The impact of ESG performance on firm-idiosyncratic risk in the US and Canada

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น.ส.ณัชชา คงปรีชา

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ณัชชา คงปรีชา : The impact of ESG performance on firm-idiosyncratic risk in the US and Canada. (The impact of ESG performance on firm-idiosyncratic risk in the US and Canada) อ. ที่ปรึกษาหลัก : อ. ดร.นราพงศ์ ศรีวิศาล

This paper aims to examine how environmental, social, and governance (ESG) performance affects the idiosyncratic risk of firms in the United States and Canada between 2007 and 2020. This study retrieves ESG scores and other factors from the Refinitiv DataStream, the firms used for analysis in this paper are 480 listed companies. Results show that ESG performance can reduce idiosyncratic risk in different firms' characteristics and periods. First, ESG performance can subdue the idiosyncratic risk in both sensitive and non-sensitive industries at the same level. Second, only the environmental pillar in the sensitive industry has an additional negative influence on idiosyncratic risk due to the concentration in environmentally sensitive industries of the samples. Third, high market value firms tend to benefit more from improving ESG performance than low market value firms. Fourth, the effect size of ESG performance on idiosyncratic risk of low leverage firms is larger than high leverage firms. Fifth, ESG practice shows a more considerable effect in times of recession periods compared to normal periods. Lastly, ESG performance can subdue idiosyncratic risk of firms in covid-19 period higher than in pre-covid-19 periods.

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Field of Study:	Finance	Student's Signature .....
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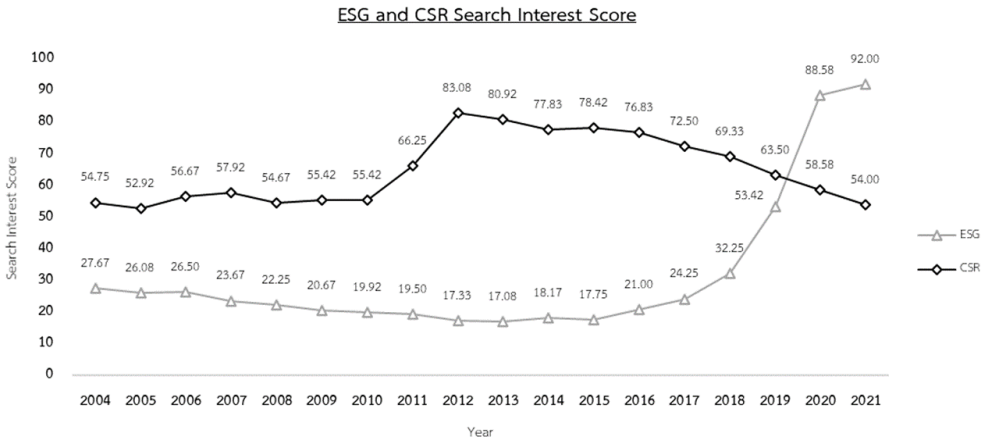
1. INTRODUCTION

1.1 Background and Motivation

Environmental, social, and governance (ESG) issues have gotten a lot of attention and importance in recent years among businesses and all stakeholders, particularly customers, employees, investors, and governments (Benlemlih et al., 2018; Cordeiro et al., 2020). The reasons behind this trend are the rise of natural disasters, CO2 emissions, climate change, and technological transformation including the change in individual behaviors and culture (PwC Survey[1], 2021). Moreover, Ernst & Young's survey in 2017 explains that ESG performance is significantly associated with both opportunity and risk. ESG standards can help businesses manage investment risk and discover new long-term opportunities. It can also assist businesses in avoiding bad financial performance as a result of inadequate environmental and social governance. The survey also suggests that as more investors become concerned about non-financial information such as a company's sustainability, ESG data is becoming more essential. Additionally, stakeholders also view the ESG factor as an indicator signaling the company's financial health, and they believe that the better the ESG initiatives, the higher the opportunities for long-term returns (PwC Report[2], 2021).

Many studies are concentrating on the Corporate Social Responsibility (CSR) issue, but there are still scarce studies investigating ESG. According to the Google Search Trend, it shows that CSR issue gained a lot more attention in the past before it began to decline continuously. On the other hand, the ESG search trend keeps rising significantly between 2018 and 2021.



Although ESG and CSR are similar in many aspects, using ESG as an indicator is more appropriate because it covers all the environmental, social, and governance issues (Chatzoglou et al., 2017; Luo et al., 2012; Matsumura et al., 2014). According to the

[1] PWC. (2021). Beyond compliance: Consumers and employees want business to do more on ESG. https://www.pwc.com/us/en/services/consulting/library/consumer-intelligence-series/consumer-and-employee-esg-expectations.html

[2] PWC. (2021). Why it's vital to your company narrative. ESG Reporting. https://www.pwc.com/us/en/services/esg/esg-reporting.html

CSR, