)
MTB	0.023***	-0.001	0.034***	0.001	-0.003	0.026***
	(2.62)	(-0.42)	(3.42)	(0.56)	(-0.08)	(2.74)
CASH	0.016	-0.153***	1.063***	0.741***	-0.110	-0.345***
	(0.17)	(-6.84)	(8.96)	(21.67)	(-0.20)	(-3.14)
QUICK	-0.018**	-0.005***	-0.022*	-0.003***	-0.109	-0.005
	(-1.97)	(-7.29)	(-1.94)	(-4.01)	(-1.38)	(-1.26)
RD	0.944***	0.172***	0.715**	0.127*	2.667**	-0.260
	(3.48)	(2.84)	(2.34)	(1.82)	(2.02)	(-0.85)
LOSS	0.013	-0.033***	0.001	-0.033***	-0.138	-0.174***
	(0.46)	(-3.87)	(0.03)	(-3.60)	(-1.20)	(-3.97)
AGE	-0.021**	0.006*	-0.021**	0.005	-0.099	-0.067***
	(-2.44)	(1.73)	(-2.48)	(1.25)	(-1.27)	(-3.54)
Constant	0.042	0.197***	0.019	0.209***	1.488***	1.214***
	(0.73)	(9.12)	(0.31)	(8.90)	(5.13)	(12.12)
Observations	237	1,740	237	1,740	237	1,740
Adj. R^2	0.399	0.325	0.544	0.501	0.370	0.488
Year FE	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES

This table reports results of the moderating impact of litigation on the relationship between climate change disclosure performance (CCDP) and financial distress. A positive coefficient of the CCDP variable means a negative association of CCDP and financial distress. All variables are defined in Appendix 2.B. The full sample is divided into two subsamples with 1 indicating the subsample of litigation above its median and 0 for below its median. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.4.3.3 The moderating role of Big4 Auditing Firms

To test the moderating role of Big4 auditing firms in the relationship between *CCDP* and financial distress (H2.3), we divide the sample into two subsamples relating to hiring *Big4* auditing firms (subsample 1) and not hiring Big4 auditors (subsample 0). As shown in Table 2.6, the association of *CCDP* and financial distress is significant in firms that hire *Big4* auditing firms for all the measures of financial distress. There is a significant and positive relationship (at $p < 0.01$) between the *CCDP* variable and financial distress in the subsample of firms that hire *Big4* auditors. Our results are consistent with those of previous studies (Ado et al., 2020; Ashari & Krismiaji, 2020; DeAngelo, 1981; Marwa et al., 2020) and agency theory (Ashari & Krismiaji, 2020), in which firms provide more extensive disclosure and better financial performance with the employment of *Big4* audit firms. Moreover, the lowest adjusted R-square figure (0.302) in Table 2.6 indicates that our regression model can explain a minimum variation of 30.2% in the likelihood of going to financial distress.

Table 2.6: The moderating impact of Big4 auditors on the relationship of CCDP and financial distress (H2.3)

	Model 1		**Model 2**		**Model 3**	
	BOS_Dis		AC_Dis		AltmanZ	
	Big4 = 1	Big4 = 0	Big4 = 1	Big4 = 0	Big4 = 1	Big4 = 0
CCDP	**0.063*** **	**0.018**	**0.048*** **	**0.019**	**0.240*** **	**0.296**
	(4.84)	**(0.28)**	**(3.37)**	**(0.31)**	**(3.68)**	**(1.49)**
SIZE	-0.002	0.033***	0.001	0.032***	0.010	0.120***
	(-0.64)	(5.69)	(0.21)	(4.74)	(0.71)	(3.73)
LEV	0.017	-0.036	-0.011	-0.064	-0.931***	-0.753***
	(0.73)	(-0.71)	(-0.42)	(-1.15)	(-8.03)	(-3.61)
ROA	0.057***	-0.008	0.057***	-0.006	1.454***	0.999***
	(3.21)	(-1.35)	(2.88)	(-0.64)	(8.27)	(9.01)
MTB	-0.002	0.004	-0.003	0.012**	0.023**	0.026*
	(-1.23)	(1.25)	(-1.19)	(2.52)	(2.06)	(1.96)
CASH	-0.152***	-0.157***	0.752***	0.743***	-0.203	-0.513***
	(-5.12)	(-3.98)	(17.22)	(12.78)	(-1.17)	(-2.96)
QUICK	-0.006***	-0.002**	-0.004***	-0.002*	-0.020**	0.011***
	(-4.43)	(-2.50)	(-2.85)	(-1.84)	(-2.02)	(3.32)
RD	0.244***	-0.006	0.293***	-0.272**	-0.087	0.121
	(3.34)	(-0.06)	(3.80)	(-2.03)	(-0.25)	(0.37)
LOSS	-0.014	-0.027	-0.020**	-0.011	-0.055	-0.206**
	(-1.48)	(-1.35)	(-2.06)	(-0.47)	(-1.04)	(-2.34)
AGE	0.003	-0.005	0.004	-0.020	-0.069***	-0.157***
	(0.89)	(-0.36)	(1.02)	(-1.47)	(-3.40)	(-3.97)
Constant	0.238***	0.116**	0.248***	0.157***	1.376***	1.108***
	(10.12)	(2.16)	(9.67)	(2.82)	(11.34)	(6.17)
Observations	1,651	326	1,651	326	1,651	326
Adj. R^2	0.302	0.462	0.451	0.626	0.345	0.837
Year FE	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES

This table shows the moderating impact of Big4 auditing firms on the relationship between CCDP and financial distress. A positive coefficient of the CCDP variable means a negative association of CCDP and financial distress. All variables are defined in Appendix 2.B. The full sample is divided into two subsamples with 1 indicating the subsample of Big4 auditor above its median and 0 for below its median. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.4.3.4 The Moderating Role of a Risk Committee

To test for the moderating role of the existence of a risk committee in the relationship between *CCDP* and financial distress (H2.4), we divide the sample into two subsamples – firms with a risk committee (subsample 1) and firms without a risk committee (subsample 0). As shown in Table 2.7, the association of *CCDP* and financial distress is only present in firms with a risk committee for all the measures of financial distress. There is a significantly positive relationship (at $p < 0.05$ or better) between the *CCDP* variable and financial distress in the subsample of firms with a risk committee. Our results are consistent with previous studies (Bhuiyan et al., 2021; Halim et al., 2017), and the predictions of agency theory (Baklouti et al., 2016) and stakeholder theory (Barakat & Hussainey, 2013), in which a risk committee, as a monitoring instrument, is shown to play an important role in the quality of financial reporting and firm value. Furthermore, the highest adjusted R-square figure (0.743) in Table 2.7 suggests that our regression model can explain a maximum variation of 74.3% for the probability of financial distress.

Table 2.7: The moderating impact of risk committee on the relationship of CCDP and financial distress (H2.4)

	Model 1		Model 2		Model 3	
	BOS Dis		AC Dis		AltmanZ	
	Risk_Com = 1	Risk_Com = 0	Risk_Com = 1	Risk_Com = 0	Risk_Com = 1	Risk_Com = 0
CCDP	**0.050*** **	**0.023**	**0.039** **	**-0.007**	**0.219*** **	**0.137**
	(3.52)	**(1.03)**	**(2.51)**	**(-0.30)**	**(3.05)**	**(1.24)**
SIZE	-0.000	0.013***	0.000	0.018***	0.009	0.032*
	(-0.07)	(3.92)	(0.11)	(4.78)	(0.56)	(1.95)
LEV	-0.011	0.082*	-0.029	0.028	-1.079***	-0.494**
	(-0.47)	(1.75)	(-1.09)	(0.52)	(-9.21)	(-2.38)
ROA	0.042***	0.002	0.039***	-0.009	1.120***	1.229***
	(3.58)	(0.35)	(2.98)	(-1.21)	(7.98)	(40.37)
MTB	0.001	-0.006**	0.002	-0.001	0.023*	0.028***
	(0.52)	(-2.39)	(0.73)	(-0.18)	(1.82)	(2.95)
CASH	-0.155***	-0.116***	0.742***	0.788***	-0.518***	-0.087
	(-5.13)	(-3.71)	(16.73)	(15.69)	(-3.42)	(-0.64)
QUICK	-0.008***	-0.003***	-0.005***	-0.002*	-0.016*	0.001
	(-4.95)	(-4.41)	(-3.89)	(-1.84)	(-1.74)	(0.43)
RD	0.028	0.677***	0.020	0.482***	-0.558	1.043**
	(0.44)	(3.86)	(0.25)	(2.74)	(-1.57)	(2.27)
LOSS	0.002	-0.067***	-0.000	-0.072***	-0.074	-0.288***
	(0.20)	(-5.19)	(-0.01)	(-4.96)	(-1.37)	(-5.70)
AGE	-0.003	-0.002	-0.002	-0.016*	-0.084***	-0.063**
	(-0.77)	(-0.21)	(-0.41)	(-1.91)	(-3.75)	(-2.23)
Constant	0.250***	0.216***	0.253***	0.240***	1.606***	1.051***
	(8.83)	(5.86)	(8.44)	(6.12)	(11.44)	(5.94)
Observations	1,460	517	1,460	517	1,460	517
Adj. R^2	0.325	0.528	0.478	0.610	0.379	0.743
Year FE	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES

This table shows the moderating impact of risk committee on the relationship between CCDP and financial distress. A positive coefficient of the CCDP variable means a negative association of CCDP and financial distress. All variables are defined in Appendix 2.B. The full sample is divided into two subsamples with 1 indicating the subsample of risk committee above its median and 0 for below its median. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.4.3.5 The Moderating Role of Audit Fees

To test for the moderating role of audit fees in the relationship between *CCDP* and financial distress (H2.5), we divide the sample into two subsamples based on firms' appearance above (subsample 1) or below (subsample 0) the median value of the audit fees variable. As shown in Table 2.8, the association between *CCDP* and financial distress is only significant in firms with higher audit fees in the three financial distress models. There is a significant and positive relationship (at $p < 0.10$ or better) between the *CCDP* variable and financial distress in the subsample in which the audit fees are above the median value. These regression results are consistent with those of previous studies (Ado et al., 2020; Moutinho et al., 2012; Shakhatreh et al., 2020) and the perspectives of agency theory (Michael & William, 1976) and of economic theory (DeFond et al., 2002), in which audit fees exert a significant impact on disclosure quality and financial performance. In addition, the highest adjusted R-square figure (0.626) in Table 2.8 implies that our regression model can explain a maximum variation of 62.6% for the probability of financial distress.

Table 2.8: The moderating impact of audit fees on the relationship of CCDP and financial distress (H2.5)

	Model 1		**Model 2**		**Model 3**	
	BOS_Dis		AC_Dis		AltmanZ	
	High	Low	High	Low	High	Low
CCDP	**0.052*** **	**0.043**	**0.031***	**0.034**	**0.161****	**0.085**
	(3.34)	**(1.62)**	**(1.83)**	**(1.19)**	**(2.33)**	**(0.84)**
SIZE	0.005	0.011***	0.008*	0.010**	-0.024	0.032*
	(1.34)	(2.63)	(1.87)	(2.20)	(-1.23)	(1.84)
LEV	-0.008	0.059*	-0.022	0.025	-1.033***	-0.796***
	(-0.31)	(1.80)	(-0.81)	(0.66)	(-8.70)	(-5.09)
ROA	-0.009	0.011*	-0.022	0.008	0.367	1.124***
	(-0.17)	(1.73)	(-0.41)	(0.99)	(1.49)	(11.75)
MTB	-0.002	-0.001	-0.001	0.002	0.021	0.026**
	(-0.58)	(-0.44)	(-0.25)	(0.71)	(1.23)	(2.43)
CASH	0.116*	-0.138***	1.131***	0.746***	1.058***	-0.344***
	(1.81)	(-5.46)	(13.41)	(19.16)	(3.10)	(-2.77)
QUICK	-0.059***	-0.004***	-0.061***	-0.002**	-0.391***	0.002
	(-3.97)	(-6.23)	(-3.66)	(-2.35)	(-3.48)	(0.50)
RD	0.779***	0.132**	0.738***	0.085	1.684*	-0.080
	(5.06)	(1.97)	(4.51)	(1.13)	(1.87)	(-0.21)
LOSS	-0.005	-0.030***	-0.012	-0.031***	-0.019	-0.288***
	(-0.41)	(-2.75)	(-0.92)	(-2.63)	(-0.30)	(-5.81)
AGE	-0.001	0.010*	-0.000	0.006	-0.056**	-0.062**
	(-0.18)	(1.79)	(-0.12)	(1.07)	(-2.47)	(-2.46)
Constant	0.163***	0.216***	0.151***	0.239***	1.300***	1.425***
	(4.75)	(6.80)	(4.15)	(6.86)	(7.86)	(9.80)
Observations	956	1021	956	1021	956	1021
Adj. R^2	0.368	0.376	0.426	0.538	0.313	0.626
Year FE	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES

This table reports the moderating impact of audit fees on the relationship between CCDP and financial distress. A positive coefficient of the CCDP variable means a negative association of CCDP and financial distress. All variables are defined in Appendix 2.B. The full sample is divided into two subsamples with 1 indicating the subsample of audit fees above its median and 0 for below its median. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.5 Additional Analyses

Multivariate analyses (e.g. OLS) may suffer from functional misspecification, endogeneity, and unobservable or omitted variable bias, which can result in inconsistencies and errors in inferences, leading to erroneous conclusions and theoretical interpretations (Ullah et al., 2018). To check the robustness of our results in Table 2.4, we adopt two methods: PSM and the two-step system GMM.

2.5.1 Propensity Score Matching (PSM)

To address endogeneity concerns and ensure that our conclusions are not influenced by confounding impacts due to observable covariates, we apply the PSM technique. Observed differences in attributes between high- and low-CCDP firms are controlled using this technique. We apply PSM to a matched sample with similar firm attributes to isolate the influence of *CCDP* on financial distress. Based on a propensity score derived using a probit regression that assesses the likelihood that a firm has a high *CCDP* score, PSM matches each firm with a high *CCDP* score (above the median) to a firm with a low *CCDP* score (below the median). All the control variables in the original regression model (1) are adopted in the probit model as explanatory variables. As the dependent variable, this probit model uses a binary variable for *CCDP* that takes the value 1 if the firm's CCDP score is higher than the median and 0 otherwise. We use the nearest-neighbour matching method with a maximum distance of 1% to match each firm with a high *CCDP* score (treatment firm) to a firm with a low *CCDP* score (control firm) without replacement. A matched sample of 927 firm-year observations is obtained using the PSM technique. Panel A of Table 2.9 shows that there is no significant difference in explanatory variables between our treated and our control firms.

Table 2.9 Panel B presents the regression results for our matched sample. The coefficient of the *CCDP* variable is still significantly positive for all the measures of financial distress. Our results imply that firms that incorporate *CCDP* into their operations and business strategies have reduced financial distress. Overall, the results of the PSM-matched sample analysis are similar to those of our main analysis.

Table 2.9: Propensity score matching (PSM)

Panel A: Covariate balance test

	Treated	Control	*t*-stat
SIZE	7.469	7.521	-0.62
LEV	0.196	0.207	-1.00
ROA	0.031	0.019	0.63
MTB	1.462	1.330	1.29
CASH	0.106	0.110	-0.48
QUICK	0.281	0.563	-1.25
RD	0.007	0.007	-0.32
LOSS	0.199	0.195	0.16
AGE	2.597	2.643	-0.77

Panel B: Propensity score matching (PSM) results

	Model 1	**Model 2**	**Model 3**
	BOS_Dis	AC_Dis	AltmanZ
CCDP	**0.061*****	**0.047*****	**0.169****
	(3.55)	**(2.60)**	**(2.13)**
SIZE	-0.004	-0.003	0.036*
	(-1.03)	(-0.64)	(1.69)
LEV	0.020	0.010	-1.020***
	(0.77)	(0.33)	(-7.47)
ROA	0.030***	0.024***	1.009***
	(4.02)	(2.60)	(19.98)
MTB	0.001	-0.000	0.027**
	(0.47)	(-0.01)	(2.04)
CASH	-0.217***	0.699***	-0.234
	(-5.12)	(12.08)	(-1.16)
QUICK	-0.006***	-0.004***	-0.014
	(-4.06)	(-2.99)	(-1.39)
RD	0.246	0.299	-0.027
	(1.48)	(1.64)	(-0.04)
LOSS	-0.009	-0.016	-0.094
	(-0.79)	(-1.30)	(-1.57)
AGE	-0.004	-0.003	-0.084***
	(-0.88)	(-0.64)	(-3.25)
Constant	0.248***	0.253***	1.122***
	(6.15)	(5.90)	(5.80)
Observations	933	933	933
Adj. R^2	0.256	0.404	0.324
Year FE	YES	YES	YES
Ind FE	YES	YES	YES

This table shows the results of the PSM-matched sample analysis. A positive coefficient of the CCDP variable means a negative association of CCDP and financial distress. All variables are defined in Appendix 2.B. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.5.2 Generalised Method of Moments (GMM)

Table 2.10 shows the results of our model estimation utilising a system GMM approach, in which the right-hand side variables are treated as endogenous (excluding year dummies), and their prior values are used orthogonally as respective instruments. Our regression model is a dynamic panel data model since it incorporates a one-year lagged financial distress score. Table 2.10 shows a positive and statistically significant correlation between *CCDP* and all the measures of financial distress, implying that firms with high *CCDP* experience less financial distress. Taken together, after accounting for any possible endogeneity concerns, these empirical findings show that our conclusions remain qualitatively the same.

Table 2.10: Two-step system generalised method of moments (GMM)

	Model 1	**Model 2**	**Model 3**
	BOS_Dis	AC_Dis	AltmanZ
L. Financial Distress	**0.413*** **	**0.097*** **	**0.191*** **
	(5.93)	**(3.45)**	**(14.95)**
CCDP	0.044**	0.050**	0.186**
	(2.33)	(2.19)	(2.04)
SIZE	0.003	0.008**	-0.025
	(1.04)	(2.12)	(-1.40)
LEV	-0.009	-0.030	-0.433***
	(-0.34)	(-0.94)	(-3.00)
ROA	0.013**	0.021***	1.047***
	(2.21)	(2.76)	(21.49)
MTB	-0.001	0.002	0.015
	(-0.48)	(1.08)	(1.64)
CASH	-0.094***	0.702***	-0.428***
	(-3.65)	(21.17)	(-3.45)
QUICK	-0.004***	-0.004***	-0.010***
	(-8.36)	(-9.58)	(-3.21)
RD	-0.039	-0.064	-0.312
	(-0.76)	(-0.87)	(-0.91)
LOSS	0.003	-0.006	-0.142***
	(0.46)	(-0.70)	(-3.32)
AGE	0.002	0.008	0.011
	(0.45)	(1.35)	(0.43)
Constant	0.130***	0.177***	0.792***
	(5.17)	(6.15)	(7.14)
Observations	1,782	1,782	1,782
Year FE	YES	YES	YES
Ind FE	NO	NO	NO
Hansen (p-value)	31.69(0.024)	66.22 (0.042)	28.49(0.074)
Diff-Hansen (p-value)	8.08(0.621)	6.11 (0.806)	21.67 (0.247)
AR 1 (p-value)	-4.97 (0.000)	-3.92 (0.000)	-5.04(0.000)
AR 2 (p-value)	-0.03(0.976)	-0.77(0.439)	1.70(0.090)

This table shows the results of the system GMM approach. A positive coefficient of the CCDP variable means a negative association of CCDP and financial distress. All variables are defined in Appendix 2.B. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.5.3 Alternative Measures of the Independent Variable CCDP

As additional analyses, we consider disclosures and trends related to *GHG* emissions and certification, and its impact on financial distress. We categorise each firm-year observation

as meeting (or otherwise) the requirements of *Scope 1, 2, and 3 GHG* emission targets under the GHG Protocol Corporate Accounting and Reporting Standard, which provides an objective assessment of a company's corporate carbon footprint (CCF). Scope 1 emissions are direct *GHG* emissions from operations that the reporting company owns or controls; Scope 2 emissions are indirect *GHG* emissions from the generation of purchased energy that the reporting company consumes; and Scope 3 emissions are all other indirect *GHG* emissions (not included in Scope 2) that occur in the reporting company's value chain.[16] All data on *GHG* emissions and certification are manually collected from company sustainability reports and/or their Scope 1, 2, and 3 GHG emissions' calculation methodology.

The first alternative measure of *CCDP* that we employ is an indicator variable if the firm has made a disclosure of each scope separately. For instance, when the firm published data on Scope 1 (or *Scope 2, or Scope 3*) emissions in their report, it is coded as 1 for *Scope 1* (or *Scope 2, or Scope 3*) and 0 otherwise. The second alternative measure of *CCDP* is a binary variable on the assurance provided by an audit firm over *Scope 1, Scope 2, or Scope 3* emissions data. The level of assurance can be reasonable, limited, or no assurance for each scope. For example, KPMG has provided reasonable assurance over Scope 1 and Scope 2 emissions data and no assurance over Scope 3 emissions data for BHP in its 2015 Sustainability Report. If the audit firm has provided the reasonable or limited assurance for any scope, it is coded as 1 for the Assurance variable and 0 otherwise.

The last alternative measure of *CCDP* is the *GHG*-emissions-related disclosure index (*GHG_INDX*), which includes 34 items of hard disclosure and soft disclosure items, adapted from Hollindale et al. (2019), which in turn is based on Clarkson et al. (2008) and the Global Reporting Initiatives (GRI). This index reflects the quality of sustainability reporting. We employ the index version of Hollindale et al. (2019) since it is modified for Australian companies.[17] Following Hollindale et al. (2019), there are three categories under the hard disclosure items for companies making disclosures on (1) governance structure and management systems (category A1 with five items), (2) credibility (category A2 with 10 items), and (3) environmental spending (category A3 with three items). Regarding soft disclosure items, they are separated into another three categories for companies making disclosures on (4)

[16] See: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

[17] The initial index of Clarkson et al. (2008) is for public US companies. Hollindale et al. (2019) modified this index to make it more suitable for collecting data from Australian companies. The differences are in Category A1 with 5 items instead of 6 items, and the drop of one hard category about environmental performance indicators as in Clarkson et al. (2008) since it is impossible to collect this data for Australian firms. In summary, there are 6 categories (3 hard disclosure and 3 soft disclosure categories) in Hollindale et al. (2019), compared to 7 categories (4 hard disclosure and 3 soft disclosure categories) in Clarkson et al. (2008).

visions and strategy claims (category A4), (5) environmental profile (category A5 with four items), and (6) environmental initiatives (category A6 with six items). According to Clarkson et al. (2008), category A1 reports information of governance structure and management mechanisms that a firm puts in place for its environmental protection. Category A2 focuses on the reliability of disclosures made in an organisation's environmental report, with higher scores given to firms having independent verification or certification by third parties. Category A3 shows the environmental spending of a company with emphasis on disclosing financial savings from already-existing environmental initiatives and programmes, as well as on discretionary spending to improve environmental performance in the future, such as investing in new environmental technology or R&D and innovations. The disclosures of the company's vision and environmental strategy statements are reflected in category A4. The disclosures of the firm's environmental profile in light of current and upcoming environmental legislation are evaluated in category A5. Finally, category A6 refers to disclosures of good environmental performers and their environmental initiatives.

For each item in any category of our *GHG*-emissions-related disclosure index, it is scored 1 if in existence and 0 otherwise. From the 34 equally weighted items in our *GHG*-emission-related disclosure index, the number of items related to hard disclosure measures (categories A1–A3) and soft disclosure measures (categories A4–A6) is 18 and 16, respectively. A higher score on the firm's *GHG*-emissions-related disclosure index indicates a better quality of its environmental policies, performance, and inputs. Table 2.11 Panel A presents summary statistics for all three alternative measures of the independent *CCDP* variable.

Table 2.11: Alternative measures of climate change disclosure performance (CCDP)
Panel A – Descriptive statistics of alternative independent variables

Variables	N	Mean	S.D.	25th	Median	75th	Max
Scope 1	1,969	0.16	0.36	0.00	0.00	0.00	1.00
Scope 2	1,969	0.11	0.31	0.00	0.00	0.00	1.00
Scope 3	1,969	0.04	0.21	0.00	0.00	0.00	1.00
Assurance	1,969	0.02	0.16	0.00	0.00	0.00	1.00
GHG_INDX	1,969	0.03	0.11	0.00	0.00	0.00	0.62

This panel presents the descriptive statistics of new independent variables used in the subsequent analyses. Scope 1, Scope 2, and Scope 3 are indicator variables if the firm published its data on Scope 1, 2, and 3 GHG emissions in their sustainability reports. Assurance is a binary variable if the data on Scope 1, Scope 2, or Scop 3 GHG emissions received certification from an auditing firm. GHG_INDX refers to the GHG-emissions-related disclosure index, scaled by 34 (the highest possible value), which contains 34 items about the firm's environmental policies, performance, and inputs. Details of each alternative measure are in Section 2.5.3.

In this section, we replace the original *CCDP* variable that was employed in Table 2.4 with these three alternative measures related to GHG disclosures to evaluate their impact on the likelihood of firm financial distress. The regression results are presented in Table 2.11 (Panel B, C, and D). We find that the coefficient of our *Scope 1* emissions variable is significantly positive in all measures of financial distress (Table 2.11, Panel B), indicating a negative relationship between *Scope 1* disclosure and financial distress. This result is quantifiably similar to that of our base regression model results (see Table 2.4). The coefficient of our Scope 3 emissions variable is only significantly positive when the level of financial distress is measured by Altman (1968) (*AltmanZ*). The Scope 2 emissions variable is non-significant in all proxies of financial distress. Similar results are observed when the independent variables are changed to *GHG assurance* and the *GHG*-emissions-related disclosure index. In Table 2.11 Panel C, it is found that the coefficient of the Assurance variable is significantly positive for the first two measures of financial distress (*BOS_Dis* and *AC_Dis*), suggesting that firms with external validation of their Scope, 1, 2, and 3 emissions data have a significantly lower probability of experiencing financial distress. Finally, Table 2.11 Panel D shows that the coefficient of *GHG_INDX* variable is significantly positive for both BOS_Dis and *AC_Dis* ($p < 1\%$), implying that the level of *GHG* emissions disclosure is significantly and negatively related to the likelihood of financial distress. To sum up, our alternative measures of the independent variable *CCDP* on the firm's disclosures related to *GHG* emissions and certification provide further support to the base results in Table 2.4.

Panel B – Regression results on Scope 1, 2, and 3 GHG emissions

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*	*Model 8*	*Model 9*
VARIABLES	BOS_Dis	BOS_Dis	BOS_Dis	AC_Dis	AC_Dis	AC_Dis	AltmanZ	AltmanZ	AltmanZ
Scope 1	0.026***			0.026***			0.108**		
	(3.15)			(3.08)			(2.48)		
Scope 2		0.013			0.013			0.059	
		(1.36)			(1.34)			(1.21)	
Scope 3			-0.021			-0.020			0.171**
			(-1.61)			(-1.54)			(2.26)
SIZE	0.006***	0.008***	0.009***	0.008***	0.009***	0.010***	0.031**	0.035**	0.033**
	(2.92)	(3.58)	(4.14)	(3.49)	(4.12)	(4.66)	(2.09)	(2.51)	(2.37)
LEV	0.043**	0.041**	0.040**	0.027	0.024	0.023	-0.853***	-0.862***	-0.860***
	(2.20)	(2.08)	(2.04)	(1.31)	(1.20)	(1.15)	(-7.91)	(-7.98)	(-7.99)
ROA	0.116***	0.116***	0.114***	0.090***	0.090***	0.088***	2.119***	2.119***	2.125***
	(5.84)	(5.84)	(5.78)	(4.26)	(4.26)	(4.20)	(9.93)	(9.95)	(9.98)
MTB	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.026*	-0.026*	-0.027*
	(-1.42)	(-1.43)	(-1.45)	(-0.66)	(-0.68)	(-0.70)	(-1.73)	(-1.73)	(-1.77)
CASH	-0.095***	-0.095***	-0.093***	0.924***	0.924***	0.926***	-1.201***	-1.203***	-1.203***
	(-2.68)	(-2.69)	(-2.64)	(25.20)	(25.18)	(25.24)	(-7.31)	(-7.31)	(-7.33)
QUICK	-0.005***	-0.005***	-0.005***	-0.002***	-0.003***	-0.002**	0.004	0.004	0.003
	(-7.54)	(-7.51)	(-7.46)	(-2.58)	(-2.59)	(-2.58)	(0.61)	(0.60)	(0.58)
RD	0.255***	0.258***	0.264***	0.298***	0.301***	0.307***	0.310	0.321	0.300
	(4.29)	(4.33)	(4.42)	(4.11)	(4.14)	(4.22)	(0.77)	(0.80)	(0.74)
LOSS	-0.010	-0.010	-0.010	-0.012	-0.012	-0.012	0.016	0.016	0.016
	(-1.13)	(-1.13)	(-1.11)	(-1.39)	(-1.38)	(-1.37)	(0.30)	(0.30)	(0.30)
AGE	0.003	0.003	0.003	0.003	0.003	0.003	-0.091***	-0.092***	-0.093***
	(0.96)	(0.87)	(0.91)	(0.89)	(0.80)	(0.84)	(-4.93)	(-4.97)	(-5.01)
Constant	0.173***	0.165***	0.157***	0.165***	0.157***	0.149***	1.135***	1.105***	1.119***
	(8.81)	(8.46)	(8.05)	(8.15)	(7.82)	(7.43)	(8.81)	(8.76)	(8.90)
Observations	1,969	1,969	1,969	1,969	1,969	1,969	1,969	1,969	1,969
Adj. R^2	0.321	0.318	0.319	0.536	0.535	0.535	0.394	0.393	0.394
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel C – Regression results on Assurance provided over Scope 1, 2, and 3 GHG emissions

Variables	***Model 1***	***Model 2***	***Model 3***
	BOS_Dis	AC_Dis	AltmanZ
Assurance	0.040***	0.040***	-0.103
	(3.08)	(3.03)	(-1.61)
SIZE	0.008***	0.010***	0.038***
	(3.95)	(4.54)	(3.46)
LEV	0.049**	0.029	-0.677***
	(2.49)	(1.46)	(-7.05)
ROA	0.026***	0.011	1.182***
	(3.06)	(0.88)	(11.87)
MTB	0.000	0.001	0.021**
	(0.15)	(0.40)	(2.32)
CASH	-0.095***	0.922***	-1.012***
	(-2.67)	(25.14)	(-6.37)
QUICK	-0.005***	-0.003***	-0.009**
	(-7.62)	(-2.95)	(-2.26)
RD	0.226***	0.277***	-0.211
	(3.80)	(3.81)	(-0.71)
LOSS	-0.028***	-0.028***	-0.146***
	(-3.50)	(-3.42)	(-3.41)
AGE	0.004	0.003	-0.070***
	(1.10)	(0.95)	(-3.78)
Constant	0.174***	0.164***	1.259***
	(8.63)	(7.96)	(12.87)
Observations	1,969	1,969	1,969
Adj. R^2	0.310	0.530	0.450
Year FE	YES	YES	YES
Ind FE	YES	YES	YES

Panel D – Regression results on GHG Index

Variables	***Model 1***	***Model 2***	***Model 3***
	BOS_Dis	AC_Dis	AltmanZ
GHG_INDX	0.096***	0.097***	-0.017
	(4.68)	(4.64)	(-0.14)
SIZE	0.006***	0.007***	0.038**
	(2.61)	(3.15)	(2.54)
LEV	0.043**	0.026	-0.865***
	(2.19)	(1.30)	(-8.00)
ROA	0.117***	0.091***	2.117***
	(5.92)	(4.34)	(9.98)
MTB	-0.002	-0.001	-0.027*
	(-1.54)	(-0.78)	(-1.76)
CASH	-0.096***	0.923***	-1.197***
	(-2.72)	(25.22)	(-7.28)
QUICK	-0.005***	-0.003***	0.004
	(-7.60)	(-2.65)	(0.59)
RD	0.251***	0.294***	0.333
	(4.22)	(4.05)	(0.82)
LOSS	-0.009	-0.011	0.016
	(-1.06)	(-1.31)	(0.30)
AGE	0.002	0.002	-0.092***
	(0.66)	(0.59)	(-4.91)
Constant	0.177***	0.170***	1.083***
	(8.77)	(8.15)	(8.18)
Observations	1,969	1,969	1,969
Adj. R^2	0.322	0.537	0.392
Year FE	YES	YES	YES
Ind FE	YES	YES	YES

Panels B–D report the regression results between financial distress and alternative measures of CCDP (i.e., Scope 1, Scope 2, and Scope 3 GHG emissions in Panel B; Assurance provided over Scope 1, 2, or 3 GHG emissions in Panel C; and GHG index in Panel D). Panel A defines all the alternative measures. A positive coefficient of any alternative measure of CCDP variable (Scope 1, Scope 2, Scope 3, Assurance, GHG_INDX*)* means a negative association between financial distress and the alternative measure of CCDP. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.6 Conclusion and Implications

This research investigates the relationship between *CCDP* and financial distress. The moderating impacts of litigation, the existence of a risk committee, Big4 auditing firms, and audit fees on this relationship are also examined. Our sample covers non-financial firms from the top 300 firms listed on the ASX over the period 2008–2019. Using OLS regression analysis with fixed effects, we find that *CCDP* is positively related to financial distress, which means that higher levels of *CCDP* are related to lower levels of financial distress because firms that maintain high environmental performance have strong relationships with stakeholders, which encourage stakeholders' trust and collaboration with businesses, act as a 'cushion' against unfavourable financial occurrences and reduce financial distress. In addition, this positive relationship between *CCDP* and financial distress is only significant in firms with low litigation, in firms with a risk committee, in firms that hire Big4 auditors, and in firms with a higher level of audit fees. Our results are robust to PSM and system GMM tests.

Our findings provide some important implications for firm management, regulators, investors, and other stakeholders. We present empirical evidence that climate change, as a factor of external risk, influences financial distress. The results of our study are timely and important in raising public awareness of this topic as concerns about the unprecedented impacts of climate change risks are growing. This research is also important for firms' management, which needs to consider this risk factor when compiling financial reports, and for maintaining firms' reputation and credibility. Our findings are likely to be useful to investors in estimating risk premiums related to the cost of capital and future cash flows and the valuation of assets as well as determining the possibility that a company will face financial distress.

This research has a number of limitations. First, the *CCDP* score used as the dependent variable comprises elements from four categories – governance, strategy, risk management, and metrics and targets – based on the TCFD recommendations. Each of the elements included in CCDP is unweighted. Additional indices could be created that weight certain elements based on their relative importance, effect, or outcomes. Future research may assess the relationship between carbon emission performance and financial distress, or carbon emission performance and level of compliance or adoption of new technologies and artificial intelligence. Additionally, future research may investigate the relationship between *CCDP* on firm outcomes, such as asset impairment, stock price crash risk, and decisions to acquire target companies or assets.

Appendix 2.A: The list of 11 items that make up the CCDP index

CCDP	**Definition**
Climate change disclosure performance	**A- Governance (GOV)** **1.** Board Oversight: Describe the board's oversight of climate-related risks and opportunities. **(G1)** **2.** Management's Role: Describe management's role in assessing and managing climate-related risks and opportunities. **(G2)** **B- Strategy (STR)** **3**. Risks and Opportunities: Describe the climate-related risks and opportunities the organisation has identified over the short, medium, and long term. **(S1)** **4.** Impact on Organisation: Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning. **(S2)** **5.** Resilience of Strategy: Describe the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario. **(S3)** **C- Risk Management (RM)** **6.** Risk ID & Assessment Processes: Describe the organisation's processes for identifying and assessing climate-related risks. **(R1)** **7.** Risk Management Processes: Describe the organisation's processes for managing climate-related risks. **(R2)** **8.** Integration into Overall Risk Management: Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organisation's overall risk management. **(R3)** **D- Metrics and Targets (MT)** **9.** Climate-Related Metrics: a) Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process. **(M1)** **10.** Scope 1, 2, 3 GHG Emissions: Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks. **(M2)** **11.** Climate-Related Targets: Describe the targets used by the organisation to manage climate-related risks and opportunities and performance against targets. **(M3)** Each item if present is set to 1 and 0 otherwise.

Appendix 2.B: Measurements of variables used in Chapter 2

Dependent variables	***Measurement***
BOS_Dis	Financial distress variable measured using the model of Berger, Ofek, and Swary (1996). It is calculated as *0.715* Receivable + 0.547 * Inventory + 0.535 * Net PPE)/Total Assets*
AC_Dis	Financial distress variable measured using the model of Almeida and Campello (2007). It is calculated as *Cash + 0.715 * Receivable + 0.547 * Inventory + 0.535 * Net PPE)/Total Assets*
AltmanZ	Financial distress variable measured using the Altman (1968) model. It is calculated as: *1.2 * Working Capital/Total Assets. + 1.4 * Retained Earnings/Total Assets + 3.3 * Earnings Before Interest and Taxes/ Total Assets* *+ 0.6 * Market Value of Equity/Book Value of Total Liabilities* *+ 0.99 * Sales/Total Assets*
Independent variable	***Measurement***
CCDP	The average score of all 11 disclosed items of corporate governance (G1 and G2), strategy (S1, S2, and S3), risk management (R1, R2, and R3), and metrics and targets (M1, M2, and M3)
Moderator Variable	***Measurement***
LITIGATION	An indicator variable, which is equal to 1 if the firm has a lawsuit recorded and 0 otherwise
RISK_COM	An indicator variable, which is equal to 1 if the firm has its risk committee and 0 otherwise
BIG4	An indicator variable, which is equal to 1 if the firm is hiring a Big4 auditor and 0 otherwise
AFEE	The natural logarithm of audit fees
Control variables	***Measurement***
SIZE	The natural logarithm of total assets
LEV	Long-term debt divided by total assets
ROA	Net income divided by total assets
MTB	The market value of the firm scaled by book value of the firm
CASH	Firm cash holding, defined as cash and marketable securities scaled by total assets
QUICK	The quick ratio, calculated as the total of cash and receivables divided by current liability
RD	Research and development expense ratio, measured as research and development expense scaled by lagged total assets
LOSS	An indicator variable, which is equal to 1 if the firm's net income is negative and 0 otherwise
AGE	Firm age, measured as the number of years since the firm was incorporated

Chapter 3
Climate Change Disclosure Performance and Audit Fees: Evidence from Australia

3.1 Introduction

Climate change is among the most challenging issues around the word (IOE, 2015). While global warming will affect all sectors – primarily owing to CO_2 emissions from fossil fuel consumption – energy, water, agriculture and food production, transportation, construction, and energy-intensive industries, such as iron and steel, chemicals, and cement, will be particularly affected (IOE, 2015). Climate change has risen to the top of the agenda for business, with corporations under increasing pressure to contribute and respond to finding answers to this pressing issue (Pinkse & Kolk, 2009). Climate change is accelerating and might have a significant influence on values of investment (Covington & Thamotheram, 2014). The impact of climate change is increasingly a concern for investors on the operations of business as the correlating risks potentially have an influence on the returns of their investment (Ko & Tai, 2019).

Investors' demand for firm transparency and disclosure of information regarding the risks of climate change, effects, and opportunities has increased significantly over the last decade as these factors could have a significant effect on valuation and investment decisions (South et al., 2021). The AASB Practice Statement 2 'Making Materiality Judgements' (APS/PS 2[18]) requires 'material' risks to be disclosed when preparing financial statements. In addition, climate-related risks should be considered within financial statements (in accordance with ASP/PS 2) given the significance that investors place on such risks when making their decisions. The AASB (2019) highlights that there is increasing pressure from regulators, policymakers and shareholders globally to disclose climate change risks and impacts. Additionally, other stakeholders such as suppliers, customers and the general public demand disclosure of climate change information risk (Kouloukoui et al., 2019). The AASB and the AUASB expect the APS/PS 2 to be considered while financial statements are being prepared and audited by directors and auditors (Li et al., 2019). Regarding climate change and

[18] Refer to: AASB_AUASB_Joint_Bulletin_Finished.pdf

accounting, a recent CPA Australia webinar argues that climate change risks received the most attention among a myriad of global risks during the 21st century (Moodie, 2020). *It is therefore expected that auditors will consider climate-related risk implications in their procedures and risk assessments (Li et al., 2019). We conjecture that more extensive climate change disclosure performance by firms will impact audit risk and auditor risk and ultimately audit pricing.*

As more firms, investors, and countries establish net-zero goals for 2050, pressure is mounting on businesses to better explain their exposure to climate change risks and on regulators to create a level playing field (Treadgold, 2021). The IGCC and a group of worldwide investor networks have proposed that Australia implement obligatory disclosure of TCFD climate change risks (Treadgold, 2021). The Financial Stability Board established the TCFD with the objective to develop recommendations for more effective climate-related disclosures globally. The TCFD consists of 31 members[19] from across the G20 countries, including both preparers and users of financial disclosures. From 2017, the TCFD released model frameworks and recommendations on climate-related financial disclosures including disclosure of climate-related financial risks (Muldowney & Colquhoun, 2019). In addition, investors and other users were encouraged by the TCFD to engage with firms on the particular types of information required to be disclosed for decision-making (Christofidi & Rodrigues Pereira, 2019). The TCFD final recommendations, combined with rising expectations from Australian regulators, have resulted in a sharp increase in voluntary disclosures by firms and financial institutions, with 60 of the ASX200 firms adopting the framework of the TCFD (IGCC, 2021). These model frameworks and recommendations include 11 items, which are divided into four groups: governance, strategy, risk management, metrics and targets. Firms have been strongly encouraged by the TCFD to utilise these recommendations when reporting and disclosing climate risks and opportunities (TCFD, 2019). This study adopts the TCFD frameworks as an objective metric to assess *CCDP*.

The final sample of this study consists of 208 non-financial firms listed on the ASX, comprising 1,934 firm-year observations. We test the relationship between the *CCDP* and audit fees and the moderating impact of board size, board independence, audit committee size, and audit committee independence. We find that *CCDP* is significantly and positively associated with audit fees. In addition, the association between *CCDP* and audit fees is significant in firms with a larger board size, high level of board independence, a larger audit committee, and in firms with greater audit committee independence.

[19] see: https://www.fsb-tcfd.org/members/

Our study contributes to the literature in a number of significant ways. First, given that climate change imposes substantial costs on the economy and society (Dietz et al., 2016; Lesk et al., 2016), it is important to assess the extent to which firms are addressing these considerations. Importantly, stakeholders need to be aware of the costs of climate change, the quantification of climate change impacts, and how firms address climate change in their business risk management processes. In this study, we quantify the impact of *CCDP* on auditor risk assessments via audit fees. Our research poses questions and employs models developed by auditing theory and risk assessment, and in particular demonstrates how auditing research can relate to the climate risks. Secondly, this study provides important insights on the key determinants of climate change performance and how the climate-related risks are related to audit fees. The majority of audit-pricing research has focused on identifying sundry risk characteristics of firms that are priced in the cross-section of audit fees, while paying less attention to how these risk characteristics, which change as a result of externalities that could include climate-related risks and impacts (Truong et al., 2020). In 2018, CPA Australia focused on the key climate change implications of audits in order to ensure that accounting principles and regulations were followed. The CPA was particularly concerned that little had been done to consider climate change and hence the professional liability risk of auditors, despite the fact that climate change poses substantial financial risks for client firms. We show that climate risk affects a firm's business risk and that auditors incorporate such risks when assessing audit risk. Third, this study will be one of the first to use the TCFD framework and recommendations as an index for a firm's *CCDP*, and thus we offer a methodological contribution. Furthermore, the findings of this study enable us to draw conclusions for managers and auditors on how businesses can effectively handle climate risks. Finally, the findings of this study have important implications for regulators, management, investors, and auditors.

The remainder of this essay is structured as follows. Section 2 provides an overview of climate change regulation in Australia. Section 3 reviews the literature on climate change disclosure performance and presents the hypotheses. The sample selection, regression model and variables are discussed in Section 4. The empirical results are discussed in Section 5. Additional analysis in provided in Section 6. Finally, Section 7 provides some concluding remarks to the study.

3.2 Literature Review and Hypothesis Development

3.2.1 Disclosure of Climate Change Information

One of the most pressing social and environmental issues of the twenty-first century is climate change (Dietz et al., 2020). Climate change is without a doubt the greatest problem of the century, and it is inexorably influencing society, the environment, and economic operations, driving governments and organisations to investigate mitigation techniques in order to avert future disasters (Ghadge et al., 2020; Schneider, 2011). The Financial Stability Board acknowledged the importance of climate change reporting by establishing the TCFD in 2015, with the objective to encourage and set recommendations for an efficient climate change disclosure model (Melloni, 2020). Businesses globally are being asked to be more transparent about climate change risks by following the best practice recommendations of the international TCFD (Siew, 2020).

Recent studies have investigated the impact of CCDP on organisations in terms of accounting and financial impacts (Eleftheriadis & Anagnostopoulou, 2015; Haque, 2015; Kelvin et al., 2019; Saka & Oshika, 2014; Truong et al., 2020). Haque (2015) indicates that firms are conducting social and environmental audits and reporting data on their performance concerning climate change in response to initiatives and recommendations offered by international government agencies, non-governmental organisations (NGOs), and research organisations. Two studies have investigated the impact of drought on firms, as drought risk has a significant positive association with the cost of equity capital (Huynh et al., 2020), and drought-affected borrowers are charged higher loan spreads by banks (Do et al., 2020). Kelvin et al. (2019) demonstrate that carbon emission disclosure is negatively related to the cost of equity and positively related to abnormal stock return. Budiharta and Kacaribu (2020) prove that managerial ownership has a positive impact on carbon emission disclosure. This suggests that firm executives who are also shareholders believe that carbon emissions are significant data to consider when making decisions. Carbon emission disclosure enhances firm value in Indonesia, but it has no effect on firm value in Australia (Kurnia et al., 2021). The findings of Indonesian firms show that disclosing carbon emissions gives them a competitive edge in terms of creating value. Eleftheriadis and Anagnostopoulou (2015) report a positive association between firm size and climate-related corporate disclosures, and Kouloukoui et al. (2019) find that corporate disclosures of climate risk are significantly and positively associated with firm size and financial performance.

Previous studies have often focused on carbon emission disclosure, which constitutes a component of the TCFD model framework, and recommendations on climate-related financial disclosure. In this study, we measure the role of firms' governance, strategy, risk management, and metrics and targets in the disclosure of climate change using the comprehensive TCFD framework.

3.2.2 Audit Fees

Previous studies show that there are three significant components influencing the price of audit work which the amount paid for external auditors: the audit effort to safeguard the audit firm's reputation, the minimisation of lawsuit risks, and compensation based on predicted audit costs (Chen et al., 2018; Goodwin-Stewart & Kent, 2006; Houston et al., 2005; Simunic, 1980; Yang et al., 2018). Simunic (1980) and Houston et al. (2005) argue that audit prices are higher for larger clients or firms with greater levels of complexity dispute due to additional audit effort. More audit effort can improve financial reporting quality and lessen litigation and reputation risks for firms (Chen et al., 2018; Goodwin-Stewart & Kent, 2006; Yang et al., 2018).

The American Institute of Certified Practising Accountants (AICPA, 2006) asserts that the auditor's business risks include the risk of losing or injuring his or her professional practise as a result of litigation, negative publicity, or other events related to audited financial statements. Stanley (2011) provides evidence that the risk of a client's business can affect audit pricing. The risk is that an audit firm will issue an unqualified opinion on financial statements that are materially misstated (AICPA, 2002). In accordance with the audit pricing model of Simunic (1980), audit fees can be influenced by factors such as audit investment and/or price premiums to cover the audit firm's predicted future reputation losses. Schelleman and Knechel (2010) argue that audit fees are a prime indicator of a firm's operational performance and its business risks.

3.2.3 Climate Change Disclosure Performance and Audit Fees

Climate change risk on organisations and its effects is a concerning issue recently highlighted by the media[20], thus increasing pressure on companies to provide relevant disclosures. In fact, there is a high demand from investors and regulators such as Australian Securities and Investments Commission (ASIC) to increase the level of CCDP reported by firms. Listed firms are required to provide risk disclosures in their annual reports to allow investors to make informed decisions.

CPA Australia has particularly addressed the implications of climate change for audit work to ensure compliance with accounting standards and regulations (Truong et al., 2020). Truong et al. (2020) document that climate risk impacts firms' business risk and this is incorporated by auditors in their risk assessment and fees. According to Grayston (2019), auditors are required to have enough knowledge and understanding of climate risks related to businesses to confront their clients about the assumptions used to determine financial effects. Thus, listed firms that increase their *CCDP* often would compel auditors to put in effort, depending on their experience and view of their client, which would lead to higher audit fees.

Agency theory argues that the media can be very efficient in highlighting a firm's concerns relating to environmental performance (Brown & Deegan, 1998). According to the perspective of agency theory, managers hide information from shareholders, which leads to information asymmetry and agency problems between stakeholders (Al-Shaer, 2020). Environmental reporting is considered by agency theory as an outcome of principal and agent conflict (Chaklader & Gulati, 2015), and the environmental information disclosure will decrease agency costs (Chaklader & Gulati, 2015). From the viewpoint of legitimacy theory (Brown & Deegan, 1998), organisations respond to environmental concerns by increasing the extent and quality of information in their annual reports which may give rise to higher audit fees. Brown and Deegan (1998) show that there is an association between a higher degree of media interest and the higher environmental disclosures within annual reports. Truong et al. (2020) find that extreme drought conditions and severe drought are significantly associated with higher audit fees, suggesting the climate change risk of drought impacts audit risk and firm risk. Higher audit effort is required when there is an increase in audit risk, and this will ultimately increase audit fess (Bedard & Johnstone, 2004; Christensen et al., 2014; Doogar et al., 2015; Truong et al., 2020)

[20] See: https://www.allianz.com.au/media/news/2020/climate-change-a-growing-risk-for-australian-businesses-allianz-survey

Firms with a high level of CSR and strength in corporate governance pay more audit fees because of their higher-quality financial reporting, which requires more effort by auditors (Kim & Kim, 2013). Firms that hire large audit firms are probably pushed to disclose other non-financial information about their environmental and social aspects (Pucheta-Martínez et al., 2019). Audit fees are higher when companies issue sustainability reports, which are complementary to regular financial statements (Tuo, 2015). Prior studies have shown that CSR and the level of audit fees are positively related (Choi & Yang, 2008). Firm management would need to spend recourses on auditing financial statements to guarantee that the companies have a reliable system for creating financial and non-financial information, which in turn increases the credibility of voluntary CSR reports (Chen et al., 2016). They also find that CSR reports and audit fees are positively associated and this relationship is stronger when CSR reports are more extensive, issued with independent assurance, issued by firms with strong CSR intentions, or issued sporadically by companies. A recent study of CSR activities and sustainability reports by Sevrikozi and Tzika (2018) also find a positive relationship between CSR and audit fees, but this association becomes negative in countries where the framework for sustainability reporting is well-structured. Most of the aforementioned studies show a positive relationship between CSR and audit fees. However, LópezPuertas-Lamy et al. (2017) find the high level of CSR performance reduces the auditor's assessment of material risks, resulting in lower audit fees.

Supply and demand side factors may impact the relationship between audit pricing and climate change performance. For instance, audit pricing based on the level of *CCDP* is determined by a number of drivers that incentivise the audit team to perform more (or less) work during the audit (Hay et al., 2006). 'Supply'-related variables that may impact the relationship between *CCDP* and audit pricing include the business risk of the client, which may dictate the level of audit effort required by the audit team. The audit effort is designed to ensure the quality of the audit and to reduce litigation risks pertaining to environmental risks down to an acceptable level. 'Demand'-related factors that may impact the relationship between *CCDP* and audit pricing are the strength of governance as this will primarily impact audit risk.

Firms exhibiting a higher level of *CCDP* provide evidence of adhering to laws and regulations in addressing climate change issues related to the financial reporting implications. This reduces inherent risk, and auditors may reduce the scope and depth of their audits as a consequence, thereby lowering audit fees. On the other hand, an enhanced level of *CCDP* may require an increase in audit scope, particularly for environmentally sensitive industries, and

this may necessitate an increase in audit fees. Thus, the following non-directional hypothesis is developed.

H3.1: *CCDP is associated with audit fees.*

3.2.4 The Moderating Impact of Corporate Governance Characteristics

Corporate governance comprises the processes, policies, customs, institutions, and laws that assist corporations in the path they manage, as well as the performance and control of their operations (Khan, 2011). Corporate governance is linked to environmental disclosure through a framework involving agency theory, as the mechanisms of corporate governance can control agency effects and align the interests of stakeholders and management by reducing information asymmetry (Akbaş, 2016; Allegrini & Greco, 2013; Ho & Wong, 2001). Governance structure can significantly impact climate-related risks management (Ko & Tai, 2019). Independent and nationality-diverse directors, and the existence of a sustainability committee, can significantly and positively affect carbon emissions disclosure (Kılıç & Kuzey, 2019). A study of corporate governance and carbon transparency by Elsayih et al. (2018) find that the degree of carbon transparency is significantly associated with board independence, board diversity, and managerial ownership. Ben-Amar and McIlkenny (2015) show that board effectiveness and voluntary disclosure of climate change are positively related. Ben-Amar and McIlkenny (2015) highlight the important role of the board directors in improving the transparency related to voluntary disclosures of climate change business effects. Rankin et al. (2011) find that voluntarily disclosure of GHG emissions in Australian firms' reports are impacted by firm-level corporate governance quality.

3.2.5 Board Characteristics

As a significant determinant of an effective board (Allegrini & Greco, 2013; Amran et al., 2014), board size is considered as a decisive mechanism of corporate governance that may affect corporate voluntary disclosure level, comprising environmental disclosure (Ntim et al., 2013). According to agency theory, a larger board of directors impacts the effectiveness of monitoring since larger boards provide more monitoring management ability and diversity of expertise (Akbaş, 2016; Larmou & Vafeas, 2010; Sun et al., 2010; Uwuigbe et al., 2011). Some

studies indicate a positive association between the size of the board of directors and the disclosure level (Akhtaruddin et al., 2009; Buniamin et al., 2011; Haj, 2012; Janggu et al., 2014; Jizi et al., 2014; Liao et al., 2015; Rao et al., 2012; Samaha et al., 2015). Board independence is one of the major mechanisms of corporate governance that can impact disclosure levels (Amran et al., 2014; Khan et al., 2013). Under the perspective of agency theory, the board monitoring effectiveness and controlling management increase with the increase of board independency proportion (Chau & Gray, 2010; Jizi et al., 2014; Liao et al., 2015). Thus, independent directors assist in disclosure of more information (Akbaş, 2016).

Carcello et al. (2002) find that audit fees are positively and significantly related to board independence. Prior literature (Kikhia, 2014) reveals that board size and board independence are significantly and positively associated with audit fees. These results support the agreements of the 'demand side', which indicate that a bigger board size and board with more independent directors support the high audit quality demand (Kikhia, 2014). Based on the above argument, larger board size and more board independence may increase the board monitoring effectiveness and increase the demand for high audit quality. Thus, the following hypotheses are developed:

H3.2a: *Board size moderates the relationship between CCDP and audit fees.*

H3.2b: *Board independence moderates the relationship between CCDP and audit fees.*

3.2.6 Audit Committee Characteristics

Professional associations and regulatory bodies have actively promoted the importance of an audit committee to insure transparency and integrity of corporate disclosures following the failure of international firms, such as WorldCom and Enron (Appuhami & Tashakor, 2017).

The audit committee has a decisive role in achieving corporate governance objectives (Said et al., 2009). From the perspective of agency theory, the audit committee acts as one of the practical tools which can be used for mitigating agency costs (Forker, 1992) since it works as a mechanism of monitoring designed to improve information quality reported to stakeholders and the process of auditing (Collier, 1993; Pincus et al., 1989). In this framework, experimental studies generally document that the existence of an audit committee is positively associated with the quality and level of environmental disclosure (Akhtaruddin et al., 2009; Ho & Wong, 2001; Iatridis, 2013; Khan et al., 2013)

Buallay and AlDhaen (2018) indicate that audit committee size and independence of audit committee members significantly and positively affects sustainability report

disclosures. Appuhami and Tashakor (2017) find that the size of the audit committee and audit committee independence are positively related to CSR disclosure levels. Chariri et al. (2017) show that audit committee independence positively influences environmental performance. Iatridis (2013) finds that the proportion of audit committee independent directors is positively associated with environmental disclosure quality. Samaha et al. (2015) document that the voluntary disclosure level has a positive relationship with the percentage of the audit committee independent directors.

Januarti et al. (2020) show that the size of the audit committee and its independence are positively associated with audit fees. Abbott et al. (2003) argue that independent members of audit committees probably demand a higher standard of assurance and support the auditor's demand for further testing, resulting in an increase in audit fees. Vafeas and Waegelein (2007) suggest that audit committee size and the independence of the audit committee are positively related to audit fees, consistent with the idea that audit committees complement external auditors in monitoring management. Based on the above argument, larger audit committee size and more audit committee independence may increase the committee monitoring effectiveness and increase the demand for high audit quality. Thus, the following hypotheses are developed.

H3.3a: *The size of the audit committee moderates the relationship between CCDP and audit fees.*

H3.3b: *The independence of the audit committee moderates the association of CCDP and audit fees.*

3.3 Methodology and Research Design

3.3.1 Data and Sample

We start with the top 300 firms listed on the ASX over the period 2008–2019. We exclude 77 financial and real estate firms, and a further 15 firms with missing required data. Our final sample consists of 208 non-financial firms with 1,934 firm-year observations. Data on climate change disclosure and corporate governance have been collected manually from firms' annual reports, which are available on Morningstar database. Other financial data are obtained from Connect4 database, and audit-related data comes from Global Audit Analytic database.

Table 3.1A reports the distribution of our sample firms by industry. It shows that 24.51% of our sample is from the materials industry sector, followed by consumer discretionary firms (19.23%) and industrials of (13.46%).

Table 3.1A: Firms by industry

ASX industry	No of firms	Observations	Percentage
Consumer Discretionary	40	409	19.23%
Consumer Staples	19	183	9.13%
Energy	15	169	7.21%
Health Care	21	213	10.09%
Industrials	28	295	13.46%
Information Technology	22	182	10.57%
Materials	51	551	24.51%
Utilities	6	69	2.88%
Telecommunication Services	6	50	2.88%
Total	**208**	**1,934**	**100.00%**

This table shows the distribution of our sample according to industry. It includes firms listed on the Australian Stock Exchange (ASX) over the period 2008-2019.

3.3.2 Dependent Variable

The dependent variable in this study is audit fees (*AFEE*). Increased audit fees are likely to reflect increased audit effort as a result of more time given to the audit and the utilisation of more experienced or specialised employees in the audit team (Bentley et al., 2013). Morgan and Stocken (1998) indicate that auditors are often held accountable by shareholders, even if they are not directly responsible for shareholder losses. Based on previous literature (Goodwin-Stewart & Kent, 2006; Habib et al., 2015; Wang et al., 2019), audit fees (*AFEE*) are calculated as the natural logarithm of the audit fees.

3.3.3 Independent Variables

In this study, *CCDP* is measured using the 11 items of the TCFD recommended disclosures.[21] They are divided into four groups: governance (*GOV*), strategy (*STR*), risk management (*RM*), metrics and targets (*MT*). The list of 11 items that make up the *CCDP* index is in Appendix 2.A. Our independent variables include *CCDP* (the average score of all 11

[21] See: https://www fsb-tcfd.org/wp-content/uploads/2019/06/2019-TCFD-Status-Report-FINAL-053119.pdf

disclosed items on the *CCDP* index)[22] and factor analyses of four different attributes (*GOV, STR, RM, and MT*). The purpose of factor analysis is to find commonalities or factors that underpin our measure of *CCDP* indicators (Al-Hadi et al., 2016; Tao & Hutchinson, 2013). Following Bushman et al. (2004), we keep factors with eigenvalues greater than 1 and detect one factor for each group. The factors are then rotated using the promax rotation approach to clarify their interpretation (Bushman et al., 2004). The results of factor analyses are presented in Table 3.3.1B, with four different panels for each of the attributes.

Panel 3.1B.1 reports the factor analysis of two disclosed items (*G1* and *G2*) of corporate governance attribute (*GOV_Factor*). The eigenvalue of the *GOV_Factor* captures 73% of the variations in the corporate governance characteristics, indicating a high level of representativeness of *GOV_Factor*. Similar results are observed for the factor analyses of strategy (*STR_Factor*) in Panel 1B.2, of risk management (*RM_Factor*) in Panel 3.1B.3, and of metrics and targets (*MT_Factor*) in Panel 3.1B.4. It shows the commonalities have a factor loading of 75% for strategy, 70% for risk management, and 64% for metrics and targets. Our results imply that the factor analyses capture a high level of commonalities among the characteristics of GOV, STR, RM and MT.

[22] We did not use factor analysis for the CCDP variable as there are 11 items in the index, and running a factor analysis for CCDP resulted in two different factor variables.

Table 3.1B: Factor analysis

Panel 3.1B.1 – Factor analysis for corporate governance (GOV)

Factor	Eigenvalue	Difference	Proportion	Cumulative
GOV1	1.4653	0.9305	0.7326	0.7326
GOV2	0.5348	.	0.2674	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
GOV_Factor	1.4653	0.7326		

Panel 3.1B.2 – Factor analysis for strategy (STR)

Factor	Eigenvalue	Difference	Proportion	Cumulative
STR1	2.2630	1.7887	0.7543	0.7543
SRT2	0.4744	0.2118	0.1581	0.9125
SRT3	0.2626	.	0.0875	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
STR_Factor	2.2630	0.7543		

Panel 3.1B.3 – Factor analysis for risk management (RM)

Factor	Eigenvalue	Difference	Proportion	Cumulative
RM1	2.1016	1.4407	0.7005	0.7005
RM2	0.6609	0.4235	0.2203	0.9209
RM3	0.2374	.	0.0791	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
RM_Factor	2.1016	0.7005		

Panel 3.1B.4 – Factor analysis for metrics and targets (MT)

Factor	Eigenvalue	Difference	Proportion	Cumulative
MT1	1.9169	1.2294	0.6390	0.6390
MT2	0.6875	0.2919	0.2292	0.8681
MT3	0.3956	.	0.1319	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
MT_Factor	1.9169	0.6390		

This table reports the factor analysis of the independent variables.

3.3.4 Moderation Variables

This study uses four proxies of corporate governance as the moderator variables. The first measure is board size (*BDSIZE*), which refers to the number of directors on the board. The second proxy is board independence (*BDIND*), which is the proportion of independent directors on the board of directors. The third one is the size of audit committee (*ACSIZE*), which is calculated as the total number of directors on the audit committee. The last measure is the independence of audit committee (*ACIND*), which is the proportion of independent directors on the audit committee.

3.3.5 Control Variables

Following prior literature (Habib et al., 2015; LópezPuertas-Lamy et al., 2017; Wang et al., 2019), we use a number of control variables in the regression analysis. Firm size (*SIZE*) is measured as the natural logarithm of total assets. A significant and positive relationship between firm size with audit fess is expected to be seen as it is one of the most important factors affecting audit fess (LópezPuertas-Lamy et al., 2017; Simunic, 1980; Wang et al., 2019). Following Habib et al. (2015), we control for firm leverage (*LEV*), which is measured by total liabilities divided by total assets. *RECEIV* is measured as current receivables divided by total assets. Return on assets (*ROA*) is calculated by net income divided by total asset. *LOSS* is a binary variable, which is equal to 1 if the firm has a negative net income and 0 otherwise. *BIG4* is an indicator variable, which is equal to 1 if the firm auditor is one of the largest four auditing firms and 0 otherwise. Auditor tenure (*A_TEN*) is measured by the natural logarithm of the number of years that the auditor is employed by the firm. Growth in sales (*GROW*) is calculated as the percentage change in sales compared to prior year. *CR* refers to the ratio of current assets to current liabilities, and *INV* is measured as total inventory divided by total assets. *GROW* and *INV* are expected to have negative relationship with audit fees (Habib et al., 2015). Firm age (*AGE*) is measured as the number of years since the firm was incorporated. Appendix 3.A contains a summary of all variables used in the subsequent analyses.

3.3.6 Regression Model

The following ordinary least square (OLS) regression model is estimated to test for H1, controlling for year and industry fixed effects:

$$AUD\_FEE_{i,t} = \gamma_0 + \gamma_1 CCDP_{i,t} + \gamma_2 SIZE_{i,t} + \gamma_3 LEV_{i,t} + \gamma_4 RECEIV_{i,t} + \gamma_5 ROA_{i,t} + \gamma_6 GROW_{i,t} + \gamma_7 LOSS_{i,t} + \gamma_8 CR_{i,t} + \gamma_9 INV_{i,t} + \gamma_{10} BIG4_{i,t} + \gamma_{11} A\_TEN_{i,t} + \gamma_{12} AGE_{i,t} + Year\ Dummies + Ind\ Dummies + e_{i,t} \quad (1)$$

To examine the second and third hypotheses (H2a, H2b, H3a, and H3b), we run equation (1) separately for the two subsamples for each of the moderation variables. The two subsamples are determined based on the above and below median value of each of the moderating variables, namely board size, board independence, audit committee size, and audit committee independence.

3.4 Results

3.4.1 Descriptive Statistics

Table 3.2 reports the descriptive statistics of the variables employed in this study. Consistent with prior research (Truong et al., 2020), the average amount that firms pay to their auditors is $514,011 (for a natural logarithm value of 13.15). The proportion of firms with *CCDP* attributes for governance (*GOV*), strategy (*STR*), risk management (*RM*), metrics and targets (*MT*) are 0.23%, 0.12%, 0.23%, 0.27% respectively, and 0.21% of the *CCDP*. In addition, the average firm size (*SIZE*) is $982 million (for a natural logarithm value of 6.89). The mean value of firm leverage (*LEV*), receivables (*RECEIV*), return on assets (*ROA*), growth (*GROW*), loss (*LOSS*), current ratio (*CR*), inventory (*INV*), audit tenure (*A_TEN*), age (*AGE*), are 0.17, 0.11, 0.03, 1.63, 0.21, 2.46, 0.08, 1.98, and 2.55, respectively. These values in our sample respectively indicate that there is low dependence on debit, low dependence on credit of sold products or services, that firms work efficiently and generate profits, that firms achieve higher sales growth over the years during the sample period and the majority of firms (79%) have a positive net income, that firms have high ability to pay their short-term obligations, that firms show that the inventory is a very small part of assets, that 89% of companies with financial reports are being audited by Big4 auditing firms, that the duration of the same auditors for the same firm is 9.80, and finally that the average firm age in our sample is 2.55. The

average values of control variables used in our analysis indicate that the firms in this sample are financially in good condition and are generally consistent with those reported in previous literature (Bhuiyan, Salma, et al., 2020; Bicudo de Castro et al., 2019; Miah et al., 2020).

Half of the firms in our sample have seven directors on the board (*BDSIZE*) and four directors on the audit committee (*ACSIZE*). The average values of board independence (*BDIND*) and audit committee independence (*ACIND*) are 78% and 96%, respectively, which is consistent with prior literature (Appuhami & Bhuyan, 2015; Appuhami & Tashakor, 2017; Giannarakis et al., 2020).

Table 3.2: Descriptive Statistics

Variable	N	Mean	S.D.	0.25th	Mdn	0.75th	skewness	kurtosis
AFEE	1,934	13.15	1.17	12.39	13.09	13.87	0.00	0.06
GOV	1,934	0.23	0.36	0.00	0.00	0.50	0.00	0.02
STR	1,934	0.12	0.27	0.00	0.00	0.00	0.00	0.00
RM	1,934	0.23	0.33	0.00	0.00	0.33	0.00	0.00
MT	1,934	0.27	0.32	0.00	0.33	0.33	0.00	0.00
CCDP	1,934	0.21	0.27	0.00	0.09	0.27	0.00	0.00
BDSIZE	1,934	7.44	2.07	6.00	7.00	9.00	0.00	0.00
BDIND	1,934	0.78	0.13	0.71	0.82	0.86	0.00	0.00
ACSIZE	1,934	3.79	1.09	3.00	4.00	4.00	0.00	0.00
ACIND	1,934	0.96	0.15	1.00	1.00	1.00	0.00	0.00
SIZE	1,934	6.89	1.85	5.75	6.93	8.27	0.00	0.62
LEV	1,934	0.17	0.16	0.01	0.15	0.27	0.00	0.00
RECEIV	1,934	0.11	0.10	0.03	0.09	0.15	0.00	0.00
ROA	1,934	0.03	0.26	0.01	0.05	0.10	0.00	0.00
GROW	1,934	1.63	3.42	0.97	1.07	1.24	0.00	0.00
LOSS	1,934	0.21	0.40	0.00	0.00	0.00	0.00	0.00
CR	1,934	2.46	3.88	1.07	1.55	2.36	0.00	0.00
INV	1,934	0.08	0.10	0.00	0.03	0.12	0.00	0.00
BIG4	1,934	0.89	0.63	1.00	1.00	1.00	0.00	0.00
A_TEN	1,934	1.98	0.87	1.39	2.20	2.64	0.00	0.00
AGE	1,934	2.55	0.96	2.08	2.64	3.18	0.00	0.11

This table presents the descriptive statistics for the variables used in the analysis. Definitions of these variables are in Appendix 3.A.

3.4.2 Correlation Analysis

Table 3.3 reports the Pearson's correlation matrix between all variables used in this study. There is a significantly positive association between firms with *CCDP* and audit fees.

Table 3.3 also shows that audit fees are positively associated with all measures of *CCDP (GOV, STR, RM, MT,* and *CCDP*) at $p < 0.01$. In addition, audit fees (*AFEE*) are positively related to most of the control variables, such as *SIZE, LEV, RECEIV, ROA, INV, BIG4, A_TEN* and *AGE* at $p < 0.01$, except *LOSS* and *CR*, which show negative relationships at $p < 0.01$.

Table 3.3: Pearson's correlation matrix

Variables	(1)	(2)	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(1) AFEE	1															
(2) GOV	0.31***	1														
(3) STR	0.35***	0.59***	1													
(4) RM	0.38***	0.60***	0.73***	1												
(5) MT	0.46***	0.52***	0.69***	0.70***	1											
(6) CCDP	0.45***	0.78***	0.86***	0.91***	0.86***	1										
(7) SIZE	0.86***	0.38***	0.40***	0.46***	0.52***	0.53***	1									
(8) LEV	0.14***	-0.08***	-0.06***	-0.06***	-0.06***	-0.08***	-0.01	1								
(9) RECEIV	0.17***	-0.08***	-0.07***	-0.04*	-0.02	-0.05**	0.00	0.58***	1							
(10) ROA	0.34***	0.04**	0.05**	0.08***	0.08***	0.08***	0.35***	0.17***	0.24***	1						
(11) GROW	0.03	-0.02	-0.01	-0.01	-0.01	-0.01	0.05**	0.00	-0.03	-0.05**	1					
(12) LOSS	-0.50***	-0.15***	-0.12***	-0.16***	-0.17***	-0.18***	-0.50***	-0.20***	-0.24***	-0.74***	0.06**	1				
(13) CR	-0.36***	-0.06***	-0.04*	-0.07***	-0.07***	-0.07***	-0.30***	-0.32***	-0.18***	-0.28***	0.01	0.37***	1			
(14) INV	0.10***	0.00	0.01	0.02	0.05**	0.04*	0.09***	0.32***	0.24***	0.21***	-0.03	-0.22***	-0.13***	1		
(15) BIG4	0.43***	0.13***	0.12***	0.19***	0.20***	0.20***	0.38***	0.11***	0.15***	0.18***	0.00	-0.24***	-0.15***	0.10***	1	
(16) A_TEN	0.37***	0.16***	0.16***	0.14***	0.21***	0.20***	0.38***	0.02	0.10***	0.15***	-0.06**	-0.20***	-0.12***	0.15***	0.23***	1
(17) AGE	0.36***	0.17***	0.20***	0.15***	0.24***	0.22***	0.42***	-0.03	0.08***	0.14***	-0.03	-0.17***	-0.12***	0.08***	0.16***	0.63***

This table reports correlation coefficients between variables used in this study. Definition of these variables are in Appendix 3.A.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

3.4.3 Regression Analysis

3.4.3.1 CCDP and Audit Fees

Table 3.4 presents the regression results of testing the relationship between all proxies of *CCDP* (*GOV*, *STR*, *RM*, *MT* and *CCDP*) and audit fees (*AFEE*). We find the coefficients of all climate change variables are significantly positive at $p < 0.05$ or better. Thus, firms with a high level of *CCDP* have to pay higher audit fees, which corresponds with legitimacy theory that suggests organisations respond to environmental concerns by increasing the extent and quality of information in their annual reports. Our results are similar to those of related studies in the CSR area. For example, audit fees are higher for firms issuing CSR reports (Chen et al., 2016) or sustainability reports, which are complementary to regular financial statements (Tuo, 2015). Additionally, Truong et al. (2020) find that firms impacted by drought pay significantly higher audit fees.

The control variables are consistent with those reported in previous studies (Habib et al., 2015; LópezPuertas-Lamy et al., 2017; Simunic, 1980; Wang et al., 2019). There is a significant positive relationship between *SIZE*, *LEV*, *RECEIV*, and *A_TEN* with audit fees at $p < 0.01$. Additionally, audit fees are negatively associated with *CR*, *INV*, and *AGE* at $p < 0.10$ or better.

Table 3.4: The relationship between CCDP and audit fees (H3.1)

Variable	Dependent variable = AFEE				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
GOV	**0.032****				
	(2.20)				
STR		**0.079*****			
		(4.94)			
RM			**0.056*****		
			(3.39)		
MT				**0.119*****	
				(7.21)	
CCDP					**0.348*****
					(5.21)
SIZE	0.538***	0.528***	0.530***	0.514***	0.520***
	(47.13)	(47.84)	(45.86)	(45.28)	(44.67)
LEV	0.381***	0.364***	0.387***	0.391***	0.389***
	(3.02)	(2.94)	(3.10)	(3.17)	(3.12)
RECEIV	1.423***	1.423***	1.387***	1.366***	1.394***
	(8.51)	(8.62)	(8.29)	(8.40)	(8.45)
ROA	-0.115	-0.135	-0.124	-0.129	-0.117
	(-0.82)	(-0.98)	(-0.89)	(-0.94)	(-0.85)
GROW	-0.004	-0.004	-0.004	-0.003	-0.003
	(-0.77)	(-0.74)	(-0.74)	(-0.60)	(-0.67)
LOSS	0.085	0.069	0.078	0.068	0.078
	(1.06)	(0.87)	(0.97)	(0.86)	(0.99)
CR	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***
	(-3.70)	(-3.84)	(-3.76)	(-3.93)	(-3.88)
INV	-0.633***	-0.648***	-0.649***	-0.721***	-0.678***
	(-4.31)	(-4.42)	(-4.41)	(-4.91)	(-4.59)
BIG4	0.002	0.007	0.001	-0.007	-0.001
	(0.05)	(0.17)	(0.03)	(-0.18)	(-0.04)
A_TEN	0.012***	0.012***	0.012***	0.012***	0.012***
	(4.44)	(4.60)	(4.51)	(4.47)	(4.58)
AGE	-0.038*	-0.039*	-0.034	-0.038*	-0.035*
	(-1.80)	(-1.84)	(-1.59)	(-1.79)	(-1.66)
Constant	2.019***	2.257***	2.187***	2.584***	2.360***
	(8.56)	(9.86)	(9.16)	(10.95)	(9.99)
Observations	1,934	1,934	1,933	1,934	1,933
Adj. R^2	0.752	0.755	0.753	0.758	0.755
Year FE	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES
F Statistic	204.6	213.6	209	215.8	213.5

This table reports the regression results of audit fees against CCDP. All variables are defined in Appendix 3.A. Robust *t*-statistics are in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

3.4.3.2 The Moderating Impact of Board Size

To test the moderating impact of board size on the relationship of *CCDP* and audit fees (H3.2a), we divide the sample into two subsamples, being either above or below the median value of the board size variable. As shown in Table 3.5, the association of *CCDP* and audit fees is only present in firms with a bigger board size. There is a significantly positive relationship (at $p < 0.01$) between all the *CCDP* variables (*GOV*, *STR*, *RM*, *MT* and *CCDP*) and audit fees in the subsample when the board size is bigger than its median. This result is supported by agency theory, which indicates that a larger board of directors impacts the effectiveness of monitoring, since larger boards provide more monitoring management ability and diversity of expertise. Our result is consistent with some prior studies showing a positive association between the size of board and disclosure level (Akhtaruddin et al., 2009; Buniamin et al., 2011; Haj, 2012; Janggu et al., 2014; Jizi et al., 2014; Liao et al., 2015; Rao et al., 2012; Samaha et al., 2015). This is also consistent with Jizi and Nehme (2018), who find that board size is positively associated with audit fees.

Table 3.5: The moderating impact of board size on the relationship of audit fees and CCDP (H3.2a)

	Dependent variable = AFEE									
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Variables	BDSIZE									
	1	0	1	0	1	0	1	0	1	0
GOV	**0.049*** **	**-0.043**								
	(2.98)	**(-1.43)**								
STR			**0.077*** **	**0.015**						
			(4.24)	**(0.61)**						
RM					**0.062*** **	**-0.030**				
					(3.05)	**(-1.12)**				
MT							**0.110*** **	**0.073*** **		
							(5.63)	**(2.75)**		
CCDP									**0.380*** **	**0.007**
									(4.66)	**(0.07)**
SIZE	0.549***	0.432***	0.538***	0.425***	0.540***	0.430***	0.526***	0.416***	0.528***	0.426***
	(34.50)	(17.34)	(35.07)	(17.35)	(34.60)	(17.12)	(32.39)	(17.05)	(33.17)	(16.98)
LEV	0.621***	0.138	0.605***	0.149	0.627***	0.141	0.625***	0.179	0.629***	0.150
	(3.97)	(0.70)	(3.95)	(0.76)	(4.06)	(0.71)	(4.06)	(0.91)	(4.05)	(0.76)
RECEIV	1.889***	0.557**	1.876***	0.584**	1.859***	0.605***	1.805***	0.584***	1.843***	0.581**
	(8.75)	(2.38)	(8.81)	(2.56)	(8.68)	(2.65)	(8.52)	(2.62)	(8.64)	(2.55)
ROA	-0.014	-0.156	-0.063	-0.151	-0.047	-0.153	-0.091	-0.137	-0.060	-0.151
	(-0.08)	(-0.78)	(-0.37)	(-0.76)	(-0.27)	(-0.77)	(-0.53)	(-0.69)	(-0.35)	(-0.76)
GROW	-0.002	-0.023***	-0.002	-0.023***	-0.002	-0.024***	-0.001	-0.023***	-0.001	-0.023***
	(-0.35)	(-3.13)	(-0.38)	(-3.19)	(-0.38)	(-3.18)	(-0.20)	(-3.26)	(-0.27)	(-3.21)
LOSS	0.242**	-0.112	0.213**	-0.110	0.224**	-0.111	0.205*	-0.108	0.225**	-0.110
	(2.25)	(-0.95)	(2.02)	(-0.93)	(2.09)	(-0.93)	(1.95)	(-0.92)	(2.12)	(-0.93)

CR	-0.020***	-0.019***	-0.019***	-0.019***	-0.019***	-0.019***	-0.020***	-0.019***	-0.020***	-0.019***
	(-3.46)	(-3.40)	(-3.51)	(-3.41)	(-3.42)	(-3.39)	(-3.59)	(-3.42)	(-3.58)	(-3.40)
INV	-0.852***	-0.455*	-0.860***	-0.478*	-0.876***	-0.457*	-0.950***	-0.502*	-0.909***	-0.471*
	(-5.39)	(-1.75)	(-5.47)	(-1.82)	(-5.54)	(-1.75)	(-6.00)	(-1.92)	(-5.72)	(-1.80)
BIG4	0.157	-0.000	0.158	-0.007	0.152	-0.003	0.152	-0.020	0.153	-0.007
	(0.94)	(-0.00)	(0.97)	(-0.22)	(0.94)	(-0.11)	(0.91)	(-0.64)	(0.94)	(-0.22)
A_TEN	0.014***	0.004	0.014***	0.005	0.014***	0.005	0.014***	0.006	0.014***	0.005
	(4.70)	(0.92)	(4.88)	(1.15)	(4.66)	(0.97)	(4.70)	(1.19)	(4.75)	(1.13)
AGE	-0.028	-0.060*	-0.030	-0.059*	-0.020	-0.060*	-0.029	-0.056*	-0.022	-0.060*
	(-1.08)	(-1.95)	(-1.14)	(-1.88)	(-0.75)	(-1.93)	(-1.10)	(-1.81)	(-0.85)	(-1.93)
Constant	1.512***	4.105***	1.786***	4.259***	1.708***	4.142***	2.077***	4.472***	1.921***	4.234***
	(5.69)	(8.51)	(6.81)	(8.97)	(6.22)	(8.47)	(7.53)	(9.44)	(7.07)	(8.80)
Observations	1,260	674	1,260	674	1,259	674	1,260	674	1,259	674
Adj. R^2	0.733	0.639	0.736	0.639	0.734	0.639	0.739	0.641	0.737	0.638
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Statistic	135.4	50.29	141.2	55.28	138.4	52.75	142.5	54.22	141.6	52.69

This table shows the moderating analysis of board size on the positive relationship between CCDP and audit fees. The original sample is divided to two subsamples: 1 for above the median of board size and 0 for below the median of board size. All variables are defined in Appendix 3.A. Robust *t*-statistics are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

3.4.3.3 The Moderating Impact of Board Independence

To test the moderating impact of board independence on the relationship of *CCDP* and audit fees (H3.2b), we divide the sample into two subsamples of being above and below the median value of the board independence variable. As shown in Table 3.6, the association of *CCDP* and audit fees is only present in firms with a high level of board independence. There is a positively significant relationship (at $p < 0.05$) between all the *CCDP* variables (*GOV, STR, RM, MT,* and *CCDP*) and audit fees in the subsample when the board independence is above its median according to agency theory, and the board monitoring effectiveness and controlling management increase with the increase in the proportion of board independence. This result is consistent with some prior studies indicating that independent directors might encourage firms to provide outside stakeholders with more information disclosure (Akbaş, 2016; Garcia-Meca & Sanchez-Ballesta, 2010). Additionally, this is consistent with Jizi and Nehme (2018), who find that board independence is positively associated with audit fees.

Table 3.6: The moderating impact of board independence on the relationship of audit fees and CCDP (H3.2b)

	Dependent variable = AFEE									
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Variables	BDIND									
	1	0	1	0	1	0	1	0	1	0
GOV	**0.039****	**0.012**								
	(2.10)	**(0.47)**								
STR			**0.076*****	**0.039**						
			(3.91)	**(1.62)**						
RM					**0.047****	**-0.011**				
					(2.12)	**(-0.50)**				
MT							**0.111*****	**0.069*****		
							(5.19)	**(2.85)**		
CCDP									**0.342*****	**0.120**
									(3.81)	**(1.26)**
SIZE	0.537***	0.419***	0.521***	0.418***	0.531***	0.422***	0.510***	0.411***	0.516***	0.416***
	(36.16)	(20.61)	(35.41)	(21.31)	(34.31)	(21.18)	(33.44)	(20.66)	(32.91)	(20.66)
LEV	0.663***	0.116	0.657***	0.110	0.670***	0.113	0.671***	0.128	0.679***	0.118
	(3.94)	(0.67)	(3.99)	(0.64)	(4.03)	(0.65)	(4.05)	(0.75)	(4.05)	(0.68)
RECEIV	1.954***	0.846***	1.937***	0.846***	1.924***	0.848***	1.871***	0.820***	1.901***	0.836***
	(8.10)	(3.88)	(8.15)	(3.92)	(8.02)	(3.91)	(7.89)	(3.83)	(7.95)	(3.86)
ROA	0.131	-0.283	0.078	-0.283	0.113	-0.285	0.048	-0.273	0.092	-0.282
	(0.66)	(-1.62)	(0.40)	(-1.62)	(0.57)	(-1.63)	(0.25)	(-1.56)	(0.47)	(-1.61)
GROW	-0.003	-0.016***	-0.003	-0.016***	-0.003	-0.016***	-0.002	-0.016***	-0.003	-0.016***
	(-0.64)	(-2.68)	(-0.68)	(-2.63)	(-0.66)	(-2.67)	(-0.49)	(-2.61)	(-0.56)	(-2.66)
LOSS	0.296**	-0.140	0.266**	-0.138	0.284**	-0.142	0.252**	-0.134	0.277**	-0.137
	(2.36)	(-1.39)	(2.14)	(-1.37)	(2.24)	(-1.41)	(2.03)	(-1.33)	(2.21)	(-1.36)
CR	-0.016**	-0.019***	-0.016***	-0.019***	-0.016**	-0.019***	-0.016***	-0.019***	-0.016**	-0.019***
	(-2.43)	(-3.73)	(-2.59)	(-3.73)	(-2.41)	(-3.71)	(-2.60)	(-3.75)	(-2.57)	(-3.74)

INV	-1.138***	-0.288	-1.134***	-0.308	-1.147***	-0.282	-1.256***	-0.319	-1.194***	-0.303
	(-6.20)	(-1.34)	(-6.26)	(-1.42)	(-6.28)	(-1.31)	(-6.82)	(-1.48)	(-6.48)	(-1.40)
BIG4	0.417***	0.247**	0.409***	0.246**	0.398***	0.248**	0.414***	0.239**	0.401***	0.244**
	(5.24)	(2.34)	(5.16)	(2.35)	(4.95)	(2.36)	(5.18)	(2.26)	(5.06)	(2.32)
A_TEN	0.017***	0.002	0.017***	0.002	0.017***	0.002	0.017***	0.002	0.017***	0.002
	(5.23)	(0.60)	(5.36)	(0.65)	(5.17)	(0.55)	(5.26)	(0.47)	(5.31)	(0.62)
AGE	-0.041	-0.046*	-0.041	-0.045*	-0.034	-0.047*	-0.041	-0.042	-0.034	-0.045*
	(-1.43)	(-1.75)	(-1.46)	(-1.72)	(-1.16)	(-1.76)	(-1.43)	(-1.58)	(-1.20)	(-1.70)
Constant	1.541***	4.303***	1.919***	4.336***	1.694***	4.230***	2.181***	4.499***	1.960***	4.353***
	(5.14)	(11.50)	(6.33)	(11.99)	(5.34)	(11.51)	(6.93)	(12.30)	(6.24)	(11.85)
Observations	1,037	897	1,037	897	1,036	897	1,037	897	1,036	897
Adj. R^2	0.734	0.677	0.737	0.677	0.734	0.677	0.740	0.679	0.737	0.677
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Statistic	113.5	78.92	118.7	77.71	115.1	78.31	121.3	77.60	119.1	78.13

This table shows the moderating analysis of board independence on the positive relationship between CCDP and audit fees. The original sample is divided into two subsamples: 1 for above the median of board independence and 0 for below the median of board independence. All variables are defined in Appendix 3.A. Robust *t*-statistics are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

3.4.3.4 The Moderating Impact of Audit Committee Size

To test the moderating impact of audit committee size on the relationship of *CCDP* and audit fees (H3.3a), we divide the sample into two subsamples, which are either above or below the median value of the audit committee size variable. As shown in Table 3.7, the association of *CCDP* and audit fees is only present in firms with a larger audit committee. There is a significantly positive relation (at $p < 0.01$) between all the *CCDP* variables (*GOV, STR, RM, MT*, and *CCDP*) and audit fees in the subsample when the size of the audit committee is bigger than its median, as agency theory reveals that audit committee acts as one of the practical tools which can be used for mitigating agency costs. This result is in line with some prior studies which indicate that the size of audit committee significantly and positively affects sustainability report disclosure (Buallay & AlDhaen, 2018) and impacts the CSR disclosure level (Appuhami & Tashakor, 2017). Furthermore, it is consistent with Januarti et al. (2020) and Vafeas and Waegelein (2007), who both show that the audit committee size positively influences audit fees.

Table 3.7: The moderating impact of audit committee size on the relationship of audit fees and CCDP (H3.3a).

Dependent variable = AFEE										
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Variables	ACSIZE									
	1	0	1	0	1	0	1	0	1	0
GOV	**0.051*** **	**0.007**								
	(2.79)	**(0.29)**								
STR			**0.079*** **	**0.039**						
			(4.13)	**(1.55)**						
RM					**0.071*** **	**-0.027**				
					(3.73)	**(-0.92)**				
MT							**0.098*** **	**0.080*** **		
							(5.08)	**(2.88)**		
CCDP									**0.387*** **	**0.073**
									(4.67)	**(0.69)**
SIZE	0.538***	0.469***	0.529***	0.464***	0.531***	0.475***	0.519***	0.454***	0.519***	0.465***
	(43.43)	(22.15)	(44.55)	(22.33)	(43.50)	(21.75)	(42.46)	(21.18)	(41.62)	(21.27)
LEV	0.298**	0.419**	0.313**	0.395**	0.313**	0.421**	0.342**	0.398**	0.337**	0.414**
	(2.05)	(2.17)	(2.20)	(2.08)	(2.19)	(2.17)	(2.40)	(2.09)	(2.38)	(2.17)
RECEIV	2.111***	0.587**	2.070***	0.611***	2.040***	0.582**	1.975***	0.605***	2.006***	0.592**
	(9.90)	(2.53)	(9.91)	(2.65)	(9.83)	(2.52)	(9.51)	(2.63)	(9.74)	(2.56)
ROA	-0.028	-0.280	-0.074	-0.281	-0.062	-0.287	-0.073	-0.273	-0.055	-0.279
	(-0.19)	(-1.31)	(-0.53)	(-1.32)	(-0.44)	(-1.34)	(-0.52)	(-1.29)	(-0.39)	(-1.31)
GROW	0.001	-0.009	0.001	-0.008	0.001	-0.009	0.002	-0.008	0.001	-0.008
	(0.16)	(-1.37)	(0.23)	(-1.36)	(0.12)	(-1.42)	(0.32)	(-1.31)	(0.21)	(-1.35)
LOSS	0.110	-0.011	0.077	-0.013	0.089	-0.013	0.080	-0.013	0.090	-0.011
	(1.41)	(-0.09)	(1.03)	(-0.10)	(1.17)	(-0.11)	(1.06)	(-0.10)	(1.20)	(-0.09)
CR	-0.027***	-0.017***	-0.025***	-0.017***	-0.025***	-0.017***	-0.025***	-0.017***	-0.026***	-0.017***
	(-4.64)	(-3.05)	(-4.43)	(-3.15)	(-4.47)	(-3.01)	(-4.48)	(-3.20)	(-4.58)	(-3.10)

INV	-0.646***	-0.635***	-0.674***	-0.640***	-0.679***	-0.633***	-0.739***	-0.681***	-0.706***	-0.643***
	(-3.42)	(-2.91)	(-3.56)	(-2.92)	(-3.58)	(-2.90)	(-3.95)	(-3.07)	(-3.74)	(-2.92)
BIG4	0.535***	0.166*	0.534***	0.168*	0.521***	0.168*	0.528***	0.164	0.524***	0.165*
	(8.40)	(1.69)	(8.47)	(1.72)	(8.20)	(1.72)	(8.40)	(1.63)	(8.36)	(1.69)
A_TEN	0.009***	0.010**	0.009***	0.011**	0.009***	0.010**	0.009***	0.010**	0.009***	0.011**
	(3.06)	(2.21)	(3.05)	(2.31)	(2.83)	(2.10)	(3.00)	(2.18)	(3.00)	(2.25)
AGE	-0.024	-0.068*	-0.026	-0.067**	-0.017	-0.069**	-0.022	-0.066**	-0.019	-0.067*
	(-0.97)	(-1.96)	(-1.05)	(-1.98)	(-0.67)	(-2.00)	(-0.88)	(-1.97)	(-0.76)	(-1.96)
Constant	1.559***	3.370***	1.781***	3.485***	1.733***	3.224***	1.992***	3.728***	1.919***	3.430***
	(5.97)	(8.66)	(7.01)	(9.10)	(6.67)	(7.98)	(7.64)	(9.40)	(7.37)	(8.65)
Observations	1,051	883	1,051	883	1,050	883	1,051	883	1,050	883
Adj. R^2	0.811	0.671	0.814	0.671	0.812	0.671	0.815	0.673	0.814	0.671
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Statistic	164.8	71.51	175.6	72.23	171.1	70.37	175.1	72.55	176	71.57

This table shows the moderating analysis of audit committee size on the positive relationship between CCDP and audit fees. The original sample is divided into two subsamples: 1 for above the median of audit committee size, and 0 for below the median of audit committee size. All variables are defined in Appendix 3.A. Robust *t*-statistics are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

3.4.3.5 The Moderating Impact of Audit Committee Independence

To test the moderating impact of audit committee independence on the relationship of *CCDP* and audit fees (H3.3b), the full sample is partitioned into two subsamples, which are either above or below the median value of the audit committee independence variable. As shown in Table 3.8, the association of *CCDP* and audit fees is only present in firms with a higher independence level in the audit committee. There is a positively significant relationship (at $p < 0.10$ or better) between all the *CCDP* variables (*STR, RM, MT*, and *CCDP*) and audit fees in the subsample when the independence of the audit committee is bigger than its median as the audit committee is one of the useful mechanisms that can be utilised to reduce agency costs, as agency theory makes clear. This result is consistent with some prior studies, which indicate that audit committee independence significantly and positively impacts sustainability report disclosure (Buallay & AlDhaen, 2018), the CSR disclosure level (Appuhami & Tashakor, 2017), environmental performance (Chariri et al., 2017), and environmental disclosure quality (Iatridis, 2013). Our result is also consistent with Januarti et al. (2020) and Vafeas and Waegelein (2007), who both show that audit fees are higher in firms with independent audit committees.

Table 3.8: The moderating impact of audit committee independence on the relationship of audit fees and CCDP (H3.3b).

	Dependent variable = AFEE									
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Variables	ACIND									
	1	0	1	0	1	0	1	0	1	0
GOV	**0.028***	**0.007**								
	(1.89)	**(0.07)**								
STR			**0.070*****	**0.004**						
			(4.37)	**(0.03)**						
RM					**0.044*****	**0.023**				
					(2.62)	**(0.17)**				
MT							**0.109*****	**-0.036**		
							(6.55)	**(-0.30)**		
CCDP									**0.303*****	**0.034**
									(4.48)	**(0.06)**
SIZE	0.540***	0.376***	0.529***	0.376***	0.534***	0.373***	0.515***	0.378***	0.523***	0.375***
	(40.11)	(5.88)	(41.15)	(6.32)	(40.53)	(5.57)	(38.13)	(6.49)	(38.69)	(5.88)
LEV	0.278**	0.952	0.268**	0.951	0.284**	0.951	0.291**	0.962	0.288**	0.951
	(2.20)	(1.39)	(2.16)	(1.41)	(2.27)	(1.40)	(2.34)	(1.39)	(2.29)	(1.40)
RECEIV	1.506***	-0.373	1.502***	-0.369	1.473***	-0.361	1.439***	-0.377	1.476***	-0.369
	(8.85)	(-0.35)	(8.96)	(-0.34)	(8.68)	(-0.33)	(8.66)	(-0.35)	(8.78)	(-0.34)
ROA	-0.031	-0.090	-0.061	-0.093	-0.044	-0.088	-0.067	-0.109	-0.047	-0.090
	(-0.22)	(-0.24)	(-0.44)	(-0.25)	(-0.31)	(-0.24)	(-0.49)	(-0.30)	(-0.34)	(-0.24)
GROW	-0.004	0.004	-0.003	0.004	-0.003	0.005	-0.003	0.005	-0.003	0.004
	(-0.72)	(0.33)	(-0.71)	(0.33)	(-0.70)	(0.32)	(-0.58)	(0.32)	(-0.64)	(0.33)
LOSS	0.139	-0.266	0.119	-0.265	0.131	-0.265	0.115	-0.268	0.128	-0.265
	(1.64)	(-1.42)	(1.42)	(-1.31)	(1.55)	(-1.38)	(1.38)	(-1.38)	(1.53)	(-1.37)
CR	-0.020***	-0.012*	-0.020***	-0.012*	-0.020***	-0.012*	-0.021***	-0.012*	-0.021***	-0.012*
	(-2.93)	(-1.77)	(-3.00)	(-1.78)	(-2.94)	(-1.77)	(-3.05)	(-1.75)	(-3.02)	(-1.77)

INV	-0.655***	-0.903	-0.673***	-0.911	-0.670***	-0.857	-0.742***	-1.019	-0.698***	-0.893
	(-4.41)	(-1.08)	(-4.53)	(-1.04)	(-4.50)	(-1.00)	(-4.99)	(-1.16)	(-4.68)	(-0.97)
BIG4	0.266**	0.196	0.266**	0.195	0.261**	0.194	0.259**	0.200	0.260**	0.195
	(2.40)	(1.42)	(2.43)	(1.41)	(2.39)	(1.40)	(2.32)	(1.38)	(2.36)	(1.40)
A_TEN	0.010***	-0.003	0.010***	-0.003	0.010***	-0.002	0.010***	-0.004	0.010***	-0.003
	(3.67)	(-0.19)	(3.83)	(-0.17)	(3.72)	(-0.12)	(3.67)	(-0.23)	(3.77)	(-0.17)
AGE	-0.033	-0.017	-0.034	-0.018	-0.030	-0.017	-0.032	-0.019	-0.030	-0.018
	(-1.48)	(-0.17)	(-1.52)	(-0.20)	(-1.32)	(-0.17)	(-1.47)	(-0.20)	(-1.36)	(-0.18)
Constant	1.751***	5.084***	1.993***	5.071***	1.879***	5.130***	2.323***	5.023***	2.073***	5.081***
	(7.53)	(4.58)	(8.93)	(4.79)	(8.12)	(4.37)	(9.97)	(4.91)	(8.96)	(4.71)
Observations	1,816	118	1,816	118	1,815	118	1,816	118	1,815	118
Adjusted R-squared	0.745	0.740	0.748	0.740	0.746	0.740	0.751	0.741	0.748	0.740
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Statistic	195.3	37.45	204.9	34.93	200.2	34.70	206.7	34.93	205.2	35.11

This table shows the moderating analysis of audit committee independence on the positive relationship between CCDP and audit fees. The original sample is divided into two subsamples: 1 for above the median of audit committee independence and 0 for below the median of audit committee independence. All variables are defined in Appendix 3.A. Robust *t*-statistics are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

3.5 Additional Analysis

3.5.1 Difference-in-Difference Analysis

Endogeneity (e.g. causality direction) problems may influence our main regression findings in Table 3.4, leading to potentially biased regression coefficients. Following Roberts and Whited (2013) and Wooldridge (2010), we use a difference-in-difference (*DID*) test to rectify this problem. The governance principles and recommendations for ASX firms acknowledged social and environmental elements for the first time in September 2013, and they have been effective from financial years commencing on or after 1 July 2014. These principles and recommendations outline the recommended corporate governance practices for ASX-listed entities to achieve good governance outcomes and meet most investors' fair expectations in most situations (ASX, 2014). We therefore use a dummy variable (*EVENT*) coded 1 for financial years from 2014, and 0 otherwise, as our exogenous event (ASX, 2014; Bono, 2013). The *EVENT* variable distinguishes the consequence of on audit fees after the event as compared to before the event. We then create interaction terms *GOV*EVENT, STR*EVENT, RM*EVENT, MT* EVENT, and CCDP* EVENT* and estimate the following regression model:

$$AFEE_{i,t} = \gamma_0 + \gamma_1 CCDP\ (or\ CCDP_{ITEM})_{i,t} + EVENT + CDP\ (or\ CCDP_{ITEM}) * EVENT + \gamma_2\ SIZE_{i,t} + \gamma_3\ LEV_{i,t} + \gamma_4\ RECEIV_{i,t} + \gamma_5\ ROA_{i,t} + \gamma_6\ GROW_{i,t} + \gamma_7 LOSS_{i,t} + \gamma_8\ CR_{i,t} + \gamma_9\ INV_{i,t} + \gamma_{10} BIG4_{i,t} + \gamma_{11} A\_TEN_{i,t} + \gamma_{12} AGE_{i,t} + Year\ Dummies + Ind\ Dummies + e_{i,t} \quad (2)$$

Where *CCDP* = climate change disclosure performance; $CCDP_{ITEM}$ = one of *GOV, STR, RM, or MT;* and *EVENT* = a dummy variable scored as 1 for years 2014 and after, otherwise 0.

The regression results with *DID* variables are presented in Table 3.9. We still find that all proxies of *CCDP* variables (*GOV, STR, RM, MT*, and *CCDP*) are positively associated with audit fees. The coefficients of the interaction term between measure of *CCDP* and *EVENT* is negative in all five models and significant in three of them (*STR*EVENT, MT*EVENT*, and *CCDP*EVENT*) with $p < 0.05$ or better. These findings indicate that firms pay lower audit fees after 2013. This is due to the governance principles and recommendations encouraging ASX

companies to disclose and acknowledge social and environmental factors in their financial reports. Prior research shows that strengthening the governance structure leads to a reduction in audit risks and subsequently lower audit fees (Griffin et al., 2008).

Table 3.9: DID results – The impact of CCDP on audit fees

Variables	Dependent variable = AFEE				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
GOV	**0.035**				
	(1.25)				
STR		**0.177*** **			
		(4.10)			
RM			**0.071** **		
			(1.99)		
MT				**0.168*** **	
				(5.77)	
CCDP					**0.623*** **
					(4.22)
EVENT	-0.101***	-0.140***	-0.113***	-0.109***	-0.057*
	(-3.55)	(-4.62)	(-3.81)	(-3.93)	(-1.70)
GOV*EVENT	**-0.015**				
	(-0.49)				
STR*EVENT		**-0.125*** **			
		(-2.80)			
RM*EVENT			**-0.031**		
			(-0.84)		
MT*EVENT				**-0.077** **	
				(-2.51)	
CCDP*EVENT					**-0.381*** **
					(-2.62)
SIZE	0.538***	0.524***	0.530***	0.512***	0.516***
	(46.87)	(46.82)	(45.21)	(44.90)	(43.39)
LEV	0.390***	0.379***	0.398***	0.408***	0.408***
	(3.07)	(3.06)	(3.14)	(3.28)	(3.23)
RECEIV	1.419***	1.422***	1.391***	1.366***	1.396***
	(8.45)	(8.61)	(8.29)	(8.34)	(8.41)
ROA	-0.112	-0.150	-0.119	-0.132	-0.116
	(-0.81)	(-1.09)	(-0.86)	(-0.97)	(-0.85)
GROW	-0.003	-0.004	-0.003	-0.003	-0.003
	(-0.70)	(-0.87)	(-0.68)	(-0.60)	(-0.71)
LOSS	0.089	0.069	0.085	0.070	0.084
	(1.11)	(0.87)	(1.06)	(0.89)	(1.05)
CR	-0.017***	-0.018***	-0.018***	-0.018***	-0.018***
	(-3.69)	(-3.95)	(-3.76)	(-3.87)	(-3.82)
INV	-0.627***	-0.661***	-0.640***	-0.727***	-0.682***
	(-4.30)	(-4.52)	(-4.38)	(-4.99)	(-4.64)
BIG4	0.001	0.004	-0.000	-0.008	-0.004
	(0.03)	(0.09)	(-0.01)	(-0.19)	(-0.11)
A_TEN	0.011***	0.013***	0.012***	0.012***	0.012***
	(4.31)	(4.76)	(4.38)	(4.39)	(4.59)
AGE	-0.040*	-0.045**	-0.036*	-0.041**	-0.038*

	(-1.86)	(-2.15)	(-1.66)	(-1.97)	(-1.82)
Constant	1.991***	2.344***	2.164***	2.608***	2.372***
	(8.75)	(10.34)	(9.28)	(11.38)	(10.33)
Observations	1,934	1,934	1,933	1,934	1,933
Adjusted R-squared	0.752	0.756	0.753	0.758	0.755
Ind FE	YES	YES	YES	YES	YES
F Statistic	282.5	297.8	288.2	297.4	294.7

This table shows the results of regression analysis on the relationship between CCDP and audit fees, taking into account the impact of ASX governance principles and recommendations on social and environmental elements from 1 July 2014. All variables are defined in Appendix 3.A. Robust *t*-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

3.5.2 Alternative Measures of the Independent Variable CCDP

As additional analyses, similarly to the previous essay which has more details of these alternative measures, we consider disclosures and trends related to *GHG* emissions and certification and its impact on audit fees. The first alternative measure of *CCDP* that we employ is an indicator variable if the firm has made a disclosure for each scope separately. For instance, when the firm publishes data on *Scope 1* (or *Scope 2, or Scope 3*) emissions in their report, it is coded as 1 for *Scope 1* (or *Scope 2, or Scope 3*) and 0 otherwise. The second alternative measure of *CCDP* is a binary variable on the assurance provided by an audit firm over *Scope 1, Scope 2 or Scope 3* emissions data. The level of assurance can be reasonable, limited, or no assurance for each scope. For example, KPMG has provided reasonable assurance over *Scope 1 and Scope 2* emissions data and no assurance over *Scope 3* emissions data for BHP in its 2015 Sustainability Report. If the audit firm has provided the reasonable or limited assurance for any scope, it is coded as 1 for the Assurance variable and 0 otherwise. The last alternative measure of *CCDP* is the *GHG*-emissions-related disclosure index (*GHG_INDX*), which includes 34 items of hard disclosure and soft disclosure items.

In this section, we replace the original *CCDP* variable employed in Table 3.4 with these three alternative measures related to *GHG* disclosures to evaluate their impact on audit fees. The regression results are presented in Table 3.11 (Panel A, B, and C). We find that the coefficient of our *Scope 1, 2, and 3* emissions variable is significantly positive with audit fees (Table 3.10, Panel A). This result is quantifiably similar to that of our base regression model results (see Table 3.4). Similar results are observed when the independent variables are changed to *GHG assurance* and *GHG*-emissions-related disclosure index. In Table 3.10 Panel B, it is found that the coefficient of the Assurance variable is significantly positive with audit fees.

Finally, Table 3.10 Panel C shows the coefficient of the *GHG_INDX* variable is significantly positive with audit fees. To sum up, our alternative measures of the independent variable *CCDP* on the firm's disclosures related to *GHG* emissions and certification provide further support to the base results in Table 3.4.

Table 3.10: Alternative measures of CCDP

Scope 1, 2, and 3 GHG emissions, Assurance provided and GHG index

Variable	Dependent variable = AFEE				
		Panel A		Panel B	Panel C
Scope 1	**0.211*** **				
	(4.76)				
Scope 2		**0.224*** **			
		(4.40)			
Scope 3			**0.447*** **		
			(6.04)		
Assurance				**0.484*** **	
				(4.22)	
GHG_INDX					**0.998*** **
					(6.62)
SIZE	0.530***	0.534***	0.529***	0.529***	0.515***
	(46.66)	(47.85)	(47.43)	(47.46)	(45.23)
LEV	0.439***	0.455***	0.408***	0.427***	0.416***
	(3.53)	(3.61)	(3.26)	(3.42)	(3.39)
RECEIV	1.446***	1.474***	1.455***	1.476***	1.490***
	(8.75)	(8.81)	(8.77)	(8.85)	(9.01)
ROA	-0.065	-0.054	-0.062	-0.100	-0.125
	(-0.48)	(-0.40)	(-0.47)	(-0.74)	(-0.94)
GROW	-0.001	-0.002	-0.001	-0.002	-0.002
	(-0.35)	(-0.41)	(-0.30)	(-0.49)	(-0.45)
LOSS	0.105	0.109	0.100	0.084	0.064
	(1.28)	(1.33)	(1.22)	(1.03)	(0.79)
CR	-0.018***	-0.018***	-0.018***	-0.018***	-0.019***
	(-3.41)	(-3.38)	(-3.51)	(-3.48)	(-3.68)
INV	-0.719***	-0.710***	-0.693***	-0.660***	-0.668***
	(-4.84)	(-4.75)	(-4.69)	(-4.41)	(-4.52)
BIG4	-0.012	-0.015	0.006	0.002	0.001
	(-0.30)	(-0.37)	(0.15)	(0.06)	(0.02)
A_TEN	0.083***	0.081***	0.083***	0.090***	0.087***
	(3.89)	(3.83)	(3.96)	(4.20)	(4.07)
AGE	-0.033	-0.035*	-0.039*	-0.042**	-0.045**
	(-1.56)	(-1.65)	(-1.84)	(-2.00)	(-2.13)
Constant	2.090***	1.997***	2.089***	2.106***	2.384***
	(9.00)	(8.73)	(9.08)	(9.18)	(10.25)
Observations	1,903	1,903	1,903	1,903	1,903
Adj. R^2	0.760	0.760	0.763	0.761	0.763
year FE	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES
F Statistic	218.2	219	224.8	226.2	236.4

Panels A–C report the regression results between audit fees and alternative measures of CCDP (i.e., Scope 1, Scope 2, and Scope 3 GHG emissions in Panel A, Assurance provided over Scope 1, 2, or 3 GHG emissions in Panel B, and GHG index in Panel C). All the alternative measures of CCDP are defined in Section 2.5.3 of Chapter 2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

3.6 Conclusion and Implications

Firms operating in climate-affected areas face the risk of higher operational costs, business disruptions, increased earnings volatility, changed asset valuations, and greater uncertainty about potential cash flows. While the audit industry is becoming more conscious of the risks associated with climate change (CPA Australia, 2018a), the question of whether climate risk is taken into account by auditors when assessing audit risk, auditor risk, and business risk remains an open question. In this study, we address this question by first quantifying the impact of *CCDP* on audit fees. We then demonstrate that various corporate governance characteristics moderate the effect of *CCDP* on audit pricing.

This research investigates the relationship between climate change disclosure performance (*CCDP*) and audit fees. The moderating impact of board size, board independence, audit committee size, and audit committee independence on this relationship are also examined. Our sample covers non-financial firms from the top 300 firms listed on the ASX over the period 2008–2019. We find that *CCDP* is positively related to audit fees, which is consistent with legitimacy theory, which contends that organisations address environmental issues by enhancing the quantity and quality of information in their annual reports. In addition, this positive relationship between all the *CCDP* variables (i.e. governance, strategy, risk management, metrics and targets) and audit fees is only present in firms endowed with larger boards, a high level of board independence, larger audit committees, and with audit committees that demonstrate greater independence. Where corporate governance and environmental disclosure are related through an agency theory framework, it is because the processes of corporate governance can reduce information asymmetry, limit agency effects, and align the interests of stakeholders and management. Further, employing a *DID* approach, we document that firms have experienced lower audit fees following the exogeneous shock in 2013, as the governance principles and recommendations require consideration of climate-related risks for ASX-listed firms after that date.

Our findings show some important implications for firm management, regulators, investors, and auditors. We present empirical evidence that climate change, as a factor of external risk, influences audit fees. The results of our study are timely and important in raising public awareness of this topic, as concerns about the unprecedented impacts of climate change

risks grow. This research is also important for auditors, who should consider this risk factor when performing audits and handling their clients' portfolios.

Appendix 3.A: Measurements of variables used in Chapter 3

Dependent variables	***Measurement***
AFEE	The natural logarithm of audit fees
Independent variables	***Measurement***
GOV	Factor analysis of corporate governance information of climate change disclosure performance (CCDP), an eigenvalue obtained from two items of corporate governance (G1 and G2)
STR	Factor analysis of strategy information of CCDP, an eigenvalue obtained from three items of strategy (S1, S2, and S3)
RM	Factor analysis of risk management information of CCDP, an eigenvalue obtained from three items of risk management (R1, R2, and R3)
MT	Factor analysis of metrics and targets information of CCDP, an eigenvalue obtained from three items of metrics and targets (M1, M2, and M3)
CCDP	The average score of all 11 disclosed items of corporate governance (G1 and G2), strategy (S1, S2 and S3), risk management (R1, R2, and R3), and metrics and targets (M1, M2, and M3)
Moderator Variable	***Measurement***
BDSIZE	The number of directors on the board
BDIND	The proportion of independent directors on the board
ACSIZE	The number of directors on the audit committee
ACIND	The proportion of independent directors on the audit committee
Indicator variable	***Measurement***
DID	A dummy variable coded 1 for years since financial year 2014 and 0 otherwise
Control variables	***Measurement***
SIZE	The natural logarithm of total assets
LEV	Total liabilities divided by total assets
RECEIV	Current receivables divided by total assets
ROA	Net income divided by total assets
GROW	Growth in sales compared to prior year
LOSS	An indicator variable, which is equal to 1 if the firm's net income is negative and 0 otherwise
CR	The ratio of current assets to current liabilities
INV	The ratio of total inventory to total assets
Big4	An indicator variable, which is equal to 1 when the auditor is one of the largest 4 auditing firms and 0 otherwise.
A_TEN	The number of years since the audit firm started auditing the company, expressed in natural logarithm
AGE	Firm age, measured as the number of years since the firm was incorporated

Chapter 4
Climate Change Disclosure Performance and Firm Risk: Evidence from Australia

4.1 Introduction

Climate scientists and governments around the world have declared climate change to be a threat to human well-being, warning that we are running out of time to ensure a sustainable and liveable future (Slezak, 2022). Climate change is affecting the way we live and work, and practically all industries are endangered, either directly or indirectly, by the effects of climate change (Zurich, 2021). The portfolio manager at Munro Partners, Mr James Tsinidis, says that climate change is the next prime megatrend, and it is the "biggest investment opportunity since the internet" (Gluyas, 2021). Furthermore, climate change, according to Mr Sam Hallinan, CEO of Schroders, is the most significant "social, political, and economic concern of the twenty-first century" (Gluyas, 2021). Investors must provide climate-proof to their portfolios, or risk missing out on potentially overlooked benefits offered by the global transition to a zero-carbon economy (Gluyas, 2021). Mercer (2015) describes that shareholders who actively pursue corporate investments are conscious of the significance of climate-related uncertainty and risks. Due to the threats connected with environmental issues having the potential to affect capital returns, shareholders are becoming more worried about the influence of environmental factors on company operations (Ko & Tai, 2019). Investors and regulators around the world are scrutinising climate disclosures, and top lawyers say company directors could be held liable for failing to understand and disclose climate risks, for failing to act on those risks once they are known, and for engaging in 'misleading or deceptive conduct' by selectively disclosing climate risks or declaring green goals without credible plans to achieve them (Roddan, 2021). Increased climate change disclosure by firms has repercussions for their brand, financial status, threats, efficiency, and the public.

The Task Force on Climate-Related Financial Disclosures (TCFD), with members from G20 group including both preparers and users of financial disclosure information, is widely regarded as the global standard for notifying shareholders about corporations' climate-related risks (Roddan, 2021). The TCFD has released model frameworks and recommendations on

climate-related financial disclosures, such as climate-related financial risk disclosure, since 2017 (Muldowney & Colquhoun, 2019). The TCFD also encourages investors and other users to engage with firms on the particular types of information that must be disclosed in order to make decisions (Christofidi & Rodrigues Pereira, 2019). The most current round of ASIC (Australian Securities and Investments Commission) surveillance revealed that a larger proportion of listed firms' voluntary adoption of TCFD reporting had noticeably enhanced climate-related governance and disclosure standards among Australian firms (ASIC, 2021). ASIC has also noticed a considerable and noteworthy increase in the level of participation and transparency on climate-related issues among major publicly traded firms (ASIC, 2021). The TCFD framework contains 11 items, which are separated into four categories: governance, strategy, risk management, and measurements and targets. It recommends firms to implement their reporting and disclosure for climate risks and opportunities (TCFD, 2021). In this study, the TCFD framework is employed as an objective tool to assess firm performance in climate change disclosure (*CCDP*).

Our sample comprises of 1,645 firm-years observations of non-financial companies listed on the Australian Stock Exchange (ASX). The relationship between *CCDP* and firm risk is investigated, as well as the potential moderating effects on this association. We find that *CCDP* is negatively related to firm risk, implying that firms that do well with climate change disclosure are subject to lower levels of firm risk. Furthermore, the negative association between *CCDP* and firm risk is amplified in firms with lower levels of institutional ownership, those employed external auditors with a shorter tenure, or those without disclosures and trends related to GHG emissions and certification. Our results are robust to other measures of climate change disclosure performance such as Thomson Reuters ESG scores, four sub-factors of the *CCDP* variable, and the PSM test

Our study provides considerable contributions to the literature. Firstly, using an innovative measure of firm performance in climate change disclosure, we document that there is a statistically significant negative relationship between *CCDP* and firm risk, indicating that businesses that substantially accept and disclose the financial and stakeholder consequences of climate change on their company are less likely to experience company risk. Our *CCDP* measure, which utilises the TCFD framework and guidelines to determine how far businesses are ready to go in disclosing global climate change information, offers a methodological addition to the field of environmental and climate disclosure. As opposed to previous research (Daromes, 2019; Saka & Oshika, 2014), our assessment of firm performance in climate change is more inclusive since it incorporates all components of the TCFD framework. Our study is in

response to the call of Hahn et al., (2015) for a comprehensive measurement of carbon disclosure. We also provide a comprehensive analysis of firm performance in climate change disclosure with other measures such as ESG scores reported in Thomson Reuters database, factor analysis of four sub-factors of the aggregate *CCDP* variable.

Secondly, this research uncovers new mechanisms that could influence the link between *CCDP* and firm risk. We show that the negative association of *CCDP* and firm risk is amplified by lower levels of institutional ownership, when firms employ shorter tenured external auditors, and when firms do not disclosure information related to greenhouse gas (GHG) emissions and certification. Thirdly, this study extends previous research on the causes of climatic change hazards and the disclosures of those concerns by looking at the link between *CCDP* and corporate risk. The results of our investigation show that *CCDP* consists of a collection of risk management rules and procedures that impact a wider range of investors. As a result of this connection, shareholders must be able to estimate risk premiums associated with the cost of capital and future cash flows and the probability and magnitude of firm risk. This study contributes to the body of knowledge regarding the impact of *CCDP* on financial risk management pertaining to climate change activities and disclosures because it includes elements such as carbon pricing, GHG emissions, energy, and how these aspects engage with a diverse stakeholder cohort. This is particularly essential because the fundamental operations of publicly traded firms in Australia are driven by sustainable and social and environmental performance measures.

The rest of our essay is organised as follows. An overview of Australia's current climate change regulatory framework is in the next section. Literature review and hypothesis development are presented in Section 3 with the sample and research methodology in Section 4. Section 5 discusses the empirical results with robust tests provided in Section 6. Finally, concluding remarks are provided in Section 7.

4.2 Literature Review and Hypothesis Development

4.2.1 Disclosure of Climate Change information

Climate change will have wide-ranging consequences for human society, and it can reduce the growth of the economy and raise the possibility of output, employment, and profitability problems (Rudebusch, 2021). It is considered as one of humanity's most important

challenges, and becoming a major emphasis in business and society (Nyberg et al., 2022). The Financial Stability Board recognised the importance of climate change reporting in 2015 when it established the TCFD to encourage and make recommendations for effective disclosure of climate change (Melloni, 2020). Businesses around the world are urged to be more transparent regarding the risks of climate-change by following the best practice recommendations of the worldwide TFCD (Siew, 2020). The Australian Accounting Standards Board (AASB) Practice Statement 2 'Making Materiality Judgements' (APS/PS2) mandates "material" risks reported while company preparing auditing its financial statements. In addition, climate-related risks should also be treated within the context of financial statements, considering the importance that investors place on such risks when making decisions (ASP/PS2). According to the AASB (2019), regulators, legislators, and shareholders are increasing pressure on businesses to acknowledge climate change risks and impacts. Moreover, other stakeholders, such as customers and the public, often demand more information about climate change risks (Kouloukoui et al., 2019). The threats involved with environmental issues and the influence they have on auditing procedures and operations must be recognised and assessed by auditors as a consequence (Li et al., 2019).

Prior literature (e.g. Borghei, 2021; Cowan & Deegan, 2011; He et al., 2021; Linnenluecke et al., 2015) has shown the impact of carbon disclosure on firm accounting and financial elements such as cost of equity capital (Bui et al., 2020), firm size (Eleftheriadis & Anagnostopoulou, 2015), firm financial performance and firm value (Alsaifi et al., 2020; Hardiyansah et al., 2021; Busch and Lewandowski, 2018; Saka & Oshika, 2014; Siddique et al., 2021; Busch et al., 2022; Delmas et al., 2015), and firm reputation (Daromes, 2019). In addition, Huynh et al. (2020) find that the drought risk significantly increases the cost of equity capital, and drought-impacted customers incur a higher loan spread (Do et al., 2021; Javadi and Masum, 2021). Lemma et al. (2021) show that, even with controlling the exposure of carbon risk, firms that participate in higher levels of commitment to climate change activities issue a higher proportion of debt with longer terms to maturity. Alsaifi et al. (2022) find that a firm's total, systematic, and idiosyncratic risks are lower with the disclosure of enhanced voluntary carbon. McLaughlin (2011) documents that carbon disclosure can assist investors in estimating a company's regulatory and natural risks related to climate change.

Previous research mainly emphasize on the disclosure of carbon emission, which is only one small element of the TCFD framework for the disclosure of firm climate change and environmental policies. Our study will a more comprehensive approach to the assessment of firm performance in climate change disclosure by incorporating all components of the full

TCFD recommendations which include firm's governance, strategy, risk management, and metrics and targets used to manage its climate-related risks and opportunities.

4.2.2 Firm Risk

Business risk can arise from either the internal or external environment, for instance, economic risk, compliance risks, risk of fraud, reputation risk, and risk of climate change (Korphaibool et al., 2021). The Sharpe–Lintner Capital Asset Pricing Model (CAPM), which integrates risk and asset returns, is commonly used to assess the risk and expected return relationship (Cao et al., 2008; Miller et al., 2002). Total risk, according to the CAPM, is made up of market risk (systematic risk) and firm-specific risk (unsystematic risk), with firm-specific risk being avoided by investment diversification but market risk being unavoidable for all investments (Benlemlih et al., 2018; Cai et al., 2016). Market risk refers to the danger that every firm in the market faces, such as the global economic crisis, whereas firm-specific risk can be influenced by an internal accident or a loss of sales due to publicly disclosed information (Brown & Kapadia, 2007; Cao et al., 2008). Firm-specific risk varies by firm and reflects the distinctiveness of each firm's management conducts (Ben-Zion & Shalit, 1975; Cao et al., 2008).

Prior research investigated the association between environmental and social performance and firm risk (Albuquerque et al., 2019; Cheng et al., 2014; Jo & Na, 2012; Liu & Lu, 2021; Rehman et al., 2020; Shakil, 2021). Several studies have found that environmental and social performance is negatively associated with firm risk (Chang et al., 2021; Cheng et al., 2014; Jo & Na, 2012; Liu & Lu, 2021; Rehman et al., 2020; Shakil, 2021). Hu et al. (2019) showed that disclosing corporate social responsibility has a substantial tendency to lower firm risk by mitigating information asymmetry and fraud. A study by Alsaifi et al. (2022) finds that firm’s total, systematic, and idiosyncratic risks are lower with the disclosure of enhanced voluntary carbon. Despite past research has suggested a relationship between a firm’s environmental and social performance and/or carbon disclosure and risk, previous studies have not focused on the relationship between firm performance in climate change disclosure and firm risk, nor neatly inspected the impacts of the TCFD frameworks and recommendations on firms’ operational risks.

4.2.3 Climate Change Disclosure Performance and Firm Risk

Under the perspectives of stakeholder theory and legitimacy theory (Benlemlih et al., 2018; Roberts, 1992; Schuman, 1995), firms that provide objectively environmental and social disclosures enhance corporate transparency, which can assist them to develop a favourable reputation and trust with their stakeholders and the soceity. Similarly, proponents of agency theory and instrumental stakeholder theory (Jones, 1995) argue that stakeholders prefer to deal with firms that are more transparent and are subject to less operational risk. There is evidence in prior research that corporate environmental and social activities have a negative association with firm risk (Benlemlih et al., 2018; Cai et al., 2016; Qiu et al., 2016; Rehman et al., 2020; Shakil, 2021).

Benlemlih et al. (2018) show a negative and significant link between environmental and social disclosures and a firm's overall and idiosyncratic risk through the firm's positive reputation and trust of stakeholders. Similarly, Cai et al. (2016) find that environmentally conscious businesses experience a lower level of firm risk. This negative relationship could be due to insurance-like protection, better risk management, customer appeal, improvement of information transparency, or easier access to financial markets. Qiu et al. (2016) report that firms that provide a detailed level of environmental and social disclosures have better anticipated cash flow growth rates and higher market values. Shakil (2021) demonstrates that firms with significant levels of environmental, social, and governance (ESG) performance are subject to lower total risk. Mohammad and Wasiuzzaman (2021) indicate that even with competitive advantage controlling, ESG disclosure enhances business performance with increasing ESG disclosure by one unit improves business performance by approximately 4%.

Liu and Lu (2021), and Rehman et al. (2020) argue that corporate social responsibility (CSR) significantly and positively impacts corporate reputation and performance but that it has a negative impact on firm risk. Jo and Na (2012) find that CSR engagement inversely affects firm risk. Jo and Na (2012) indicate that CSR benefits could come from a variety of sources, including increased shareholder wealth through insurance-like protection, greater risk management, market appeal to customers through a strategic approach, improved transparency, and easier access to the financial market. All or some of these criteria may help to lower the risk of firms. Cheng et al. (2014) indicate that firms that make more extensive CSR-related disclosures have reduced idiosyncratic capital limitations and better access to financing due to increased financial reporting and operational transparency.

As environmental and social disclosures can reduce firm risk through building a favourable reputation for a firm and in raising stakeholder confidence, shareholder wealth rises as a result of insurance-like protection, better risk management, and increased market attraction to customers (Cai et al., 2016; Jo & Na, 2012). Thus, considering this theoretical motive as well as the supporting evidence, the following directional hypothesis is developed:

H1: *CCDP is negatively associated with firm risk.*

4.2.4 The Moderating Role of Institutional Ownership

Institutional owners are more experienced in extracting material and stock-sensitive information from management (Balsam et al., 2002), and they become more successful in supervising and monitoring management's activities (Siregar & Utama, 2008). Large institutional owners, in general, have access to internal private information that is not available to all shareholders (El-Diftar et al., 2017). As a result of this privilege, institutional investors are less likely to make voluntary disclosures concerning social and environmental issues. Previous research suggests that institutional ownership and voluntary disclosure have a negative relationship (Juhmani, 2013; Samaha et al., 2012; Tsamenyi et al., 2007).

Acar et al. (2021) provide evidence that firms with a higher level of institutional ownership have a negative relationship with the extent of environmental disclosures. When institutional owners control a firm, firm management are less likely to make material disclosures (Bushee et al., 2004). One possible explanation for institutional owners' negative effect on environmental disclosure is their focus on firms' financial short-term interests rather than long-term sustainable growth. As a result, they are less likely to attend to the requirements of society and other stakeholders, and to justify their actions through voluntary disclosures in order to provide a positive signal to the market. Consequently, in line with legitimacy (Deegan et al., 2002) and stakeholder (Benlemlih et al., 2018) perspectives in which emphasize the importance of organisations to maintaining their activities within societal norms, institutional ownership and environmental disclosure are expected to have a negative relationship.

According to agency theorists, institutional investors with significant ownership holdings in a firm closely monitor management in order to protect their investment and to assure a satisfactory return (Monks & Minow, 1995; Shleifer & Vishny, 1997). However, Cheng et al. (2011) and Della Croce et al. (2011) document that institutional investors may be motivated by short-term profits and, as a result, encourage managers to engage in risk-taking

behaviour. Wright et al. (1996) and Hutchinson et al. (2015) show that these investors may persuade boards to take greater risks in order to obtain better returns. Callen and Fang (2013) find that transient institutional investor ownership can also put firm risk to an elevated level. Mathew et al., (2016) find that firms having institutional investors experience a higher level of firm risk.

In the absence of the monitoring by institutional investors, firms with stronger *CCDP* will reduce their operational risk because *CCDP* will constitute a key governance mechanism, which will likely reduce their firm-specific risk. Consequently, in the presence of low institutional ownership, *CCDP* as a governance mechanism, will be more effective in reducing firm risk. Based on the above discussion, the levels of institutional ownership will impact a firm's quality of disclosures, which may include, for instance, *CCDP* and its effect on firm risk. Thus, institutional ownership is likely to moderate the relationship between *CCDP* and firm risk. Consequently, the following hypothesis is developed:

H2: *Institutional ownership moderates the relationship between CCDP and firm risk.*

4.2.5 The Moderating Role of Auditor Tenure

The existence of qualified auditors within a firm can serve as an effective monitoring mechanism for management as well as a means of sending favourable signals to the market. Qualified auditors are also seen to be important in avoiding agency conflicts. Credible financial reporting from a qualified auditor can help improve management responsibility and serve as a useful tool for shareholders to monitor risk (Indarti & Widiatmoko, 2021). Prior research show that higher auditing quality will increase investors' trust in financial reporting and the opinion provided by external auditors (Alawaqleh et al., 2021). Investors are expected to value these firms for minimising information asymmetry and acting as a bonding mechanism, allowing for better managerial oversight (Houqe et al., 2017). Firms with strong governance and high performance will hire qualified auditors to protect their reputation and to demonstrate that they have nothing to hide.

If a firm is regarded as having low risk, investors will respond favourably to this condition and the required rate of return will be modest. As a result, the firm will have a lower cost of equity capital. Kurniawan and Daljono (2014) reveal that firms audited by Big4 public accounting firms have a lower cost of equity capital. This is because the quality of the audit increases the transparency of the firm's reporting and disclosure, allowing investors to judge

the risk of the firm as low, lowering the rate of return sought by investors. This result is confirmed by the findings of (Houqe et al., 2017), who found that audit quality can lower the cost of equity capital.

There is evidence in the literature that audit quality is improving with longer auditor tenure as auditors with extended tenure are more experienced and have better knowledge of their clients' business (Chen et al., 2008; Gosh and Moon, 2005; Myers et al., 2003; Wilson et al., 2018; Kyriakou & Dimitras, 2018). Similarly, Johnson et al. (2002) find that firms with shorter auditor tenure have larger and less persistent accruals, i.e. lower earnings quality. Mansi et al. (2004) find a negative relationship between the cost of debt and audit tenure, suggesting that bondholders perceive firm risk is lower in companies with extended auditor tenure.

As the auditor is an information repository pertaining to the firm, auditors with shorter tenure tend to be less familiar with the business environment of the client (Wilson et al., 2018), and the effectiveness of the audit quality or firm risk is consequently reduced (Chen et al., 2008; Gosh and Moon, 2005; Mansi et al., 2014). However, firm performance in climate change (*CCDP*) can act as a government mechanism that plays an important role in terms of reducing firm risk. As the level of audit quality is impacted by auditor tenure (Myers et al., 2003; 2015; Kyriakou & Dimitras, 2018), the levels of audit quality will impact a firm's disclosure quality, which may include, for instance, *CCDP* and its effect on firm risk. Thus, auditor tenure is likely to moderate the relationship between *CCDP* and firm risk. Consequently, the following hypothesis is developed:

H3: *Auditor tenure moderates the relationship between CCDP and firm risk.*

4.3 Methodology and Research Design

4.3.1 Data and Sample

We start our sample with the top 300 firms listed on the ASX over the period from 2008 to 2019. Financial and real estate firms (77 firms) and firms with missing data (11 firms) are initially excluded. Data on climate change disclosure and corporate governance has been manually collected from annual reports in Morningstar database. All financial data are obtained from Connect4 database, and audit data are acquired from Global Audit Analytic database. Our final sample contains 1,645 firm-year observations. It is presented in Table 4.1 that the materials industry sector is made of 29.96% of our sample, followed by firms in the consumer discretionary sector (21.27%), and in the industrial sector (14.40%).

Table 4.1: Firms by industry

ASX industry	No of firms	Observations	Percentage
Consumer Discretionary	40	350	21.27%
Consumer Staples	20	126	7.65%
Energy	16	112	6.80%
Health Care	21	156	9.48%
Industrials	29	237	14.40%
Information Technology	23	126	7.65%
Materials	51	493	29.96%
Utilities	6	32	1.94%
Telecommunication Services	6	13	0.79%
Total	212	1645	100.00%

This table shows the distribution of our sample according to industry. It includes firms listed on the Australian Stock Exchange (ASX) over the period 2008-2019.

4.3.2 Dependent Variable

Following prior literature (Khan & Bradbury, 2014; Bryan & Mason, 2020; Bryan et al., 2018; Dichev & Tang, 2009), we measure firm-specific risk by stock return volatility (*VOL_STK*) and firm-specific earnings volatility (*VOL_ERN)*. *VOL_STK* is defined as the standard deviation of firm yearly stock return over a rolling 5-year period (Alford & Boatsman, 1995). *VOL_ERN* is calculated as the standard deviation of earnings over a rolling 5-year period (Bryan & Mason, 2020; Dichev & Tang, 2009).

4.3.2.1 Independent Variable

Our first independent variable, firm performance in climate change disclosure (*CCDP*), is measured using the 11 items of the TCFD recommended disclosures[23] (Alshahrani et al. 2022). They are separated into four groups: governance (*GOV*), strategy (*STR*), risk management (*RM*), and metrics and targets (*MT*). There are two components in the governance (board oversight (*G1*) and management roles (*G2*) of climate-related risks and opportunities); three components in the strategy (climate risks and opportunities are identified according to short, medium and long term (*S1*), described in the business, strategy and financial planning (*S2*), and in the resilience of the organisation's strategy (*S3*)). Three sub-groups each are identified in the risk management (process for identifying and assessing climate-related risks (*R1*), for managing these risks (*R2*), and for integrating these risks into the organisation's overall risk management (*R3*)); and in metrics and targets (disclosing the metrics to assess climate-related risks and opportunities (*M1*), disclosing Scope 1, 2 and 3 of GHH emissions

[23] See: https://www.fsb-tcfd.org/wp-content/uploads/2019/06/2019-TCFD-Status-Report-FINAL-053119.pdf

(*M2*), and describing targets used to manage climate-related risks and opportunities (*M3*)). *CCDP* variable is measured as the average score of all 11 items disclosed in the *CCDP* index.

Following Mohammad & Wasiuzzaman (2021) and Siew et al. (2016), we adopt the environmental pillar of environmental, social and governance (ESG) scores which are reported in Thomson Reuters database as our second independent variable (*EP*). It is an indicator of companies' ESG performance, and based on 10 categories: resource use, emissions and innovation (environmental group); management, shareholders and corporate social responsibility (CSR) strategy (governance group); workforce, human rights, community and product responsibility (social group). Each firm is graded on a scale of 0 to 100 with higher score meaning a higher level of ESG. Environmental performance and environmental disclosure are increasingly important factors that can ultimately impact the competitive success of companies. Legitimacy theory implies that in order to exist, a corporation is required to be accountable to people, planet, and profit: triple bottom line reporting, or CSR reporting. Environmental accountability includes increasing public scrutiny relating to both a company's environmental performance and its disclosure of that performance (Lu et al., 2018). CCDP encapsulates the activities and outcomes pertaining to climate change on firms' performance. Many of the climate change impacts relate to the effect of climate change on the environment which may impact whether a firm is able to continue in or to expand into a particular jurisdiction. Environment impacts stemming from climate change are likely then to determine the effectiveness of operations, market share, competitiveness and hence the level of risk/distress a firm faces.

4.3.3 Moderation Variables

We adopt two variables to examine their moderating impact on the association between climate change disclosure performance and firm-specific risk. The first one is institutional ownership (*INST_OWN*), defined as an indicator variable equal to 1 if the firm institutional ownership is above the sample median, and 0 otherwise. The second moderating variable is auditor tenure (*AUD_TEN*), measured as an indicator variable equal to 1 if the firm auditor has his/her tenure higher than the sample median, and 0 otherwise.

4.3.4 Control Variables

Following the prior literature (Albuquerque et al., 2019; Benlemlih et al., 2018; Bhuiyan et al., 2020; Cai et al., 2016; Chen & Zheng, 2014; Guenther et al., 2017; Jo & Na, 2012), a number of control variables are used in our analysis. Firm size (*SIZE*), measured as the natural logarithm of firm total assets, is expected to negatively related relationship to firm risk (Benlemlih et al., 2018; Cai et al., 2016). Market-to-book ratio (*MTB*), calculated as the ratio of the market value and the book value of firm equity, and firm leverage (*LEV*), measured as the long-term debt divided by the total assets, are also controlled for. In addition to firm loss (*LOSS*), a binary variable for negative net income, we also control for the return on assets (*ROA*) which is measured as the net income divided by the total assets, the quick ratio (*QUICK*) which is calculated as the cash and receivables scaled by the current liabilities, and cash holding (*CASH*) which is defined as cash and marketable securities scaled by the total assets. Operating cash flows ratio (*OCFR*) which is measured as the operating cash flows divided by the total assets, capital expenditure expenses ratio (*CAPXR*) which is measured as capital expenditure expenses divided by total assets, CEO tenure (*CEO_TEN*) which is measured as the number of years since the CEO started working at the company, expressed in natural logarithm, the risk committee independence (*RC_IND*), an indicator variable equal to 1 when the firm has an independent risk committee and 0 otherwise, and firm age (*AGE*) are controlled in our regression. Appendix 3.A defines all the variables used in the study.

4.3.5 Regression Model

The following OLS regression model, which controls for year and industry fixed effects, is used to test our first hypothesis (H1):

$$FIRM\_RISK_{i,t} = \gamma_0 + \gamma_1 CCDP_{i,t} + \gamma_2\, SIZE_{i,t} + \gamma_3\, MTB_{i,t} + \gamma_4\, LEV_{i,t} + \gamma_5\, LOSS_{i,t} + \gamma_6\, ROA_{i,t} + \gamma_7 QUICK_{i,t} + \gamma_8\, CASH_{i,t} + \gamma_9\, OCFR_{i,t} + \gamma_{10} CAPXR_{i,t} + +\gamma_{11}\, CEO\_TEN_{i,t} + \gamma_{12} RC\_IND_{i,t} + \gamma_{13} AGE_{i,t} + Year\ Dummies + \ Ind\ Dummies + e_{i,t} \quad (1)$$

We run equation (1) independently for the two subsamples for each of the moderation variables to test the other hypotheses (H2, H3). The two subsamples are based on whether the firms appear to be above or below the median value of institutional ownership and of auditor tenure.

4.4 Results

4.4.1 Descriptive Statistics

Table 4.2 reports the descriptive statistics of all variables included in this study. The average values of the dependent variable firm risk for each of the two different measures *VOL_ERN* and *VOL_STK* are 0.19 and 0.06, respectively. The mean value of the independent variable, climate change disclosure performance (*CCDP*), is 0.20, and those of its other four attributes, which are governance (*GOV*), strategy *(STR*), risk management (*RM*), and metrics and targets (*MT*), are 0.23, 0.11, 0.22, and 0.26, respectively. The average value of environmental pillar of Thomson Reuters ESG scores (*EP)* is 0.17. The means of the moderator variables, institutional ownership (*INST_OWN*) and auditor tenure (*AUD_TEN*), are 0.54 and 0.50, respectively, which indicates that almost half of the firms in the sample have higher institutional ownership and longer auditor tenure. The average values for the control variables are as follows: firm size (*SIZE*) of 6.80 in natural logarithm which is almost equal to $982 million; firm market value scaled by book value (*MTB*) of 1.79; firm leverage (*LEV*) of 0.21; firm loss (*LOSS*) of 0.12; return on assets (*ROA*) of 0.03; quick ratio (*QUICK*) of 0.42; cash holding (*CASH*) of 0.14; operating cash flows ratio (*OCFR*) of 0.09; capital expenditure expenses ratio (*CAPXR*) of 0.06; CEO tenure (*CEO_TEN*) of 1.42 in natural logarithm which is almost equal to 5.54 years; the risk committee independence (*RC_IND*) of 0.73 which means 73% of them have established a risk committee; and firm age (*AGE*) of 2.54 years.

Table 4.2: Descriptive Statistics

Variable	N	Mean	S.D.	.25th	Median	.75th	skewness	kurtosis
VOL_ERN	1645	0.19	0.35	0.00	0.10	0.21	0.00	0.00
VOL_STK	1645	0.06	0.09	0.02	0.03	0.07	0.00	0.00

CCDP	1645	0.20	0.27	0.00	0.09	0.27	0.00	0.00
GOV	1645	0.23	0.36	0.00	0.00	0.50	0.00	0.00
STR	1645	0.11	0.27	0.00	0.00	0.00	0.00	0.02
RM	1645	0.22	0.33	0.00	0.00	0.33	0.00	0.00
MT	1645	0.26	0.32	0.00	0.33	0.33	0.00	0.02
EP	1645	0.17	0.25	0.00	0.00	0.31	0.00	0.00
INST_OWN	1645	0.54	0.50	0.00	1.00	1.00	0.00	0.00
AUD_TEN	1645	0.50	0.50	0.00	0.00	1.00	0.00	0.00
SIZE	1645	6.80	1.88	5.62	6.85	8.23	0.00	0.11
MTB	1645	1.79	2.01	0.64	1.08	2.02	0.00	0.00
LEV	1645	0.21	0.14	0.10	0.18	0.28	0.00	0.00
LOSS	1645	0.12	0.32	0.00	0.00	0.00	0.00	0.00
ROA	1645	0.03	0.51	0.01	0.05	0.10	0.00	0.00
QUICK	1645	0.42	2.02	-0.18	-0.02	0.19	0.00	0.00
CASH	1645	0.14	0.17	0.03	0.08	0.19	0.00	0.00
OCFR	1645	0.09	0.38	0.05	0.09	0.15	0.00	0.00
CAPXR	1645	0.06	0.07	0.02	0.04	0.08	0.00	0.00
CEO_TEN	1645	1.42	0.80	0.69	1.39	2.08	0.00	0.00
RC_IND	1645	0.73	0.44	0.00	1.00	1.00	0.00	0.00
AGE	1645	2.54	0.95	1.95	2.56	3.18	0.00	0.11

This table presents the descriptive statistics for all variables that are used in subsequent analyses. Variable definitions are in Appendix 4.A.

4.4.2 Correlation Analysis

Table 4.3 presents the Pearson's correlation matrix among the variables used in this study. It shows a significant negative association between climate change disclosure performance (*CCDP*) and earnings volatility (*VOL_ERN*) and a significant negative association between *CCDP* and stock return volatility (*VOL_STK)* all at $p < 0.01$, indicating that higher firm performance in climate change disclosure significantly associated with firm risk, which supports H1. Moreover, the control variables mostly have a significant correlation with the dependent variable.

Table 4.3: Pearson's correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) VOL_ERN	1														
(2) VOL_STK	0.09***	1													
(3) CCDP	-0.10***	0.48***	1												
(4) SIZE	-0.23***	0.60***	0.52***	1											
(5) MTB	0.01	-0.16***	-0.18***	-0.40***	1										
(6) LEV	-0.03	-0.08***	-0.09***	-0.04**	0	1									
(7) LOSS	0.24***	-0.21***	-0.18***	-0.50***	0.15***	-0.19***	1								
(8) ROA	-0.05**	0.05**	0.04*	0.21***	-0.05**	-0.04*	-0.28***	1							
(9) QUICK	0.27***	-0.15***	-0.12***	-0.40***	0.22***	-0.31***	0.48***	-0.11***	1						
(10) CASH	0.16***	-0.24***	-0.22***	-0.55***	0.49***	-0.09***	0.44***	-0.19***	0.66***	1					
(11) CFO	-0.05**	0.06***	0.04*	0.19***	-0.01	0	-0.28***	0.91***	-0.14***	-0.19***	1				
(12) CAPX	0.16***	0.01	-0.01	-0.12***	-0.02	-0.19***	0.30***	-0.16***	0.17***	0.09***	0	1			
(13) CEO_TEN	-0.19***	-0.03	0.06***	0.08***	0.05**	0.02	-0.11***	0.05**	-0.06***	0	0.04*	-0.09***	1		
(14) RC_IND	-0.12***	0.08***	0.19***	0.30***	-0.05**	0.03	-0.22***	0.06***	-0.22***	-0.25***	0.06***	-0.18***	-0.02	1	
(15) AGE	-0.38***	0.32***	0.21***	0.39***	-0.11***	-0.02	-0.18***	0.08***	-0.19***	-0.17***	0.10***	-0.03	0.28***	0.02	1

This table presents correlation coefficients among variables used in subsequent analyses. Variable definitions are in Appendix 4.A. ***, **, and * indicate significant levels at 1%, 5% and 10%, respectively.

4.4.3 Regression Analysis

4.4.3.1 CCDP and Firm Risk

Table 4.4 (Model 1 and 2) presents the regression results regarding the relationship between firm performance in climate change disclosure (*CCDP*) and firm risk (*VOL_ERN* and *VOL_STK*). We find that the coefficients of *CCDP* variables are significantly negative in both measures of firm risk (*VOL_ERN* and *VOL_STK*) at $p<0.10$, implying that a higher level of climate change disclosure performance significantly reduces firm risk. These results are supported by stakeholder theory which argues that companies providing unbiased environmental and social disclosures increase corporate transparency, and it in turn can help them to build a good reputation and stakeholder confidence (Benlemlih et al, 2018). Additionally, agency theory and instrumental stakeholder theory claim that stakeholders favour doing business with companies that are more transparent and have less operational risk (Jones, 1995). Our result is consistent with those of previous studies which have found that environmental and social performance is negatively associated with firm risk (Chang et al., 2021; Cheng et al., 2014; Jo & Na, 2012; Liu & Lu, 2021; Rehman et al., 2020; Shakil, 2021). In terms of economic significance of our results, based on Model 1 in Table 4.4, one unit increase in firm climate change disclosure performance (*CCDP)* will lead to a decrease in its earnings volatility (*VOL_ERN*) by 17.3%, and in its stock return volatility (*VOL_STK)* by 5.8%.

For control variables, our results are mostly consistent with those of previous studies (Benlemlih et al., 2018; Cai et al., 2016; Jo & Na, 2012). There is a significantly negative relationship at $p<0.10$ between firm size (*SIZE*) and the two measures of firm risk (*VOL_ERN* and *VOL_STK*). Moreover, the coefficient of the *MTB* variable is significantly negative at $p<0.05$ for both measures of firm risk. The coefficients of quick ratio (*QUICK*) and CEO tenure (*CEO_TEN*) are significantly positive ($p<0.01$) for the *VOL_ERN* measurement of firm risk. The coefficient of firm cash holding (*CASH*) is significantly negative ($p<0.05$) for the *VOL_ERN* measurement of firm risk. The coefficient of firm age (*AGE*) is significantly negative ($p<0.01$) for the earnings volatility (*VOL_ERN*) and significantly positive ($p<0.10$) for the stock return volatility (*VOL_STK*).

We replace the independent variable, climate change disclosure performance (*CCDP*), by ESG scores reported in Thomson Reuters database (*EP*) and report the results in Models 3

and 4 in Table 4.4. Similar results are found with the coefficient of *EP* variable being significantly negative for *VOL_ERN* but not significant for *VOL_STK*, suggesting that firms with higher ESG scores have a lower level of earnings volatility. Our results are robust to a different measure of firm performance in climate change disclosure.

Table 4.4: The relationship between CCDP (or EP) and firm risk (H4.1)

	Model 1	**Model 2**	**Model 3**	**Model 4**
	VOL_ERN	VOL_STK	VOL_ERN	VOL_STK
CCDP	**-0.073***	**-0.058****		
	(-1.71)	**(-2.36)**		
EP			**-0.253*****	**0.019**
			(-3.02)	**(0.73)**
SIZE	-0.036*	-0.028***	-0.036*	-0.027***
	(-1.88)	(-3.15)	(-1.84)	(-3.11)
MTB	-0.016**	-0.009**	-0.016**	-0.008**
	(-2.06)	(-2.29)	(-2.05)	(-2.12)
LEV	0.065	-0.101	0.073	-0.102
	(0.55)	(-1.59)	(0.62)	(-1.61)
LOSS	-0.006	0.017	-0.007	0.018
	(-0.18)	(0.77)	(-0.24)	(0.81)
ROA	0.016	-0.035	0.017	-0.035
	(0.24)	(-0.38)	(0.26)	(-0.38)
QUICK	0.023***	-0.006	0.024***	-0.006
	(3.12)	(-0.89)	(3.18)	(-0.89)
CASH	-0.246**	0.024	-0.242**	0.025
	(-2.44)	(0.33)	(-2.41)	(0.35)
OCFR	-0.094	0.038	-0.101	0.034
	(-0.90)	(0.45)	(-0.97)	(0.41)
CAPX	0.097	-0.119	0.093	-0.115
	(0.55)	(-1.01)	(0.53)	(-0.97)
CEO_TEN	0.025***	0.001	0.027***	0.000
	(2.71)	(0.21)	(2.88)	(0.04)
RC_IND	-0.012	-0.018	-0.017	-0.018
	(-0.50)	(-1.32)	(-0.72)	(-1.35)
AGE	-0.578***	0.056*	-0.570***	0.056*
	(-11.68)	(1.93)	(-11.51)	(1.91)
Constant	1.725***	0.209***	1.720***	0.197***
	(9.72)	(3.90)	(9.78)	(3.77)
Observations	1,645	1,645	1,645	1,645
Adj. R^2	0.634	0.546	0.636	0.545
Year FE	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES

This table reports results of the relationship between *CCDP* (or *EP*) and firm risk. A negative coefficient of *CCDP* (or *EP*) signifies that higher firm performance of climate change disclosure (or higher ESG scores) reduces its firm-specific risk. All variables are defined in Appendix 4.A. Robust *t*-statistics are in parentheses. ***, **, and * indicate significant levels at 1%, 5% and 10%, respectively.

4.4.3.2 The Moderating Role of Institutional Ownership

In order to examine the impact of institutional ownership on the association of climate change disclosure performance (*CCDP*) and firm risk (H2), we split the original sample into two groups: firms with institutional ownership higher than the sample median (Group 1) and firms with institutional ownership lower than the sample median (Group 0). Model 1 and 2 of Table 4.5 show that the coefficient of *CCDP* variable is only significantly negative (at $p<0.10$) for both measures of firm risk (*VOL_ERN* and *VOL_STK*) only in firms having institutional ownership lower than its sample median. Similar results are observed for earnings volatility (Model 3 of Table 4.5) when changing climate change disclosure performance (*CCDP*) variable to ESG scores (*EP*). Our results indicate that the association of firm performance in climate change disclosure (*CCDP*) and its firm risk is significant in firms with a lower level of institutional ownership because *CCDP* is a crucial governance instrument that reduce volatility in earnings and stock return. Firms with a higher level of climate change performance disclosure will help to minimise their firm-specific risk in the absence of increased institutional investor monitoring. Our regression results are consistent with Acar et al. (2021) who find that firms with a higher level of institutional ownership have a negative impact on environmental disclosures.

Table 4.5: The moderating impact of institutional ownership on the association of CCDP (or EP) and firm risk (H4.2)

	Model 1		Model 2		Model 3		Model 4	
VARIABLES	VOL_ERN		VOL_STK		VOL_ERN		VOL_STK	
	1	0	1	0	1	0	1	0
CCDP	**-0.071**	**-0.168****	**-0.004**	**-0.115***				
	(-1.20)	**(-2.04)**	**(-0.33)**	**(-1.89)**				
EP					**-0.213**	**-0.350*****	**0.038**	**0.017**
					(-1.55)	**(-3.41)**	**(1.62)**	**(0.36)**
SIZE	-0.060**	-0.016	-0.027***	-0.024*	-0.058**	-0.015	-0.027***	-0.023
	(-2.06)	(-0.56)	(-2.99)	(-1.67)	(-2.02)	(-0.52)	(-2.98)	(-1.63)
MTB	-0.003	-0.031***	-0.011***	-0.012*	-0.003	-0.030**	-0.011***	-0.010*
	(-0.28)	(-2.61)	(-3.35)	(-1.92)	(-0.25)	(-2.52)	(-3.35)	(-1.68)
LEV	0.065	0.156	-0.018	-0.184*	0.060	0.181	-0.018	-0.181*
	(0.58)	(0.89)	(-0.48)	(-1.79)	(0.55)	(1.04)	(-0.48)	(-1.77)
LOSS	0.047	-0.041	0.017	0.030	0.042	-0.040	0.018	0.032
	(0.99)	(-0.91)	(0.66)	(1.04)	(0.91)	(-0.89)	(0.67)	(1.14)
ROA	0.116	-0.046	0.083*	-0.036	0.124	-0.049	0.081*	-0.034
	(0.96)	(-0.46)	(1.82)	(-0.27)	(1.03)	(-0.49)	(1.79)	(-0.25)
QUICK	-0.005	0.029***	0.002	-0.008	-0.004	0.029***	0.002	-0.008
	(-0.58)	(3.08)	(0.88)	(-0.89)	(-0.47)	(3.10)	(0.81)	(-0.88)
CASH	-0.113	-0.325**	0.010	0.006	-0.115	-0.309**	0.013	0.009
	(-1.09)	(-2.12)	(0.27)	(0.05)	(-1.12)	(-2.02)	(0.34)	(0.08)
OCFR	0.016	-0.161	-0.021	0.059	0.001	-0.156	-0.021	0.054
	(0.09)	(-1.15)	(-0.39)	(0.45)	(0.01)	(-1.11)	(-0.38)	(0.41)
CAPX	-0.043	0.151	-0.084	-0.136	-0.024	0.129	-0.087	-0.130
	(-0.20)	(0.63)	(-0.77)	(-0.89)	(-0.11)	(0.53)	(-0.79)	(-0.84)
CEO_TEN	0.026**	0.025	-0.001	0.001	0.027**	0.027*	-0.001	0.000
	(2.50)	(1.60)	(-0.34)	(0.17)	(2.57)	(1.74)	(-0.39)	(0.05)
RC_IND	-0.020	-0.043	-0.040**	0.001	-0.026	-0.045	-0.039**	-0.000
	(-0.58)	(-1.12)	(-2.29)	(0.05)	(-0.74)	(-1.18)	(-2.25)	(-0.01)
AGE	-0.519***	-0.664***	0.000	0.093	-0.504***	-0.663***	-0.003	0.095
	(-7.97)	(-8.06)	(0.01)	(1.47)	(-7.74)	(-8.11)	(-0.24)	(1.50)
Constant	1.687***	1.878***	0.298***	0.137	1.651***	1.882***	0.300***	0.112
	(6.22)	(7.57)	(3.79)	(1.43)	(6.28)	(7.63)	(3.79)	(1.20)
Observations	810	835	810	835	810	835	810	835
Adj. R^2	0.699	0.639	0.595	0.531	0.700	0.640	0.597	0.529
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES

This table reports results of the moderating impact of institutional ownership on the relationship between *CCDP* (or *EP*) and firm risk. A negative coefficient of *CCDP* (or *EP*) signifies that higher firm performance in climate change disclosure (or higher ESG scores) reduces its firm-specific risk. All variables are defined in Appendix 4.A. The full sample is partitioned into two groups, with 1 indicating the subsample of institutional ownership above its median and 0 for below its median. Robust *t*-statistics are in parentheses. ***, **, and * indicate significant levels at 1%, 5% and 10%, respectively.

4.4.3.3 The Moderating Role of Auditor Tenure

To investigate the influence of auditor tenure on the relationship between climate change disclosure performance (*CCDP*) and firm risk (H3), we partition the full sample into two groups: firms having auditors with tenure higher than its sample median (Group 1) and firms having auditors with tenure lower than its sample median (Group 0). The regression results for each of the groups are presented in Table 4.6. It is found that the coefficients of climate change performance disclosure (*CCDP*) and ESG scores (*EP*) are significantly negative (at $p<0.10$) for both measures of firm risk (*VOL_ERN* and *VOL_STK*) only in firms with auditor tenure below the sample median. Our results indicate that the negative association of firm performance in climate change disclosure (or its ESG scores) and firm risk is only significant in firms with shorter auditor tenure which is linked to lower audit quality. In those firms, firm performance in climate change disclosure tends to be a significant government instrument that plays a crucial role in decreasing its firm-specific risk amid lower audit quality. These regression results are consistent with previous studies which indicate that the audit quality or firm risk is lower in firms with shorter auditor tenure (Chen et al., 2008; Gosh and Moon, 2005; Mansi et al, 2004).

Table 4.6: The moderating impact of auditor tenure on the association of CCDP (or EP) and firm risk (H4.3)

	Model 1		Model 2		Model 3		Model 4	
VARIABLES	VOL_ERN		VOL_STK		VOL_ERN		VOL_STK	
	1	0	1	0	1	0	1	0
CCDP	**0.008**	**-0.214****	**0.015**	**-0.096***				
	(0.38)	**(-1.98)**	**(1.33)**	**(-1.92)**				
EP					**-0.062**	**-0.612*****	**0.030**	**-0.087***
					(-1.29)	**(-3.31)**	**(1.24)**	**(-1.72)**
SIZE	-0.027***	-0.036	-0.005	-0.021*	-0.026***	-0.042	-0.006	-0.022*
	(-3.09)	(-1.18)	(-0.91)	(-1.66)	(-2.92)	(-1.37)	(-1.14)	(-1.71)
MTB	-0.001	-0.036***	-0.001	-0.010*	-0.001	-0.038***	-0.002	-0.010*
	(-0.49)	(-2.66)	(-0.62)	(-1.89)	(-0.46)	(-2.79)	(-0.69)	(-1.78)
LEV	0.019	0.204	-0.011	-0.155	0.027	0.217	-0.012	-0.147
	(0.42)	(1.01)	(-0.43)	(-1.52)	(0.61)	(1.07)	(-0.47)	(-1.47)
LOSS	0.017	-0.010	-0.018*	-0.010	0.017	-0.018	-0.018*	-0.010
	(1.33)	(-0.18)	(-1.74)	(-0.41)	(1.31)	(-0.34)	(-1.74)	(-0.39)
ROA	0.035	-0.043	-0.027	-0.120	0.036	-0.032	-0.025	-0.116
	(1.30)	(-0.42)	(-0.93)	(-0.85)	(1.35)	(-0.31)	(-0.89)	(-0.83)
QUICK	-0.004	0.030***	-0.001	-0.005	-0.004	0.032***	-0.000	-0.005
	(-1.33)	(3.12)	(-0.38)	(-0.63)	(-1.40)	(3.38)	(-0.24)	(-0.57)
CASH	0.022	-0.356**	-0.042	0.029	0.022	-0.338**	-0.045	0.033
	(0.50)	(-2.33)	(-1.12)	(0.30)	(0.50)	(-2.22)	(-1.18)	(0.33)
OCFR	-0.015	-0.119	0.101**	-0.008	-0.013	-0.127	0.102**	-0.011
	(-0.29)	(-0.81)	(2.34)	(-0.08)	(-0.25)	(-0.87)	(2.37)	(-0.11)
CAPX	-0.179**	0.094	-0.112	-0.118	-0.187**	0.136	-0.104	-0.105
	(-2.46)	(0.36)	(-1.64)	(-0.64)	(-2.52)	(0.52)	(-1.57)	(-0.58)
CEO_TEN	-0.002	0.066***	0.004	0.002	-0.001	0.066***	0.004	0.001
	(-0.42)	(2.87)	(1.38)	(0.19)	(-0.22)	(2.93)	(1.37)	(0.15)
RC_IND	0.001	-0.039	-0.005	-0.035**	0.001	-0.062	-0.005	-0.038**
	(0.13)	(-0.68)	(-0.86)	(-2.01)	(0.12)	(-1.07)	(-0.77)	(-2.13)
AGE	0.069	-0.730***	-0.020	0.079*	0.065	-0.706***	-0.020	0.085**
	(1.56)	(-10.56)	(-0.70)	(1.94)	(1.48)	(-10.06)	(-0.71)	(1.99)
Constant	0.146	1.696***	0.149*	0.207***	0.155	1.701***	0.154*	0.195***
	(1.13)	(7.52)	(1.79)	(3.16)	(1.20)	(7.70)	(1.87)	(3.06)
Observations	759	886	759	886	759	886	759	886
Adj. R^2	0.743	0.615	0.691	0.557	0.744	0.620	0.692	0.556
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES

This table reports results of the moderating impact of auditor tenure on the relationship between *CCDP* (or *EP*) and firm risk. A negative coefficient of *CCDP* (or *EP*) signifies that higher firm performance in climate change disclosure (or higher ESG scores) reduces its firm-specific risk. All variables are defined in Appendix 4.A. The full sample is partitioned into two groups with 1 indicating the subsample of auditor tenure above its median and 0 for below its median. Robust *t*-statistics are in parentheses. ***, **, and * indicate significant levels at 1%, 5% and 10%, respectively.

4.5 Additional Analysis

4.5.1 Alternative measure of *CCDP*

Our previous analyses use the climate change disclosure performance variable (*CCDP*) as the average score of 11 items recommended by the TCFD. They are made of 4 groups: governance (*GOV*), strategy (*STR*), risk management (*RM*), and metrics and targets (*MT*). In this section, we run factor analyses of those four different attributes (*GOV, STR, RM,* and *MT)* separately. The purpose of factor analysis is to find commonalities or factors that underpin our measure of the *CCDP* indicator (Al-Hadi et al., 2016; Tao & Hutchinson, 2013). Following Bushman et al. (2004), we keep factors with eigenvalues greater than 1 and detect one factor for each group. The factors are then rotated using the promax rotation approach to clarify their interpretation (Bushman et al., 2004). The results of factor analyses are presented in Table 4.7A with four different panels for each of the attributes.

Panel 4.7A.1 presents the factor analysis of two disclosed items (*G1* and *G2*) of corporate governance attribute (*GOV_Factor*). The eigenvalue of the *GOV_Factor* captures 73% of the variations in the characteristics of corporate governance, indicating a high level of representativeness of *GOV_Factor*. Similar results are observed for the factor analyses of strategy (*STR_Factor*) in Panel 4.7A.2, of risk management (*RM_Factor*) in Panel 4.7A.3, and of metrics and targets (*MT_Factor*) in Panel 4.7A.4. It shows that commonalities with factor loading of 75% for strategy (*STR_Factor*), 70% for risk management (*RM_Factor*), and 64% for metrics and targets (*MT_Factor*). Our results reveal that the factor analyses capture a high level of commonalities among the characteristics of *GOV, STR, RM,* and *MT*.

We then replace the independent variable *CCDP* in Table 4.4 (Model 1 and 2) by each of the four factors and present the regression results of testing the relationship between the four sub-factors of climate change disclosure performance (*GOV_Factor, STR_Factor, RM_Factor,* and *MT_Factor*) and firm risk (*VOL_ERN* and *VOL_STK*) in Table 4.7B. It is found that the coefficients of three sub-factors of governance (*GOV_Factor*), risk management (*RM_Factor*), and metrics and targets (*MT_Factor*) are significantly negative at $p<0.05$. These results indicate that firms with a high level of climate change disclosure in governance, risk management, and metrics and targets have lower firm risk. Our results in Table 4.7B are robust to those reported in Table 4.4 (Model 1 and 2).

Table 4.7A: Factor analysis

Panel 4.7A.1 – Factor analysis for corporate governance (GOV)

Factor	Eigenvalue	Difference	Proportion	Cumulative
GOV1	1.4653	0.9305	0.7326	0.7326
GOV2	0.5348	.	0.2674	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
GOV_Factor	1.4653	0.7326		

Panel 4.7A.2 – Factor analysis for strategy (STR)

Factor	Eigenvalue	Difference	Proportion	Cumulative
STR1	2.2630	1.7887	0.7543	0.7543
SRT2	0.4744	0.2118	0.1581	0.9125
SRT3	0.2626	.	0.0875	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
STR_Factor	2.2630	0.7543		

Panel 4.7A.3 – Factor analysis for risk management (RM)

Factor	Eigenvalue	Difference	Proportion	Cumulative
RM1	2.1016	1.4407	0.7005	0.7005
RM2	0.6609	0.4235	0.2203	0.9209
RM3	0.2374	.	0.0791	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
RM_Factor	2.1016	0.7005		

Panel 4.7A.4 – Factor analysis for metrics and targets (MT)

Factor	Eigenvalue	Difference	Proportion	Cumulative
MT1	1.9169	1.2294	0.6390	0.6390
MT2	0.6875	0.2919	0.2292	0.8681
MT3	0.3956	.	0.1319	1.0000
Rotation: Promax				
Factor	Variance	Proportion		
MT_Factor	1.9169	0.6390		

This table reports the factor analysis of the four components of firm performance in climate change disclosure (*CCDP*).

Table 4.7B: Additional test - the association between four sub-factors of CCDP and firm risk.

VARIABLE	Model 1				Model 2			
	VOL_ERN				VOL_STK			
GOV_Factor	**-0.016**				**-0.047****			
	(-0.58)				**(-2.48)**			
STR_Factor		**-0.045**				**-0.002**		
		(-1.53)				**(-0.16)**		
RM_Factor			**-0.067****				**-0.040****	
			(-2.22)				**(-2.43)**	
MT_Factor				**-0.032**				**-0.038*****
				(-0.93)				**(-2.79)**
SIZE	-0.036*	-0.036*	-0.036*	-0.036*	-0.028***	-0.027***	-0.027***	-0.027***
	(-1.86)	(-1.88)	(-1.85)	(-1.86)	(-3.17)	(-3.10)	(-3.12)	(-3.14)
MTB	-0.016**	-0.016**	-0.016**	-0.016**	-0.009**	-0.008**	-0.009**	-0.008**
	(-2.00)	(-2.05)	(-2.05)	(-2.01)	(-2.34)	(-2.12)	(-2.22)	(-2.20)
LEV	0.065	0.067	0.064	0.065	-0.101	-0.101	-0.102	-0.101
	(0.55)	(0.56)	(0.54)	(0.55)	(-1.59)	(-1.59)	(-1.60)	(-1.59)
LOSS	-0.005	-0.005	-0.006	-0.005	0.017	0.018	0.017	0.018
	(-0.16)	(-0.16)	(-0.19)	(-0.16)	(0.75)	(0.80)	(0.77)	(0.79)
ROA	0.016	0.016	0.015	0.017	-0.036	-0.035	-0.036	-0.034
	(0.24)	(0.25)	(0.23)	(0.26)	(-0.39)	(-0.38)	(-0.38)	(-0.37)
QUICK	0.024***	0.023***	0.023***	0.024***	-0.006	-0.006	-0.006	-0.006
	(3.13)	(3.11)	(3.12)	(3.12)	(-0.89)	(-0.89)	(-0.89)	(-0.89)
CASH	-0.245**	-0.243**	-0.247**	-0.244**	0.022	0.025	0.023	0.025
	(-2.45)	(-2.42)	(-2.46)	(-2.43)	(0.31)	(0.35)	(0.32)	(0.35)
OCFR	-0.096	-0.096	-0.093	-0.098	0.040	0.034	0.038	0.035
	(-0.93)	(-0.93)	(-0.89)	(-0.95)	(0.48)	(0.41)	(0.45)	(0.41)
CAPX	0.100	0.098	0.091	0.105	-0.121	-0.116	-0.122	-0.112
	(0.57)	(0.55)	(0.52)	(0.60)	(-1.02)	(-0.98)	(-1.03)	(-0.95)
CEO_TEN	0.025***	0.025***	0.026***	0.025***	0.000	0.000	0.001	0.001
	(2.64)	(2.70)	(2.74)	(2.64)	(0.11)	(0.08)	(0.21)	(0.12)
RC_IND	-0.013	-0.013	-0.012	-0.013	-0.017	-0.018	-0.017	-0.018
	(-0.51)	(-0.54)	(-0.48)	(-0.53)	(-1.27)	(-1.38)	(-1.31)	(-1.37)
AGE	-0.576***	-0.578***	-0.579***	-0.576***	0.057**	0.056*	0.055*	0.057**
	(-11.63)	(-11.67)	(-11.73)	(-11.62)	(1.97)	(1.95)	(1.91)	(1.97)
Constant	1.714***	1.721***	1.723***	1.716***	0.208***	0.199***	0.205***	0.205***
	(9.69)	(9.70)	(9.75)	(9.68)	(3.90)	(3.69)	(3.86)	(3.88)
Observations	1645	1645	1645	1645	1645	1645	1645	1645
Adjusted	0.633	0.633	0.634	0.633	0.546	0.545	0.546	0.545
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES

This table reports results of the impact of the CCDP four sub-factors on firm risk. A negative coefficient of *GOV* (or *STR/RM/MT*) signifies that higher firm performance in sub-components of climate change disclosure reduces its firm-specific risk. All variables are defined in Appendix 4.A. Robust *t*-statistics are in parentheses. ***, **, and * indicate significant levels at 1%, 5% and 10%, respectively.

4.5.2 Propensity Score Matching

We use the PSM technique to address endogeneity concerns and provide further robust evidence for our main results in Table 4.4. This technique is used to control observed disparities in qualities between firms with high and low level of climate change disclosure performance (*CCDP*) and/or ESG scores (*EP*). To isolate the impact of *CCDP* (or *EP*) on firm risk, we use PSM on a matched sample with similar firm features. Each firm with a high *CCDP* (or *EP*) score (above the median) is matched with a firm with a low *CCDP* (or *EP*) score based on a propensity score produced using a probit regression that estimates the likelihood that a firm has a high *CCDP* (or *EP*) score. The dependent variable in this probit model is the indicator of *CCDP* (or *EP*) which takes the value of 1 if the firm's *CCDP* (or *EP)* score is higher than the sample median, and 0 otherwise. All control variables from the original regression model (1) are used as explanatory variables in the probit model. The closest neighbour matching approach with a maximum distance of 1% is adopted to match any firm with a high *CCDP* (or *EP*) score (treatment firm) to a firm with a low *CCDP* (or *EP*) score (control firm) without replacement. Using the PSM approach, a matched sample of 1,627 firm-year observations is obtained.

Panel A of Table 4.8 shows that there is no significant difference in explanatory variables between our treatment and control firms. The regression results of our matched sample are reported in Panel B of Table 4.8. It is found that the coefficients of *CCDP* (or *EP)* are still significantly negative for both measures of firm risk (*VOL_ERN* and *VOL_STK*), except for the association of stock return volatility (*VOL_STK*) and ESG scores (*EP)*. Our PSM matched-sample regression results in Table 4.8 Panel B are quantitatively similar to those reported in Table 4.4, providing further support for the first hypothesis (H1) that climate change disclosure performance is negatively related to firm risk.

Table 4.8: Propensity score matching (PSM)

Panel A: Covariate balance test

Variable	Treated	Control	*t*-stat
SIZE	9.171	8.895	1.05
MTB	0.885	0.774	1.00
LEV	0.204	0.141	1.99
LOSS	0.057	0.029	0.58
ROA	0.037	0.023	0.83
QUICK	0.330	0.193	0.48
CASH	0.102	0.085	0.68
OCFR	0.109	0.084	1.47
CAPX	0.061	0.112	-2.81
CEO_TEN	1.293	1.044	1.36
RC_IND	0.686	0.914	-2.46
AGE	3.066	2.892	0.60

Panel B: Propensity score matching (PSM) results

	Model 1	**Model 2**	**Model 3**	**Model 4**
VARIABLES	VOL_ERN	VOL_STK	VOL_ERN	VOL_STK
CCDP	**-0.077***	**-0.058****		
	(-1.78)	**(-2.37)**		
EP			**-0.262*****	**0.019**
			(-3.09)	**(0.73)**
SIZE	-0.038*	-0.028***	-0.037*	-0.027***
	(-1.96)	(-3.16)	(-1.92)	(-3.12)
MTB	-0.019**	-0.009**	-0.019**	-0.008**
	(-2.33)	(-2.30)	(-2.31)	(-2.13)
LEV	0.070	-0.101	0.076	-0.102
	(0.58)	(-1.59)	(0.64)	(-1.60)
LOSS	0.002	0.017	0.001	0.018
	(0.07)	(0.76)	(0.02)	(0.81)
ROA	0.027	-0.035	0.029	-0.035
	(0.41)	(-0.38)	(0.43)	(-0.37)
QUICK	0.024***	-0.006	0.025***	-0.006
	(3.20)	(-0.89)	(3.26)	(-0.89)
CASH	-0.240**	0.024	-0.236**	0.025
	(-2.38)	(0.33)	(-2.35)	(0.35)
OCFR	-0.073	0.038	-0.080	0.034
	(-0.70)	(0.45)	(-0.77)	(0.41)
CAPX	0.073	-0.119	0.068	-0.115
	(0.41)	(-1.00)	(0.38)	(-0.97)
CEO_TEN	0.027***	0.001	0.028***	0.000
	(2.81)	(0.21)	(2.99)	(0.04)
RC_IND	-0.010	-0.018	-0.015	-0.018
	(-0.39)	(-1.32)	(-0.62)	(-1.35)
AGE	-0.565***	0.055*	-0.557***	0.056*
	(-11.28)	(1.92)	(-11.13)	(1.90)
Constant	1.706***	0.210***	1.701***	0.198***
	(9.53)	(3.91)	(9.59)	(3.78)
Observations	1,627	1,627	1,627	1,627
Adj. R^2	0.638	0.546	0.640	0.545
Year FE	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES

This table shows the results of the PSM matched sample analysis on the association between *CCDP* (or *EP*) and firm risk. A negative coefficient of *CCDP* (or *EP*) signifies that higher firm performance in climate change disclosure (or higher ESG scores) reduces its firm-specific risk. All variables are defined in Appendix A. Robust *t*-statistics are in parentheses. ***, **, and * indicate significant levels at 1%, 5% and 10%, respectively

4.5.3 Additional Substitute Impact of Greenhouse Gas Emissions

To test for the substitute role of disclosures and trends related to *GHG* emissions and certification (Alshahrani et al., 2022) on the relationship between climate change disclosure performance (*CCDP*) and firm risk, we divide the full sample into two subsamples based on a number of substitute factors. The first substitute is a binary variable if the company made a disclosure on *Scope 1* (or *Scope 2, or Scope 3*) emissions in their annual report. According to the GHG Protocol Corporate Accounting and Reporting Standard,[24] direct GHG emissions from operations that the reporting company owns or controls are referred as Scope 1 emissions; while indirect GHG emissions from the generation of purchased energy are referred as Scope 2 emissions are; and all other indirect GHG emissions (not included in Scope 2) are referred as Scope 3 emissions. Firms with a disclosure on *Scope 1* (or *Scope 2, or Scope 3*) emissions are classified into Group 1, while those without the disclosure are in Group 0.

The second substitute is a binary variable on the level of assurance provided by an audit firm over *Scope 1, Scope 2, or Scope 3* emissions data (*Assurance*). There are three levels of assurance that an audit firm can provide: reasonable, limited, or no assurance for each scope. Firms with reasonable or limited assurance for any scope is put in Group 1, while those with no assurance are classified into Group 0. The last substitute is the *GHG*-emissions-related disclosure index (*GHG_INDX*), which includes 34 items of hard disclosure and soft disclosure items to reflect the quality of sustainability reporting (Hollindale et al, 2019; Clarkson et al., 2008). Following Alshahrani et al. (2022), each of the 34 items is score as 1 if it is reported by the company, and 0 otherwise. The higher the score of GHG-emissions-related disclosure index (*GHG_INDX*), the better the quality of firm environmental policy and performance. We classify firms with higher (or lower) *GHG_INDX* score than its sample median into Group 1 (or Group 0).

Table 4.9 presents the regression results of the subsample analyses based on these three substitute factors. It is reported that the negative relationship between climate change disclosure performance (*CCDP*) and firm-specific risk (measured as volatility in earnings, *VOL_ERN*) is only significant (at $p<0.10$) in firms with no disclosure in *Scope 1* or *Scope 2*, in firms with no assurance support by audit firms for any scope disclosure (*Assurance*), or in firms with lower score of GHG-emissions-related disclosure index (*GHG_INDX*). Stronger

[24] https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

results are observed when using stock return volatility as a measure of business since this negative association become significant at $p<0.01$ and it is significant in firms with no disclosure in *Scope 3* as well. Our results indicate that firm performance in climate change disclosure (*CCDP*) is an important corporate governance factor in reducing its firm-specific risk, especially in firms that do not have disclosures and trends related to *GHG* emissions and assurance provided by an audit firm over *Scope 1, Scope 2,* or *Scope 3* emissions data, or in firms with better quality of environmental policies.

Table 4.9: Additional substitute impact of GHG emissions.

VARIABLES	VOL_ERN									
	Scope 1		Scope 2		Scope 3		Assurance		GHG_INDX	
	1	0	1	0	1	0	1	0	1	0
CCDP	**-0.020**	**-0.130***	**0.085**	**-0.138****	**0.021**	**-0.066**	**0.021**	**-0.078***	**-0.002**	**-0.124***
	(-0.30)	**(-1.76)**	**(1.43)**	**(-2.22)**	**-0.18**	**(-1.27)**	**-0.18**	**(-1.68)**	**(-0.03)**	**(-1.68)**
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	0.933*	1.773***	-0.330	1.774***	1.897*	1.734***	1.897*	1.738***	0.39	1.781***
	(1.87)	(9.61)	(-0.72)	(9.80)	(1.82)	(9.70)	(1.82)	(9.75)	-0.87	(9.62)
Observations	214	1,430	133	1,511	49	1595	49	1613	228	1416
Adj. R^2	0.724	0.637	0.923	0.637	0.582	0.634	0.582	0.631	0.719	0.638
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
VARIABLES	VOL_STK									
CCDP	**0.009**	**-0.157*****	**0.012**	**-0.115*****	**0.015**	**-0.096*****	**0.025**	**-0.096*****	**0.018**	**-0.158*****
	-0.64	**(-3.12)**	**-0.62**	**(-3.01)**	**-1.1**	**(-3.23)**	**-0.55**	**(-3.23)**	**-1.33**	**(-3.11)**
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	-0.107	0.195***	-0.128	0.204***	-0.242	0.207***	0.884	0.207***	-0.171*	0.192***
	(-1.25)	(3.51)	(-0.82)	(3.73)	(-1.53)	(3.82)	-0.61	(3.82)	(-1.75)	(3.46)
Observations	214	1416	133	1497	49	1581	31	1581	228	1402
Adj. R^2	0.787	0.541	0.787	0.543	0.965	0.546	0.756	0.546	0.777	0.541
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

This table reports the results of the substitute impact of GHG emissions disclosure on the relationship between CCDP and firm risk. A negative coefficient of *CCDP* signifies that higher firm performance in climate change disclosure reduces its firm-specific risk. All variables are defined in Appendix 4.A, and GHG emissions variables (Scope 1, 2 and 3) are explained in Section 4.5.3. The full sample is divided into two groups, with 1 indicating the subsample of disclosure of GHG emissions and 0 otherwise. Robust *t*-statistics in parentheses. ***, **, and * indicate significant levels at 1%, 5% and 10%, respectively.

4.6 Conclusion and Implications

In this study, we investigate the association between climate change disclosure performance (*CCDP*) and firm risk. The moderating impacts of institutional ownership and auditor tenure on this relationship are also examined. Our study sample contains non-financial firms from the top 300 firms listed on the ASX over the period from 2008 to 2019. We find that firm performance in climate change disclosure is negatively related to its firm-specific risk, suggesting that stakeholders trust and prefer to deal with firms providing objective environmental and social disclosures to enhance corporate transparency and they are subject to less operational risk. Our results are robust to additional measures of climate change disclosure performance such as ESG scores provided by Thomson Reuters, and the four sub-factors of the independent *CCDP* variable. In addition, this negative association of *CCDP* and firm risk is only significant in firms with low institutional ownership and low auditor tenure, or in firms without disclosures and trends related to *GHG* emissions and certification.

Our findings have significant implications for company executives, regulators, investors, and other stakeholders. It is found that climate change, as an external risk factor, can potentially have an important impact on firm risk. Our findings are relevant and significant in promoting public awareness of this issue, as concerns about extraordinary implications of climate change threats are increasing. This study is particularly significant for company executives, who must evaluate this risk factor while generating financial reports and maintaining the company's reputation and trustworthiness. Our findings are likely to be valuable to investors in evaluating risk premiums relating to the cost of capital, future cash flows, asset valuation, and determining the likelihood of a company facing its operational risk.

Appendix 4.A: Measurements of variables used in Chapter 4

Dependent variables	***Measurement***
VOL_ERN	Firm-specific volatility of earnings calculated as the standard deviation of earnings over a rolling 5-year period
VOL_STK	Standard deviation of firm yearly stock return over rolling 5-year period
Independent variables	***Measurement***
CCDP	An average score of all 11 disclosed items of corporate governance (G1 and G2), strategy (S1, S2, and S3), risk management (R1, R2, and R3), and metrics and targets (M1, M2, and M3)
GOV	Factor analysis of corporate governance information of climate change disclosure performance (CCDP), an eigenvalue obtained from two items of corporate governance (G1 and G2)
STR	Factor analysis of strategy information of CCDP, an eigenvalue obtained from three items of strategy (S1, S2, and S3)
RM	Factor analysis of risk management information of CCDP, an eigenvalue obtained from three items of risk management (R1, R2, and R3)
MT	Factor analysis of metrics and targets information of CCDP, an eigenvalue obtained from three items of metrics and targets (M1, M2, and M3)
EP	Environmental pillar of Thomson Reuters ESG scores
Moderator Variable	***Measurement***
INST_OWN	An indicator variable, which is equal to 1 if the firm institutional ownership is above the median and 0 otherwise.
AUD_TEN	An indicator variable: which is equal to 1 if the firm auditor tenure is above the median and 0 otherwise.
Control variables	***Measurement***
SIZE	Natural logarithm of total assets
MTB	Market value of the firm scaled by book value of the firm
LEV	Long-term debt divided by total assets
LOSS	An indicator variable, which is equal to 1 if the firm's net income is negative and 0 otherwise
ROA	Net income divided by total assets
QUICK	Quick ratio, calculated as the total of cash and receivables divided by current liability
CASH	Firm cash holding, defined as cash and marketable securities scaled by total assets
OCFR	Operating cash flows divided by total assets
CAPXR	Capital expenditure expenses divided by total assets
CEO_TEN	CEO tenure, defined as the number of years since the CEO started working at the company, expressed in natural logarithm
RC_IND	An indicator variable, which is equal to 1 when the firm has an independent risk committee and 0 otherwise.
AGE	Firm age, measured as the number of years since the firm is incorporated

Chapter 5 Conclusions, Policy implications and Future studies

5.1 Introduction

This thesis consists of three essays. Chapter 2 (essay 1) is to investigate the association between *CCDP* and financial distress. Chapter 3 (essay 2) examines the association between *CCDP* and audit fees. Finally, Chapter 4 (essay 3) explores the association between *CCDP* and firm risk.

5.2 Summary of Findings

The first essay studies the relationship between *CCDP* and financial distress, as well as the moderating effects of litigation, the presence of a risk committee, the use of Big4 auditing firms, and the level of audit fees. Using a sample of the top 300 ASX-listed non-financial firms from 2008 to 2019, it was discovered that higher levels of *CCDP* are associated with lower levels of financial distress. Furthermore, the significant association between *CCDP* and financial distress is manifested in firms with low litigation risk, firms with a risk committee, firms using Big4 auditing firms, and firms incurring a higher level of audit fees. Additional tests, such as PSM and the system GMM, show that our findings are robust to self-selection and endogeneity.

The second essay examines the relationship between *CCDP* and external auditor fees. The moderating effect of corporate governance characteristics on that relationship is also investigated. *CCDP* is found to be significantly positively related to external auditor fees in a sample of the top 300 ASX listed non-financial firms from 2008 to 2019. Furthermore, firms with a larger board of directors, a higher level of board independence, larger audit committees, and audit committees that are proportionately more independent show a significant association between *CCDP* and audit fees. Our findings are robust to a *DID* test, which alleviates concerns about endogeneity.

The third essay tests the relationship between *CCDP* and firm risk as well as the moderating effects of institutional ownership and auditor tenure. In our sample of the top 300

ASX-listed non-financial firms from 2008 to 2019, we find that higher levels of *CCDP* are associated with lower levels of firm risk. Furthermore, firms with lower levels of institutional ownership and those that use external auditors with shorter tenure moderate the relationship between *CCDP* and firm risk significantly. The results are resistant to self-selection bias and endogeneity concerns, as demonstrated by tests that include PSM.

5.3 Limitations and Future Research

Regarding the independent variable score in the methodology section, the score in this thesis is created from the TCFD recommendation based on four categories: governance, strategy, risk management, and metrics and targets. For each of these groups, an indicator variable is used with 1 for the presence and 0 for the absence of the elements within each of the four categories as this is the best currently acceptable method of the study sample. However, information captured in each of four categories can be descriptive and subjective, depending on each company.

Future research, instead of having only two scales for each category, may create four different scales of 0, 1, 2, and 3 in order to capture more information about the level of environmental disclosure. For example, companies that do not provide any information about each specific element would be scored as 0. Companies that provided but low-level information on each specific element would be scored as 1. Companies that provided information, but of a medium level on each specific element, would be scored as 2. Companies that provided high-level (and complete) information on each specific element would be scored as 3.

In addition, some future work might arise from this thesis, including investigating the influence of *CCDP* on other firm outcomes, such as asset impairment, stock price crash risk, and the decision to acquire another company. Another aspect is to examine non-financial disclosures and trends related to *GHG* and to relate it to our *CCDP* measures.

5.4 Recommendations to Policymakers, Regulators, and Investors

Corporations operating in climate-affected areas face increased operational costs, business disruption, increased earnings volatility, changed asset valuations, and increased uncertainty about potential cash flows. While the audit industry is becoming more conscious of the risks associated with climate change (CPA Australia, 2018b), the question of whether

climate risk is taken into account by auditors when assessing audit risk, auditor risk, and business risk remains an open question. In this study, we address this question by first quantifying the impact of *CCDP* on audit fees. We then demonstrate that various corporate governance characteristics moderate the effect of *CCDP* on audit pricing. The findings of the first essay (Chapter 2) have important implications for company management, regulators, investors, and other stakeholders. We present empirical evidence that climate change, as an external risk factor, has an impact on financial distress. Our study's findings are timely and significant in raising public awareness of this topic, as concerns about the unprecedented impacts of climate change risks grow. This research is also important for firm management, who must consider this risk factor when compiling financial reports and maintaining the reputation and credibility of their companies. Our findings are likely to be useful to investors in estimating risk premiums related to the cost of capital and future cash flows as well as in determining the likelihood that a company will face financial distress.

The results of the second essay (Chapter 3) show some important implications for firm management, regulators, investors, and auditors. We present empirical evidence that climate change, as a factor of external risk, influences audit fees. The results of our study are timely and important in raising public awareness of this topic, as concerns about the unprecedented impacts of climate change risks grow. This research is also important for auditors to consider this risk factor when performing audits and handling their client portfolios.

The findings of the third essay (Chapter 4) have important management implications. Based on Chapter 4's results, firms should strive to improve corporate transparency practices, particularly *CCDP*, in order to maximise cost savings and accelerate business benefits, as well as to proactively integrate climate change mitigation efforts into their business strategy. Firms should also consider the TCFD framework and *CCDP* recommendations. Aside from increasing transparency and decreasing information asymmetry, such environmental and climate change disclosures send a positive message to stakeholders while also determining the likelihood of a company facing firm risk.

References

AASB. (2019). *Climate-related and other emerging risks disclosures*. The Australian Accounting Standards Board https://www.aasb.gov.au/admin/file/content102/c3/AASB_AUASB_Joint_Bulletin_Finished.pdf

Abbott, L. J., Parker, S., Peters, G. F., & Raghunandan, K. (2003). The association between audit committee characteristics and audit fees. *Auditing: A Journal of Practice & Theory, 22*(2), 17-32.

Acar, E., Çalıyurt, K. T., & Zengin-Karaibrahimoglu, Y. (2021). Does ownership type affect environmental disclosure? *International Journal of Climate Change Strategies and Management, 13*(2), 120-141.

Ado, A. B., Rashid, N., Mustapha, U. A., & Ademola, L. S. (2020). The impact of audit quality on the financial performance of listed companies Nigeria. *Journal of Critical Reviews, 7*(9), 37-42.

AICPA. (2002). *Consideration of fraud in a financial statement audit* [Statement on Auditing Standards](99). The American Institute of Certified Practising Accountants. https://egrove.olemiss.edu/cgi/viewcontent.cgi?article=1100&context=aicpa_sas

AICPA. (2006). *Understanding the entity and its environment and assessing the risks of material misstatement* [Statement on Auditing Standards](109). The American Institute of Certified Practising Accountants. https://www.legislation.gov.au/Details/F2006L01372

Akbaş, H. E. (2016). The relationship between board characteristics and environmental disclosure: Evidence from Turkish listed companies. *The South East European Journal of Economics and Business, 11*(2), 7-19.

Akhtaruddin, M., Hossain, M. A., Hossain, M., & Yao, L. (2009). Corporate governance and voluntary disclosure in corporate annual reports of Malaysian listed firms. *Journal of Applied Management Accounting Research, 7*(1), 1-20.

Alawaqleh, Q. A., Almasria, N. A., & Alsawalhah, J. M. (2021). The effect of board of directors and CEO on audit quality: Evidence from listed manufacturing firms in Jordan. *The Journal of Asian Finance, Economics, and Business, 8*(2), 243-253.

Albuquerque, R., Koskinen, Y., & Zhang, C. (2019). Corporate social responsibility and firm risk: Theory and empirical evidence. *Management Science, 65*(10), 4451-4469.

Alexopoulos, I., Kounetas, K., & Tzelepis, D. (2018). Environmental and financial performance. Is there a win-win or a win-loss situation? Evidence from the Greek manufacturing. *Journal of Cleaner Production, 197*(1), 1275-1283.

Alford, A. W., & Boatsman, J. R. (1995). Predicting long-term stock return volatility: Implications for accounting and valuation of equity derivatives. *Accounting Review, 70*(4), 599-618.

Al-Hadi, A., Chatterjee, B., Yaftian, A., Taylor, G., & Monzur Hasan, M. (2019). Corporate social responsibility performance, financial distress and firm life cycle: Evidence from Australia. *Accounting & Finance, 59*(2), 961-989.

Al-Hadi, A., Hasan, M. M., & Habib, A. (2016). Risk committee, firm life cycle, and market risk disclosures. *Corporate Governance: An International Review, 24*(2), 145-170.

Allegrini, M., & Greco, G. (2013). Corporate boards, audit committees and voluntary disclosure: Evidence from Italian listed companies. *Journal of Management & Governance, 17*(1), 187-216.

Almeida, H., & Campello, M. (2007). Financial constraints, asset tangibility, and corporate investment. *The Review of Financial Studies, 20*(5), 1429-1460.

Alsaifi, K., Elnahass, M., Al-Awadhi, A. M., & Salama, A. (2022). Carbon disclosure and firm risk: Evidence from the UK corporate responses to climate change. *Eurasian Business Review, 12*(3), 505-526.

Alsaifi, K., Elnahass, M., & Salama, A. (2020). Carbon disclosure and financial performance: UK environmental policy. *Business Strategy and the Environment, 29*(2), 711-726.

Al-Shaer, H. (2020). Sustainability reporting quality and post-audit financial reporting quality: Empirical evidence from the UK. *Business Strategy and the Environment, 29*(6), 2355-2373.

Alshahrani, F., B. Eulaiwi, L. Duong and G. Taylor. 2022. Climate change performance and financial distress. *Business Strategy and the Environment* (Forthcoming). https://doi.org/10.1002/bse.3298

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance, 23*(4), 589-609.

Altman, E. I., & Hotchkiss, E. (1993). *Corporate financial distress and bankruptcy* (Vol. 1998, pp. 105-110). New York: John Wiley & Sons. http://ndl.ethernet.edu.et/bitstream/123456789/27600/2/68.pdf.pdf

Amran, A., Lee, S. P., & Devi, S. S. (2014). The influence of governance structure and strategic corporate social responsibility toward sustainability reporting quality. *Business Strategy and the Environment, 23*(4), 217-235.

Andrew, J., & Cortese, C. (2011). Accounting for climate change and the self-regulation of carbon disclosures. *Accounting Forum, 35*(3), 130-138.

Ane, P. (2012). An assessment of the quality of environmental information disclosure of corporation in China. *Systems Engineering Procedia, 5*(2012), 420-426.

Appuhami, R., & Bhuyan, M. (2015). Examining the influence of corporate governance on intellectual capital efficiency: Evidence from top service firms in Australia. *Managerial Auditing Journal, 30*(4/5), 347-372.

Appuhami, R., & Tashakor, S. (2017). The impact of audit committee characteristics on CSR disclosure: An analysis of Australian firms. *Australian Accounting Review, 27*(4), 400-420.

Arslan-Ayaydin, Ö., & Thewissen, J. (2016). The financial reward for environmental performance in the energy sector. *Energy & Environment, 27*(3-4), 389-413.

Artiach, T., Lee, D., Nelson, D., & Walker, J. (2010). The determinants of corporate sustainability performance. *Accounting & Finance, 50*(1), 31-51.

Ashari, S., & Krismiaji, K. (2020). Audit committee characteristics and financial performance: Indonesian evidence. *Equity, 22*(2), 139-152.

ASIC. (2021, October 14). *Australian Securities and Investments Commission. Corporate governance update: Climate change risk and disclosure*. https://asic.gov.au/about-asic/news-centre/speeches/corporate-governance-update-climate-change-risk-and-disclosure/

Aslam, S., Elmagrhi, M. H., Rehman, R. U., & Ntim, C. G. (2021). Environmental management practices and financial performance using data envelopment analysis in Japan: The mediating role of environmental performance. *Business Strategy and the Environment, 30*(4), 1655-1673.

ASX. (2014). *Corporate governance principles and recommendations*. ASX Corporate Governance Council. https://www.asx.com.au/documents/asx-compliance/cgc-principles-and-recommendations-3rd-edn.pdf

Attig, N., & Cleary, S. (2015). Managerial practices and corporate social responsibility. *Journal of Business Ethics, 131*(1), 121-136.

Ayu, M., Gamayuni, R. R., & Urbański, M. (2020). The impact of environmental and social costs disclosure on financial performance mediating by earning management. *Polish Journal of Management Studies, 21*(2), 74-86.

Bachoo, K., Tan, R., & Wilson, M. (2013). Firm value and the quality of sustainability reporting in Australia. *Australian Accounting Review, 23*(1), 67-87.

Bakar, N. B. A., & Ahmad, M. (2009). Auditor independence: Malaysian accountant's perception. *International Journal of Business and Management, 4*(12), 129-141.

Baklouti, N., Gautier, F., & Affes, H. (2016). Corporate governance and financial distress of European commercial banks. *Journal of Business Studies Quarterly, 7*(3), 75.

Balsam, S., Bartov, E., & Marquardt, C. (2002). Accruals management, investor sophistication, and equity valuation: Evidence from 10–Q filings. *Journal of Accounting Research, 40*(4), 987-1012.

Barakat, A., & Hussainey, K. (2013). Bank governance, regulation, supervision, and risk reporting: Evidence from operational risk disclosures in European banks. *International Review of Financial Analysis, 30*, 254-273.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120.

Beck, C., Frost, G., & Jones, S. (2018). CSR disclosure and financial performance revisited: A cross-country analysis. *Australian Journal of Management, 43*(4), 517-537.

Bedard, J. C., & Johnstone, K. M. (2004). Earnings manipulation risk, corporate governance risk, and auditors' planning and pricing decisions. *The Accounting Review, 79*(2), 277-304.

Begg, K., Van der Woerd, F., & Levy, D. (2018). *The business of climate change: Corporate responses to Kyoto*. Routledge. https://books.google.com.au/books?hl=en&lr=&id=80haDwAAQBAJ&oi=fnd&pg=PT6&dq=Begg,+K.,+Van+der+Woerd,+F.,+%26+Levy,+D.+(2018).

Belal, A. R. (2001). A study of corporate social disclosures in Bangladesh. *Managerial Auditing Journal, 16*(5), 274-289.

Ben-Amar, W., & McIlkenny, P. (2015). Board effectiveness and the voluntary disclosure of climate change information. *Business Strategy and the Environment, 24*(8), 704-719.

Ben-Zion, U., & Shalit, S. S. (1975). Size, leverage, and dividend record as determinants of equity risk. *The Journal of Finance, 30*(4), 1015-1026.

Benlemlih, M., Shaukat, A., Qiu, Y., & Trojanowski, G. (2018). Environmental and social disclosures and firm risk. *Journal of Business Ethics, 152*(3), 613-626.

Bentley, K. A., Omer, T. C., & Sharp, N. Y. (2013). Business strategy, financial reporting irregularities, and audit effort. *Contemporary Accounting Research, 30*(2), 780-817.

Berger, P. G., Ofek, E., & Swary, I. (1996). Investor valuation of the abandonment option. *Journal of Financial Economics, 42*(2), 259-287.

Bhuiyan, M. B. U., Cheema, M. A., & Man, Y. (2020). Risk committee, corporate risk-taking and firm value. *Managerial Finance*. 47(3), 285-309.

Bhuiyan, M. B. U., Cheema, M. A., & Man, Y. (2021). Risk committee, corporate risk-taking and firm value. *Managerial Finance, 47*(3), 285-309. https://doi.org/10.1108/MF-07-2019-0322

Bhuiyan, M. B. U., Salma, U., Roudaki, J., & Tavite, S. (2020). Financial reporting quality, audit fees and risk committees. *Asian Review of Accounting, 28*(3), 423-444.

Bicudo de Castro, V., Gul, F. A., Muttakin, M. B., & Mihret, D. G. (2019). Optimistic tone and audit fees: Some Australian evidence. *International Journal of Auditing, 23*(2), 352-364.

Bono, P. (2013). *Social and environmental factors on the corporate radar*. https://probonoaustralia.com.au/news/2013/09/social-and-environmental-factors-on-the-corporate-radar/

Borghei, Z. (2021). Carbon disclosure: A systematic literature review. *Accounting & Finance, 61*(4), 5255-5280.
Boubaker, S., Cellier, A., Manita, R., & Saeed, A. (2020). Does corporate social responsibility reduce financial distress risk? *Economic Modelling, 91*(1), 835-851.
Brammer, S., & Pavelin, S. (2008). Factors influencing the quality of corporate environmental disclosure. *Business Strategy and the Environment, 17*(2), 120-136.
Brown, G., & Kapadia, N. (2007). Firm-specific risk and equity market development. *Journal of Financial Economics, 84*(2), 358-388.
Brown, N., & Deegan, C. (1998). The public disclosure of environmental performance information—a dual test of media agenda setting theory and legitimacy theory. *Accounting and Business Research, 29*(1), 21-41.
Bryan, D. B., & Mason, T. W. (2020). Earnings volatility and auditor risk assessments: Evidence from auditor resignations. *Accounting Horizons, 34*(4), 33-56.
Bryan, D. B., Mason, T. W., & Reynolds, J. K. (2018). Earnings autocorrelation, earnings volatility, and audit fees. *Auditing: A Journal of Practice & Theory, 37*(3), 47-69.
Buallay, A. M., & AlDhaen, E. S. (2018). The relationship between audit committee characteristics and the level of sustainability report disclosure. Conference on e-Business, e-Services and e-Society. https://doi.org/10.1007/978-3-030-02131-3_44
Budiharta, P., & Kacaribu, H. E. P. B. (2020). The influence of board of directors, managerial ownership, and audit committee on carbon emission disclosure: A study of non-financial companies listed on BEI. *Review of Integrative Business and Economics Research, 9*(3), 75-87.
Bui, B., Moses, O., & Houqe, M. N. (2020). Carbon disclosure, emission intensity and cost of equity capital: Multi-country evidence. *Accounting & Finance, 60*(1), 47-71.
Buniamin, S., Alrazi, B., Johari, N. H., & Rahman, N. (2011). Corporate governance practices and environmental reporting of companies in Malaysia: Finding possibilities of double thumbs up. *Jurnal Pengurusan, 32*(2011), 55-71.
Busch, T., Bassen, A., Lewandowski, S., and Sump, F. (2022). Corporate carbon and financial performance revisited. *Organization & Environment* 35(1), 154-171.
Busch, T., & Lewandowski, S. (2018). Corporate carbon and financial performance: A meta-analysis. *Journal of Industrial Ecology, 22*(4), 745-759.
Bushee, B. J., Matsumoto, D. A., & Miller, G. S. (2004). Managerial and investor responses to disclosure regulation: The case of Reg FD and conference calls. *The Accounting Review, 79*(3), 617-643.
Bushman, R. M., Piotroski, J. D., & Smith, A. J. (2004). What determines corporate transparency? *Journal of Accounting Research, 42*(2), 207-252.
Cai, L., Cui, J., & Jo, H. (2016). Corporate environmental responsibility and firm risk. *Journal of Business Ethics, 139*(3), 563-594.
Calderwood, K. (2020, November 2). Australia will lose more than $3 trillion and 880,000 jobs over 50 years if climate change is not addressed, Deloitte says. *ABC News*. https://www.abc.net.au/news/2020-11-02/australian-economy-lose-$3-trillion-climate-change-inaction/12837244
Callen, J. L., & Fang, X. (2013). Institutional investor stability and crash risk: Monitoring versus short-termism? *Journal of Banking & Finance, 37*(8), 3047-3063.
Campello, M., Giambona, E., Graham, J. R., & Harvey, C. R. (2011). Liquidity management and corporate investment during a financial crisis. *The Review of Financial Studies, 24*(6), 1944-1979.
Campello, M., Giambona, E., Graham, J. R., & Harvey, C. R. (2012). Access to liquidity and corporate investment in Europe during the financial crisis. *Review of Finance, 16*(2), 323-346.

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics*, *97*(3), 470-487.

Cao, C., Simin, T., & Zhao, J. (2008). Can growth options explain the trend in idiosyncratic risk? *The Review of Financial Studies*, *21*(6), 2599-2633.

Cao, Z., & Narayanamoorthy, G. (2006). *Accounting and litigation risk (No. amz2514)*. Yale School of Management. https://ideas.repec.org/p/ysm/wpaper/amz2514.html

Carcello, J. V., Hermanson, D. R., Neal, T. L., & Riley Jr, R. A. (2002). Board characteristics and audit fees. *Contemporary Accounting Research, 19*(3), 365-384.

Chaihanchanchai, P., & Anantachart, S. (2022). Encouraging green product purchase: Green value and environmental knowledge as moderators of attitude and behavior relationship. *Business Strategy and the Environment*. https://onlinelibrary.wiley.com/doi/full/10.1002/bse.3130

Chaklader, B., & Gulati, P. A. (2015). A study of corporate environmental disclosure practices of companies doing business in India. *Global Business Review, 16*(2), 321-335.

Chang, T.-C., Yan, Y.-C., & Chou, L.-C. (2013). Is default probability associated with corporate social responsibility? *Asia-Pacific Journal of Accounting & Economics*, *20*(4), 457-472.

Chang, Y., Du, X., & Zeng, Q. (2021). Does environmental information disclosure mitigate corporate risk? Evidence from China. *Journal of Contemporary Accounting & Economics*, *17*(1), 100239.

Chariri, A., Januarti, I., & Yuyetta, E. N. A. (2017). Firm characteristics, audit committee, and environmental performance: Insights from Indonesian companies. *International Journal of Energy Economics and Policy, 7*(6), 19-26.

Chau, G., & Gray, S. J. (2010). Family ownership, board independence and voluntary disclosure: Evidence from Hong Kong. *Journal of International Accounting, Auditing and Taxation, 19*(2), 93-109.

Chen, C., Lin, C. and Lin Y. (2008). Audit partner tenure, audit firm tenure, and discretionary accruals: Does long auditor tenure impair earnings quality? *Contemporary Accounting Research* 25(2), 415-455.

Chen, D., & Zheng, Y. (2014). CEO tenure and risk-taking. *Global Business and Finance Review, 19*(1), p1-27.

Chen, L., Krishnan, G. V., & Yu, W. (2018). The relation between audit fee cuts during the global financial crisis and earnings quality and audit quality. *Advances in Accounting, 43*(2018), 14-31.

Chen, L., Srinidhi, B., Tsang, A., & Yu, W. (2016). Audited financial reporting and voluntary disclosure of corporate social responsibility (CSR) reports. *Journal of Management Accounting Research, 28*(2), 53-76.

Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal, 35*(1), 1-23.

Cheng, J., Elyasiani, E., & Jia, J. (2011). Institutional ownership stability and risk taking: Evidence from the life–health insurance industry. *Journal of Risk and Insurance, 78*(3), 609-641.

Choi, J., & Yang, H. (2008). An examination on the relationship between corporate governance, audit fees, and audit hours. *Accounting Information Research, 26*(1), 59-77.

Christensen, B. E., Omer, T. C., Sharp, N. Y., & Shelley, M. K. (2014). Pork bellies and public company audits: Have audits once again become just another commodity? *Available at SSRN 2184413*. https://ssrn.com/abstract=2184413

Christofidi, D. L. A., & Rodrigues Pereira, P. (2019). Impact of the CEO age and CSR score on mergers and acquisitions (Master's thesis). https://lup.lub.lu.se/student-papers/search/publication/8985280S

Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations and Society, 33*(4-5), 303-327.

Collier, P. (1993). Factors affecting the formation of audit committees in major UK listed companies. *Accounting and Business Research, 23*(sup1), 421-430.

Conner, K. R. (1991). A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm? *Journal of management, 17*(1), 121-154.

Cooper, S., & Pearce, G. (2011). Climate change performance measurement, control and accountability in English local authority areas. *Accounting, Auditing & Accountability Journal, 24*(8), 1097-1118.

Cordeiro, J. J., & Sarkis, J. (1997). Environmental proactivism and firm performance: Evidence from security analyst earnings forecasts. *Business Strategy and the Environment, 6*(2), 104-114.

Cormier, D., Magnan, M., & Van Velthoven, B. (2005). Environmental disclosure quality in large German companies: Economic incentives, public pressures or institutional conditions? *European Accounting Review, 14*(1), 3-39.

Covington, H., & Thamotheram, R. (2014). How should investors manage climate-change risk? *Rotman International Journal of Pension Management, 7*(2), 42-49.

Cowan, S., & Deegan, C. (2011). Corporate disclosure reactions to Australia's first national emission reporting scheme. *Accounting & Finance, 51*(2), 409-436.

CPA Australia. (2018a). *Climate change and professional liability risk for auditors: A comparative United Kingdom/Australia analysis.* https://www.cpaaustralia.com.au/;/media/corporate/allfiles/document/professional-resources/esg/climate-changeand-professional-liability-risk-for-auditors-1.pdf?la¼en

CPA Australia. (2018b). *Climate change and professional liability risk for auditors: A comparative United Kingdom/Australia analysis.* https://www.cpaaustralia.com.au/;/media/corporate/allfiles/document/professional-resources/esg/climate-changeand-professional-liability-risk-for-auditors-1.pdf?la¼en

Daromes, F. E. (2019). Women on boards and greenhouse gas emission disclosures: How their impact on corporate reputation. *Available at SSRN 3434917.* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3434917

DeAngelo, L. E. (1981). Auditor size and audit quality. *Journal of Accounting and Economics, 3*(3), 183-199.

DeFond, M. L., Raghunandan, K., & Subramanyam, K. R. (2002). Do non–audit service fees impair auditor independence? Evidence from going concern audit opinions. *Journal of Accounting Research, 40*(4), 1247-1274.

Della Croce, R., Stewart, F., & Yermo, J. (2011). Promoting longer-term investment by institutional investors: Selected issues and policies. *OECD Journal: Financial Market Trends, 2011*(1), 145-164.

Deloitte. (2022, January 24). *Australian business leaders more concerned than ever before about the impacts of climate change*. https://www2.deloitte.com/au/en/pages/media-releases/articles/australian-business-leaders-impacts-climate-change-240121.html

Demaria, S., & Rigot, S. (2021). Corporate environmental reporting: Are French firms compliant with the Task Force on Climate Financial Disclosures' recommendations? *Business Strategy and the Environment, 30*(1), 721-738.

Delmas, M. A., Nairn-Birch, N., and Lim, J. (2015). Dynamics of environmental and finance performance: the case of greenhouse gas emissions. *Organization & Environment* 28(4), 374-393.

Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *The Accounting Review, 86*(1), 59-100.

Dichev, I. D., & Tang, V. W. (2009). Earnings volatility and earnings predictability. *Journal of Accounting and Economics, 47*(1-2), 160-181.

Dietz, S., Bowen, A., Dixon, C., & Gradwell, P. (2016). Climate value at risk of global financial assets. *Nature Climate Change, 6*(7), 676-679.

Dietz, T., Shwom, R. L., & Whitley, C. T. (2020). Climate change and society. *Annual Review of Sociology, 46*(1), 135-158.

Do, V., Nguyen, T. H., Truong, C., & Vu, T. (2021). Is drought risk priced in private debt contracts? *International Review of Finance, 21*(2), 724-737.

Doogar, R., Rowe, S. P., & Sivadasan, P. (2015). Asleep at the wheel (again)? Bank audits during the lead-up to the financial crisis. *Contemporary Accounting Research, 32*(1), 358-391.

Dunn, K. A., & Mayhew, B. W. (2004). Audit firm industry specialization and client disclosure quality. *Review of Accounting Studies, 9*(1), 35-58.

Eberhart, A. C., & Senbet, L. W. (1993). Absolute priority rule violations and risk incentives for financially distressed firms. *Financial Management, 22*(3), 101-116.

Edwards, A., Schwab, C., & Shevlin, T. (2013, February). Financial constraints and the incentive for tax planning. *In ANNUAL ROTMAN ACCOUNTING RESEARCH CONFERENCE* (Vol. 7).

Edwards, R. B., Naylor, R. L., Higgins, M. M., & Falcon, W. P. (2020). Causes of Indonesia's forest fires. *World Development, 127*, 104717.

El-Diftar, D., Jones, E., Ragheb, M., & Soliman, M. (2017). Institutional investors and voluntary disclosure and transparency: The case of Egypt. *Corporate Governance: The International Journal of Business in Society, 17*(1), 134-151.

El Ghoul, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance, 35*(9), 2388-2406.

Eleftheriadis, I. M., & Anagnostopoulou, E. G. (2015). Relationship between corporate climate change disclosures and firm factors. *Business Strategy and the Environment, 24*(8), 780-789.

Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review, 36*(2), 90-100.

Elsayih, J., Tang, Q., & Lan, Y.-C. (2018). Corporate governance and carbon transparency: Australian experience. *Accounting Research Journal, 31*(3), 405-422.

Eulaiwi, B., Al-Hadi, A., Duong, L., Clark, K., Taylor, G., & Perrin, B. (2022). Audit pricing and corporate whistleblower governance: Evidence from Australian financial firms. *Accounting & Finance, 62*(2), 2339-2384.

Farooq, M., Noor, A., & Qureshi, S. F. (2021). The impact of corporate social responsibility on financial distress: Empirical evidence. *Social Responsibility Journal, 18*(5), 1050-1067.

Flammer, C., Toffel, M. W., & Viswanathan, K. (2021). Shareholder activism and firms' voluntary disclosure of climate change risks. *Strategic Management Journal, 42*(10), 1850-1879.

Florence, E. (2021). Climate change and corporate climate change risk disclosure in Australia. *The Blue Planet 1*(3), Article 8. https://acsdri.com/climate-change-and-corporate-climate-change-risk-disclosure-in-australia/

Foley, M. (2022). Climate change will cost Australia hundreds of billions of dollars: UN report. *The Sydney Morning Herald*. https://www.smh.com.au/politics/federal/climate-change-will-cost-australia-hundreds-of-billions-of-dollars-un-report-20220301-p5a0k9.html

Forker, J. J. (1992). Corporate governance and disclosure quality. *Accounting and Business Research, 22*(86), 111-124.

Freeman, R. E. (2010). *Strategic management: A stakeholder approach*. Cambridge University Press. https://books.google.com.au/books?id=DcxVAgAAQBAJ&dq=Freeman,+R.+E.+(2010)

Gallego-Álvarez, I., García-Sánchez, I. M., & da Silva Vieira, C. (2014). Climate change and financial performance in times of crisis. *Business Strategy and the Environment, 23*(6), 361-374.

Garcia-Meca, E., & Sanchez-Ballesta, J. P. (2010). The association of board independence and ownership concentration with voluntary disclosure: A meta-analysis. *European Accounting Review, 19*(3), 603-627.

Ghadge, A., Wurtmann, H., & Seuring, S. (2020). Managing climate change risks in global supply chains: A review and research agenda. *International Journal of Production Research, 58*(1), 44-64.

Ghosh, A. and Moon. D. (2005). Auditor tenure and perceptions of audit quality. *The Accounting Review* 80(2), 585-612.

Giannarakis, G., Andronikidis, A., & Sariannidis, N. (2020). Determinants of environmental disclosure: Investigating new and conventional corporate governance characteristics. *Annals of Operations Research, 294*(1), 87-105.

Giannarakis, G., Zafeiriou, E., & Sariannidis, N. (2017). The impact of carbon performance on climate change disclosure. *Business Strategy and the Environment, 26*(8), 1078-1094.

Gilley, K. M., Worrell, D. L., Davidson III, W. N., & El–Jelly, A. (2000). Corporate environmental initiatives and anticipated firm performance: The differential effects of process-driven versus product-driven greening initiatives. *Journal of Management, 26*(6), 1199-1216.

Gluyas, A. (2021, September 1). *Climate change 'biggest investment opportunity since the internet'*. https://www.afr.com/wealth/personal-finance/climate-change-biggest-investment-opportunity-since-the-internet-20210826-p58m4w

Godfrey, P. C., Merrill, C. B., & Hansen, J. M. (2009). The relationship between corporate social responsibility and shareholder value: An empirical test of the risk management hypothesis. *Strategic Management Journal, 30*(4), 425-445.

Goodman, J. (2020, January 2). What is Australia doing to tackle climate change? [WWW Document]. *BBC News*. https://www.bbc.com/news/world-australia-50869565

Goodwin-Stewart, J., & Kent, P. (2006). Relation between external audit fees, audit committee characteristics and internal audit. *Accounting & Finance, 46*(3), 387-404.

Goss, A. (2009). Corporate social responsibility and financial distress. *Proceedings of the Administrative Sciences Association of Canada, 29*(1), 1-18.

Grant, R. M. (1991). The resource-based theory of competitive advantage: Implications for strategy formulation. *California Management Review, 33*(3), 114-135.

Gray, R., Kouhy, R., & Lavers, S. (1995). Corporate social and environmental reporting: A review of the literature and a longitudinal study of UK disclosure. *Accounting, Auditing & Accountability Journal, 8*(2), 47-77.

Grayston, C. (2019, May 1). *Accounting for climate risk is now the auditor's business*. CPA Australia. https://www.intheblack.com/articles/2019/05/01/climate-change-risk-auditor-business

Griffin, J. J., & Mahon, J. F. (1997). The corporate social performance and corporate financial performance debate: Twenty-five years of incomparable research. *Business & Society, 36*(1), 5-31.

Griffin, P. A., Lont, D. H., & Sun, Y. (2008). Corporate governance and audit fees: Evidence of countervailing relations. *Journal of Contemporary Accounting & Economics, 4*(1), 18-49.
Guenther, D. A., Matsunaga, S. R., & Williams, B. M. (2017). Is tax avoidance related to firm risk? *The Accounting Review, 92*(1), 115-136.
Gulluscio, C., Puntillo, P., Luciani, V., & Huisingh, D. (2020). Climate change accounting and reporting: A systematic literature review. *Sustainability, 12*(13), 5455.
Gupta, K., & Krishnamurti, C. (2018). Does corporate social responsibility engagement benefit distressed firms? The role of moral and exchange capital. *Pacific-Basin Finance Journal, 50*(2018), 249-262.
Habib, A., Jiang, H., & Zhou, D. (2015). Related-party transactions and audit fees: Evidence from China. *Journal of International Accounting Research, 14*(1), 59-83.
Hahn, R., Reimsbach, D., and Schiemann, F. (2015). Organizations, climate change, and transparency: reviewing the literature on carbon disclosure. *Organization & Environment* 28(1), 80-102.
Haj, A. A. (2012). The trend of CSR disclosures and the role of corporate governance attributes: The case of Shari'ah compliant companies in Mala. *Issues in Social & Environmental Accounting, 6*(2), 221-247.
Halim, E. H., Mustika, G., Sari, R. N., Anugerah, R., & Mohd-Sanusi, Z. (2017). Corporate governance practices and financial performance: The mediating effect of risk management committee at manufacturing firms. *Journal of International Studies, 10*(4), 272-289.
Halkos, G., & Skouloudis, A. (2016). Exploring the current status and key determinants of corporate disclosure on climate change: Evidence from the Greek business sector. *Environmental Science & Policy, 56*, 22-31.
Haninun, H., Lindrianasari, L., & Denziana, A. (2018). The effect of environmental performance and disclosure on financial performance. *International Journal of Trade and Global Markets, 11*(1-2), 138-148.
Haque, F. (2017). The effects of board characteristics and sustainable compensation policy on carbon performance of UK firms. *The British Accounting Review, 49*(3), 347-364.
Haque, S. (2015). Corporate climate change-related auditing and disclosure practices: Are companies doing enough? In *Social audit regulation* (pp. 169-185). Springer. https://link.springer.com/content/pdf/10.1007/978-3-319-15838-9_9.pdf
Hardiyansah, M., Agustini, A. T., & Purnamawati, I. (2021). The effect of carbon emission disclosure on firm value: Environmental performance and industrial type. *The Journal of Asian Finance, Economics, and Business, 8*(1), 123-133.
Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review, 20*(4), 986-1014.
Hay, D. C., Knechel, W. R., & Wong, N. (2006). Audit fees: A meta-analysis of the effect of supply and demand attributes. *Contemporary Accounting Research, 23*(1), 141-191.
He, R., Luo, L., Shamsuddin, A., & Tang, Q. (2022). Corporate carbon accounting: a literature review of carbon accounting research from the Kyoto Protocol to the Paris Agreement. *Accounting & Finance, 62*(1), 261-298.
Hibiki, A., & Managi, S. (2010). Environmental information provision, market valuation, and firm incentives: an empirical study of the Japanese PRTR system. *Land Economics, 86*(2), 382-393.
Ho, S. S., & Wong, K. S. (2001). A study of the relationship between corporate governance structures and the extent of voluntary disclosure. *Journal of International Accounting, Auditing and Taxation, 10*(2), 139-156.

Hoi, C. K., Wu, Q., & Zhang, H. (2013). Is corporate social responsibility (CSR) associated with tax avoidance? Evidence from irresponsible CSR activities. *The Accounting Review, 88*(6), 2025-2059.

Hollindale, J., Kent, P., Routledge, J., & Chapple, L. (2019). Women on boards and greenhouse gas emission disclosures. *Accounting & Finance, 59*(1), 277-308.

Houqe, M. N., Ahmed, K., & Van Zijl, T. (2017). Audit quality, earnings management, and cost of equity capital: Evidence from India. *International Journal of Auditing, 21*(2), 177-189.

Houston, J. F., Lin, C., Liu, S., & Wei, L. (2019). Litigation risk and voluntary disclosure: Evidence from legal changes. *The Accounting Review, 94*(5), 247-272.

Houston, R. W., Peters, M. F., & Pratt, J. H. (2005). Nonlitigation risk and pricing audit services. *Auditing: A Journal of Practice & Theory, 24*(1), 37-53.

Hu, H., Dou, B., & Wang, A. (2019). Corporate Social responsibility information disclosure and corporate fraud—"risk reduction" effect or "window dressing" effect? *Sustainability, 11*(4), 1141.

Hutchinson, M., Seamer, M., & Chapple, L. E. (2015). Institutional investors, risk/performance and corporate governance. *The International Journal of Accounting, 50*(1), 31-52.

Huynh, T. D., Nguyen, T. H., & Truong, C. (2020). Climate risk: The price of drought. *Journal of Corporate Finance, 65*(2020), 101750.

Iatridis, G. E. (2013). Environmental disclosure quality: Evidence on environmental performance, corporate governance and value relevance. *Emerging Markets Review, 14*, 55-75.

IGCC. (2021). *Investors release plan to establish mandatory financial disclosure on climate risk in Australia. The Investor Group on Climate Change*. https://igcc.org.au/mandatory-financial-disclosure-on-climate-risk/#:~:text=The%20final%20recommendations%20of%20the,ASX200%20adopting%20the%20TCFD%20framework.

Indarti, M. G. K., & Widiatmoko, J. (2021). The effects of earnings management and audit quality on cost of equity capital: Empirical evidence from Indonesia. *The Journal of Asian Finance, Economics and Business, 8*(4), 769-776.

IOE. (2015). *International Organisation of Employers. A global challenge, a future framework*. https://ioe-dev.webbaysolutions.com/index.php?eID=dumpFile&t=f&f=123168&token=b7c45dd05315fb36c3ccd3bd8e67630fd60e2bc0

Ishak, S., & Yusof, M. A. M. (2014). Auditor opinion on risk issues: The role of risk management committee. *International Journal of Management Research and Reviews, 4*(2), 266.

Jaggi, B., Allini, A., Macchioni, R., & Zagaria, C. (2018). The factors motivating voluntary disclosure of carbon information: Evidence based on Italian listed companies. *Organization & Environment, 31*(2), 178-202.

Janggu, T., Darus, F., Zain, M. M., & Sawani, Y. (2014). Does good corporate governance lead to better sustainability reporting? An analysis using structural equation modeling. *Procedia-Social and Behavioral Sciences, 145*(2014), 138-145.

Januarti, I., Darsono, D., & Chariri, A. (2020). The relationship between audit committee effectiveness and audit fees: Insights from Indonesia. *The Journal of Asian Finance, Economics, and Business, 7*(7), 179-185. https://doi.org/10.13106/jafeb.2020.vol7.no7.179

Javadi, S., & Masum, A.-A. (2021). The impact of climate change on the cost of bank loans. *Journal of Corporate Finance, 69*(2021), 102019.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360.

Jia, J., & Li, Z. (2022). Corporate environmental performance and financial distress: Evidence from Australia. *Australian Accounting Review, 32*(2), 188-200.
Jia, J., Li, Z., & Munro, L. (2019). Risk management committee and risk management disclosure: Evidence from Australia. *Pacific Accounting Review, 31*(3), 438-461.
Jizi, M., & Nehme, R. (2018). Board monitoring and audit fees: The moderating role of CEO/chair dual roles. *Managerial Auditing Journal, 33*(2), 217-243.
Jizi, M. I., Salama, A., Dixon, R., & Stratling, R. (2014). Corporate governance and corporate social responsibility disclosure: Evidence from the US banking sector. *Journal of Business Ethics, 125*(4), 601-615.
Jo, H., & Na, H. (2012). Does CSR reduce firm risk? Evidence from controversial industry sectors. *Journal of Business Ethics, 110*(4), 441-456.
Johnson, V., Khurana, I. K, and Reynolds, J. K. (2002). Audit-firm tenure and the quality of financial reports. *Contemporary Accounting Research* 19, 637-660.
Johnson, W. C., Xie, W., & Yi, S. (2014). Corporate fraud and the value of reputations in the product market. *Journal of Corporate Finance, 25*(2014), 16-39.
Jones, T. (1995). Instrumental stakeholder theory: A synthesis of ethics and economics. *Academy of Management Review, 20*(2), 404-437.
Judge, W. Q., & Douglas, T. J. (1998). Performance implications of incorporating natural environmental issues into the strategic planning process: An empirical assessment. *Journal of Management Studies, 35*(2), 241-262.
Juhmani, O. I. (2013). Ownership structure and corporate voluntary disclosure: Evidence from Bahrain. *International Journal of Accounting and Financial Reporting, 3*(2), 133.
Kelvin, C., Pasoloran, O., & Randa, F. (2019). Mekanisme Pengungkapan Emisi Karbon dan Reaksi Investor (Carbon emission disclosure mechanisms and investor reactions). *Jurnal Ilmiah Akuntansi dan Bisnis, 14*(2), 155-168.
Khan, A., Muttakin, M. B., & Siddiqui, J. (2013). Corporate governance and corporate social responsibility disclosures: Evidence from an emerging economy. *Journal of Business Ethics, 114*(2), 207-223.
Khan, H. (2011). A literature review of corporate governance. *International Conference on E-Business, Management and Economics, 25*(1), 1-5.
Khan, S., & Bradbury, M. E. (2014). Volatility and risk relevance of comprehensive income. *Journal of Contemporary Accounting & Economics, 10*(1), 76-85.
Kikhia, H. Y. (2014). Board characteristics, audit committee characteristics, and audit fees: Evidence from Jordan. *International Business Research, 7*(12), 98.
Kılıç, M., & Kuzey, C. (2019). The effect of corporate governance on carbon emission disclosures. *International Journal of Climate Change Strategies and Management, 11*(1), 35-53.
Kim, D., & Kim, J. Y. (2013). Effects of corporate social responsibility and corporate governance on determining audit fees. *International Journal of Multimedia and Ubiquitous Engineering, 8*(2), 189-196.
Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. *Management Science, 42*(8), 1199-1214.
Ko, C., & Tai, R. (2019). Corporate governance and climate change risk management: A case study of transport industry in Hong Kong. *Available at SSRN 3506543*.
Korphaibool, V., Chatjuthamard, P., & Treepongkaruna, S. (2021). Scoring sufficiency economy philosophy through GRI standards and firm risk: A case study of Thai listed companies. *Sustainability, 13*(4), 2321.
Kouloukoui, D., Sant'Anna, Â. M. O., da Silva Gomes, S. M., de Oliveira Marinho, M. M., de Jong, P., Kiperstok, A., & Torres, E. A. (2019). Factors influencing the level of environmental disclosures in sustainability reports: Case of climate risk disclosure by

Brazilian companies. *Corporate Social Responsibility and Environmental Management, 26*(4), 791-804.

KPMG. (2017). *KPMG survey of corporate responsibility reporting* https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/10/kpmg-survey-of-corporate-responsibility-reporting-2017.pdf

KPMG. (2020, May 31). *COVID-19: Potential impact on financial reporting*. https://assets.kpmg/content/dam/kpmg/in/pdf/2020/03/chapter-1-aau-covid-19-financial-reporting-inventory-impact-relaxations.pdf

Kurnia, P., Nur, D. E., & Putra, A. A. (2021). Carbon emission disclosure and firm value: A study of manufacturing firms in Indonesia and Australia. *International Journal of Energy Economics and Policy, 11*(2), 83.

Kurniawan, J. A., & Daljono, D. (2014). Pengaruh Kualitas Audit terhadap Manajemen Laba dan Biaya Modal Ekuitas. *Diponegoro Journal of Accounting, 3*(1), 105-113.

Kyriakou, M. I., & Dimitras, A. I. (2018). Impact of auditor tenure on audit quality: European evidence. *Investment Management and Financial Innovations,15*(1), 374-386.

Larmou, S., & Vafeas, N. (2010). The relation between board size and firm performance in firms with a history of poor operating performance. *Journal of Management & Governance, 14*(1), 61-85.

Lemma, T. T., Lulseged, A., & Tavakolifar, M. (2021). Corporate commitment to climate change action, carbon risk exposure, and a firm's debt financing policy. *Business Strategy and the Environment, 30*(8), 3919-3936.

Lesk, C., Rowhani, P., & Ramankutty, N. (2016). Influence of extreme weather disasters on global crop production. *Nature, 529*(7584), 84-87.

Leung, Z., & Philomena, L. (2013). An empirical analysis of the determinants of greenhouse gas voluntary disclosure in Australia. *Accounting and Finance Research, 2*(1), 110-127.

Lewandowski, S. (2017). Corporate carbon and financial performance: The role of emission reductions. *Business Strategy and the Environment, 26*(8), 1196-1211.

Li, A., Michaelides, M., Rose, M., & Garg, M. (2019). Climate-related risk and financial statements: Implications for regulators, preparers, auditors and users. *Australian Accounting Review, 29*(3), 599-605.

Li, D., Zhao, Y., Sun, Y., & Yin, D. (2017). Corporate environmental performance, environmental information disclosure, and financial performance: Evidence from China. *Human and Ecological Risk Assessment: An International Journal, 23*(2), 323-339.

Li, R., & Ramanathan, R. (2020). Can environmental investments benefit environmental performance? The moderating roles of institutional environment and foreign direct investment. *Business Strategy and the Environment, 29*(8), 3385-3398.

Liao, L., Luo, L., & Tang, Q. (2015). Gender diversity, board independence, environmental committee and greenhouse gas disclosure. *The British Accounting Review, 47*(4), 409-424.

Link, S., & Naveh, E. (2006). Standardization and discretion: Does the environmental standard ISO 14001 lead to performance benefits? *IEEE Transactions on Engineering Management, 53*(4), 508-519.

Linnenluecke, M. K., Birt, J., & Griffiths, A. (2015). The role of accounting in supporting adaptation to climate change. *Accounting & Finance, 55*(3), 607-625.

Liu, M., & Lu, W. (2021). Corporate social responsibility, firm performance, and firm risk: the role of firm reputation. *Asia-Pacific Journal of Accounting & Economics, 28*(5), 525-545.

LópezPuertas-Lamy, M., Desender, K., & Epure, M. (2017). Corporate social responsibility and the assessment by auditors of the risk of material misstatement. *Journal of Business Finance & Accounting, 44*(9-10), 1276-1314.

Lu, L. W., & Taylor, M. E. (2018). A study of the relationships among environmental performance, environmental disclosure, and financial performance. *Asian Review of Accounting*, 26 (1) 107-130

Maji, S. G., & Kalita, N. (2022). Climate change financial disclosure and firm performance: empirical evidence from Indian energy sector based on TCFD recommendations. *Society and Business Review*. https://www.emerald.com/insight/content/doi/10.1108/SBR-10-2021-0208/full/pdf

Maksimovic, V., & Titman, S. (1991). Financial policy and reputation for product quality. *The Review of Financial Studies, 4*(1), 175-200.

Malik, M. (2015). Value-enhancing capabilities of CSR: A brief review of contemporary literature. *Journal of Business Ethics, 127*(2), 419-438.

Malm, J., & Krolikowski, M. (2017). Litigation risk and financial leverage. *Journal of Economics and Finance, 41*(1), 180-194.

Mansi, S. A., Maxwell, W. F. and Miller, D. P (2004). Does auditor quality and tenure matter to investors? Evidence from the bond market. *Journal of Accounting Research* 42, 755-793.

Marcus, A. (1989). The deterrent to dubious corporate behavior: Profitability, probability and safety recalls. *Strategic Management Journal, 10*(3), 233-250.

Margolis, J. D., & Walsh, J. P. (2003). Misery loves companies: Rethinking social initiatives by business. *Administrative Science Quarterly, 48*(2), 268-305.

Marwa, M., Salhi, B., & Jarboui, A. (2020). Environmental audit and environmental disclosure quality. *Scientific Annals of Economics and Business, 67*(1), 93-115.

Mathew, S., Ibrahim, S., & Archbold, S. (2016). Boards attributes that increase firm risk–evidence from the UK. *Corporate Governance, 16*(2 2016), 233-258.

Matsumura, E. M., Prakash, R., & Vera-Munoz, S. C. (2014). Firm-value effects of carbon emissions and carbon disclosures. *The Accounting Review, 89*(2), 695-724.

McLaughlin, P. (2011). Climate change, adaptation, and vulnerability: reconceptualizing, societal-environment interaction within a socially constructed adaptive landscape. *Organizations & Environment* 24(3), 269-291.

Melloni, G. (2020). Climate change reporting: A commentary on key issues. *Die Unternehmung, 74*(3), 312-323.

Mercer. (2015). *Investing in the time of climate change*. https://www.mercer.com/our-thinking/wealth/climate-change-the-sequel.html

Miah, M. S., Jiang, H., Rahman, A., & Stent, W. (2020). Audit effort, materiality and audit fees: Evidence from the adoption of IFRS in Australia. *Accounting Research Journal, 33*(1), 186-216.

Michael, J., & William, M. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360.

Miller, J. S., Wiseman, R. M., & Gomez-Mejia, L. R. (2002). The fit between CEO compensation design and firm risk. *Academy of Management Journal, 45*(4), 745-756.

Minor, D., & Morgan, J. (2011). CSR as reputation insurance: Primum non nocere. *California Management Review, 53*(3), 40-59.

Mohammad, W. M. W., & Wasiuzzaman, S. (2021). Environmental, social and governance (ESG) disclosure, competitive advantage and performance of firms in Malaysia. *Cleaner Environmental Systems, 2*, 100015.

Monks, R., & Minow, N. (1995). *Corporate governance*. Blackwell. https://openlibrary.org/books/OL1106391M/Corporate_governance

Moodie, P. (2020). *Climate risk: What accountants need to know*. https://www.intheblack.com/articles/2020/09/18/climate-risk-what-accountants-need-to-know

Morgan, J., & Stocken, P. (1998). The effects of business risk on audit pricing. *Review of Accounting Studies, 3*(4), 365-385.

Moutinho, V., Cerqueira, A., & Brandao, E. (2012). Audit fees and firm performance. *Available at SSRN 2180020*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2180020

Muldowney, S., & Colquhoun, L. (2019). *How companies put climate change finanvail risks on the books*. https://www.acuitymag.com/finance/how-companies-put-climate-change-financial-risks-on-the-books

Nahar, S., Azim, M. I., & Hossain, M. M. (2020). Risk disclosure and risk governance characteristics: evidence from a developing economy. *International Journal of Accounting & Information Management, 28*(4), 577-605.

Myers, J. N, Myers L. A., and Omer, T. C. (2003). Exploring the tern of the auditor-client relationship and the quality of earnings: A case for mandatory auditor rotation? *The Accounting Review* 78, 799-800.

Nelson, K. K., & Pritchard, A. C. (2007). Litigation risk and voluntary disclosure: The use of meaningful cautionary language. *2nd Annual Conference on Empirical Legal Studies Paper*. https://ssrn.com/abstract=998590

Newton, T., & Harte, G. (1997). Green business: Technicist kitsch? *Journal of Management Studies, 34*(1), 75-98.

Nichita, E.-M., Nechita, E., Manea, C.-L., Irimescu, A. M., & Manea, D. (2021). Are reported greenhouse gas emissions influencing corporate financial performance? *Accounting and Management Information Systems, 20*(4), 585-606.

Nor, N. M., Bahari, N. A. S., Adnan, N. A., Kamal, S. M. Q. A. S., & Ali, I. M. (2016). The effects of environmental disclosure on financial performance in Malaysia. *Procedia Economics and Finance, 35*, 117-126.

Ntim, C. G., Lindop, S., & Thomas, D. A. (2013). Corporate governance and risk reporting in South Africa: A study of corporate risk disclosures in the pre-and post-2007/2008 global financial crisis periods. *International Review of Financial Analysis, 30*, 363-383.

Nugroho, M., Arif, D., & Halik, A. (2021). The effect of financial distress on stock returns, through systematic risk and profitability as mediator variables. *Accounting, 7*(7), 1717-1724.

Nugroho, P. I., & Arjowo, I. S. (2014). The effects of sustainability report disclosure towards financial performance. *International Journal of Business and Management Studies, 3*(03), 225-239.

Nyberg, D., Ferns, G., Vachhani, S., & Wright, C. (2022). Climate change, business, and society: Building relevance in time and space. *Business & Society, 61*(5), 1322-1352.

Okereke, C., Wittneben, B., & Bowen, F. (2012). Climate change: Challenging business, transforming politics. *Business & Society, 51*(1), 7-30.

Palmer, P. D. (2008). Audit quality and financial report disclosure. *Flinders Business School Research Paper Series, 1*, 1-29.

Partalidou, X., Zafeiriou, E., Giannarakis, G., & Sariannidis, N. (2020). The effect of corporate social responsibility performance on financial performance: The case of food industry. *Benchmarking: An International Journal, 27*(10), 2701-2720.

Pincus, K., Rusbarsky, M., & Wong, J. (1989). Voluntary formation of corporate audit committees among NASDAQ firms. *Journal of Accounting and Public Policy, 8*(4), 239-265.

Pinkse, J., & Kolk, A. (2009). *International business and global climate change* (1st ed.). Routledge. https://doi.org/10.4324/9780203887103

Platonova, E., Asutay, M., Dixon, R., & Mohammad, S. (2018). The impact of corporate social responsibility disclosure on financial performance: Evidence from the GCC Islamic banking sector. *Journal of Business Ethics, 151*(2), 451-471.

Porter, M. E., & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives, 9*(4), 97-118.

Preston, L. E., & O'bannon, D. P. (1997). The corporate social-financial performance relationship: A typology and analysis. *Business & Society*, *36*(4), 419-429.

Pucheta-Martínez, M. C., Bel-Oms, I., & Rodrigues, L. L. (2019). The engagement of auditors in the reporting of corporate social responsibility information. *Corporate Social Responsibility and Environmental Management, 26*(1), 46-56.

Qiu, Y., Shaukat, A., & Tharyan, R. (2016). Environmental and social disclosures: Link with corporate financial performance. *The British Accounting Review, 48*(1), 102-116.

Rankin, M., Windsor, C., & Wahyuni, D. (2011). An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system. *Accounting, Auditing & Accountability Journal*, 24 (8), 1037-1070.

Ransley, E. (2022, January 24). Deloitte Sustainability Report finds more Australian businesses concerned about climate change. *news.com.au* https://www.news.com.au/technology/environment/climate-change/deloitte-sustainability-report-finds-more-australian-businesses-concerned-about-climate-change/news-story/dc38954728730f7a36968a7f7520947f

Rao, K. K., Tilt, C. A., & Lester, L. H. (2012). Corporate governance and environmental reporting: an Australian study. *Corporate Governance: The International Journal of Business in Society, 12*(2), 143-163.

Rehman, Z. U., Khan, A., & Rahman, A. (2020). Corporate social responsibility's influence on firm risk and firm performance: the mediating role of firm reputation. *Corporate Social Responsibility and Environmental Management, 27*(6), 2991-3005.

Retolaza, J. L. (2016). *Social accounting for sustainability monetizing the social value*. Springer. https://link.springer.com/content/pdf/10.1007/978-3-319-13377-5.pdf

Roberts, M. R., & Whited, T. M. (2013). Endogeneity in empirical corporate finance. In *Handbook of the Economics of Finance* (Vol. 2, pp. 493-572). Elsevier.

Roberts, R. W. (1992). Determinants of corporate social responsibility disclosure: An application of stakeholder theory. *Accounting, Organizations and Society, 17*(6), 595-612.

Roddan, M. (2021, June 29). *Investor groups demand climate risk disclosure overhaul*. https://www.afr.com/companies/financial-services/investor-groups-demand-climate-risk-disclosure-overhaul-20210628-p584zu

Rudebusch, G. D. (2021). Climate change is a source of financial risk. *FRBSF Economic Letter, 2021*(03), 1-6.

Russo, M. V., & Fouts, P. A. (1997). A resource-based perspective on corporate environmental performance and profitability. *Academy of Management Journal, 40*(3), 534-559.

Said, R., Zainuddin, Y. H., & Haron, H. (2009). The relationship between corporate social responsibility disclosure and corporate governance characteristics in Malaysian public listed companies. *Social Responsibility Journal, 5*(2), 212-226.

Saka, C., & Oshika, T. (2014). Disclosure effects, carbon emissions and corporate value. *Sustainability Accounting, Management and Policy Journal, 5*(1), 22-45.

Salama, A., Anderson, K., & Toms, J. S. (2011). Does community and environmental responsibility affect firm risk? Evidence from UK panel data 1994–2006. *Business Ethics: A European Review, 20*(2), 192-204.

Samaha, K., Dahawy, K., Hussainey, K., & Stapleton, P. (2012). The extent of corporate governance disclosure and its determinants in a developing market: The case of Egypt. *Advances in Accounting, 28*(1), 168-178.

Samaha, K., Khlif, H., & Hussainey, K. (2015). The impact of board and audit committee characteristics on voluntary disclosure: A meta-analysis. *Journal of International Accounting, Auditing and Taxation, 24*, 13-28.

Sari, W. P. (2020). The effect of financial distress and growth opportunities on accounting conservatism with litigation risk as moderated variables in manufacturing companies listed on BEI. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences, 3*(1), 588-597.

Schelleman, C., & Knechel, W. R. (2010). Short-term accruals and the pricing and production of audit services. *Auditing: A Journal of Practice & Theory, 29*(1), 221-250.

Schmidheiny, S., & Timberlake, L. (1992). *Changing course: A global business perspective on development and the environment* (Vol. 1). MIT Press. https://books.google.com.au/books?hl=en&lr=&id=BDYGdfiAGtoC&oi=fnd&pg=PR11&dq=Schmidheiny,+S.,+%26+Timberlake,+L.+(1992).

Schneider, R. O. (2011). Climate change: An emergency management perspective. *Disaster Prevention and Management: An International Journal, 20*(1), 53-62.

Secinaro, S., Brescia, V., Calandra, D., & Saiti, B. (2020). Impact of climate change mitigation policies on corporate financial performance: Evidence based on European publicly listed firms. *Corporate Social Responsibility and Environmental Management, 27*(6), 2491-2501.

Sevrikozi, A., & Tzika, V. (2018). The link between CSR and audit fees: Are audit fees associated with CSR? https://repository.ihu.edu.gr/xmlui/handle/11544/29093

Shabbir, M. S., & Wisdom, O. (2020). The relationship between corporate social responsibility, environmental investments and financial performance: Evidence from manufacturing companies. *Environmental Science and Pollution Research, 27*(32), 39946-39957.

Shahab, Y., Ntim, C. G., Chengang, Y., Ullah, F., & Fosu, S. (2018). Environmental policy, environmental performance, and financial distress in China: Do top management team characteristics matter? *Business Strategy and the Environment, 27*(8), 1635-1652.

Shakhatreh, M. Z., Alsmadi, S. A., & Alkhataybeh, A. (2020). The effect of audit fees on disclosure quality in Jordan. *Cogent Business & Management, 7*(1), 1771076.

Shakil, M. H. (2021). Environmental, social and governance performance and financial risk: Moderating role of ESG controversies and board gender diversity. *Resources Policy, 72*(2021), 102144.

Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *The Journal of Finance, 52*(2), 737-783.

Shrivastava, P. (1995). The role of corporations in achieving ecological sustainability. *Academy of Management Review, 20*(4), 936-960.

Siddique, M. A., Akhtaruzzaman, M., Rashid, A., & Hammami, H. (2021). Carbon disclosure, carbon performance and financial performance: International evidence. *International Review of Financial Analysis, 75*(2021), 101734.

Siew, R. Y. (2020). Climate-related financial disclosure and the property and construction sector. *Proceedings of the Institution of Civil Engineers-Engineering Sustainability, 174*(1), 3-8.

Siew, R. Y., Balatbat, M. C., & Carmichael, D. G. (2016). The impact of ESG disclosures and institutional ownership on market information asymmetry. *Asia-Pacific Journal of Accounting & Economics, 23*(4), 432-448.

Simunic, D. A. (1980). The pricing of audit services: Theory and evidence. *Journal of Accounting Research, 18*(1), 161-190.

Siregar, S. V., & Utama, S. (2008). Type of earnings management and the effect of ownership structure, firm size, and corporate-governance practices: Evidence from Indonesia. *The International Journal of Accounting, 43*(1), 1-27.

Slezak, M. (2022, February 28). *Window to save ourselves from climate change 'rapidly closing', IPCC warns*. https://www.abc.net.au/news/2022-02-28/ipcc-adaption-report-australia-not-ready-for-climate-change/100866968

Solomon, J. F., Solomon, A., Norton, S. D., & Joseph, N. L. (2011). Private climate change reporting: An emerging discourse of risk and opportunity? *Accounting, Auditing & Accountability Journal*, *24*(8), 1119-1148.

South, D., Zolton, K., & Trump, A. (2021). Expanded climate risk disclosure requirements by the Security and Exchange Commission. *Climate and Energy*, *38*(2), 1-12.

Sprengel, D. C., & Busch, T. (2011). Stakeholder engagement and environmental strategy–the case of climate change. *Business Strategy and the Environment*, *20*(6), 351-364.

Stanley, J. D. (2011). Is the audit fee disclosure a leading indicator of clients' business risk? *Auditing: A Journal of Practice & Theory*, *30*(3), 157-179.

Subramaniam, N., McManus, L., & Zhang, J. (2009). Corporate governance, firm characteristics and risk management committee formation in Australian companies. *Managerial Auditing Journal*, *24*(4), 316-339.

Suchman, M. C. (1995). Managing legitimacy: strategic and institutional approaches. *Academy of Management Review* 20, 571-610.

Sun, N., Salama, A., Hussainey, K., & Habbash, M. (2010). Corporate environmental disclosure, corporate governance and earnings management. *Managerial Auditing Journal*, *25*(7), 679-700.

Tao, N. B., & Hutchinson, M. (2013). Corporate governance and risk management: The role of risk management and compensation committees. *Journal of Contemporary Accounting & Economics*, *9*(1), 83-99.

TCFD. (2019). *FSB Task Force on Climate-Related Financial Disclosure (TCFD)*. https://www.fsb-tcfd.org/wp-content/uploads/2019/06/2019-TCFD-Status-Report-FINAL-053119.pdf

TCFD. (2021). *FSB Task Force on Climate-Related Financial Disclosure (TCFD)*. https://assets.bbhub.io/company/sites/60/2022/03/GPP_TCFD_Status_Report_2021_Book_v17.pdf

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, *43*(1), 1-19.

Treadgold, J. (2021, July 5). *Investors call for mandatory climate disclosure in Australia*. https://onimpact.com.au/investors-call-for-mandatory-climate-disclosure-in-australia/

Truong, C., Garg, M., & Adrian, C. (2020). Climate risk and the price of audit services: The case of drought. *Auditing: A Journal of Practice & Theory*, *39*(4), 167-199.

Tsamenyi, M., Enninful-Adu, E., & Onumah, J. (2007). Disclosure and corporate governance in developing countries: Evidence from Ghana. *Managerial Auditing Journal*, *22*(3), 319-334.

Tuo, L. (2015). *Three essays on the voluntary disclosure and managerial incentive*. The University of Memphis. https://www.proquest.com/dissertations-theses/three-essays-on-voluntary-disclosure-managerial/docview/1728831473/se-2

Tzouvanas, P., Kizys, R., Chatziantoniou, I., & Sagitova, R. (2020). Environmental and financial performance in the European manufacturing sector: An analysis of extreme tail dependency. *The British Accounting Review*, *52*(6), 100863.

Ullah, S., Akhtar, P., & Zaefarian, G. (2018). Dealing with endogeneity bias: The generalized method of moments (GMM) for panel data. *Industrial Marketing Management*, *71*(1), 69-78.

Ullmann, A. A. (1985). Data in search of a theory: A critical examination of the relationships among social performance, social disclosure, and economic performance of US firms. *Academy of Management Review*, *10*(3), 540-557.

Utami, R. F. (2011). Influence risk of litigation and the financial distress company's accounting conservatism. *Jurnal. Universitas Komunikasi Indonesia*.

https://elib.unikom.ac.id/files/disk1/641/jbptunikompp-gdl-renafitria-32041-10-artikel_-i.pdf
Uwuigbe, U. N., Egbide, B.-C., & Ayokunle, A. M. (2011). The effect of board size and board composition on firms corporate environmental disclosure: A study of selected firms in Nigeria. *Acta Universitatis Danubius. Œconomica, 7*(5), 164-176.
Vafeas, N., & Waegelein, J. F. (2007). The association between audit committees, compensation incentives, and corporate audit fees. *Review of Quantitative Finance and Accounting, 28*(3), 241-255.
Wagner, M., Van Phu, N., Azomahou, T., & Wehrmeyer, W. (2002). The relationship between the environmental and economic performance of firms: An empirical analysis of the European paper industry. *Corporate Social Responsibility and Environmental Management, 9*(3), 133-146.
Wallace, R. O., Naser, K., & Mora, A. (1994). The relationship between the comprehensiveness of corporate annual reports and firm characteristics in Spain. *Accounting and Business Research, 25*(97), 41-53.
Wang, F., Xu, L., Guo, F., & Zhang, J. (2019). Loan guarantees, corporate social responsibility disclosure and audit fees: evidence from China. *Journal of Business Ethics*, 166(2), 293-309.
Wang, S., Wang, H., Wang, J., & Yang, F. (2020). Does environmental information disclosure contribute to improve firm financial performance? An examination of the underlying mechanism. *Science of the Total Environment, 714*(1), 136855.
Wilson, A. B., McNellis, C., & Latham, C. K. (2018). Audit firm tenure, auditor familiarity, and trust: Effect on auditee whistleblowing reporting intentions. *International Journal of Auditing, 22*(2), 113-130.
Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press. https://books.google.com.au/books?id=hSs3AgAAQBAJ&lpg=PP1&ots=VYRTtyXYPs&dq=Wooldridge%2C%20J.%20M.%20(2010).
Wright, P., Ferris, S. P., Sarin, A., & Awasthi, V. (1996). Impact of corporate insider, blockholder, and institutional equity ownership on firm risk taking. *Academy of Management Journal, 39*(2), 441-458.
Wu, W., Peng, F., Shan, Y. G., & Zhang, L. (2020). Litigation risk and firm performance: The effect of internal and external corporate governance. *Corporate Governance: An International Review, 28*(4), 210-239.
Wuqing, W., Peng, F., Shan, Y. G., & Zhang, L. (2020). Litigation risk and firm performance: The effect of internal and external corporate governance. *Corporate Governance: An International Review, 28*(4), 210-239.
Yang, R., Yu, Y., Liu, M., & Wu, K. (2018). Corporate risk disclosure and audit fee: A text mining approach. *European Accounting Review, 27*(3), 583-594.
Zhang, K. Q., & Chen, H. H. (2017). Environmental performance and financing decisions impact on sustainable financial development of Chinese environmental protection enterprises. *Sustainability, 9*(12), 2260.
Zhu, X., Liu, R., & Chen, J. (2022). Corporate environmental investment and supply chain financing: The moderating role of environmental innovation. *Business Strategy and the Environment*, 1-23. https://onlinelibrary.wiley.com/doi/full/10.1002/bse.3205
Ziegler, A., Busch, T., & Hoffmann, V. H. (2011). Disclosed corporate responses to climate change and stock performance: An international empirical analysis. *Energy Economics, 33*(6), 1283-1294.

Zurich. (2021). *Here's how climate change will impact businesses everywhere – and what can be done*. https://www.zurich.com/en/knowledge/topics/climate-change/how-climate-change-will-impact-business-everywhereS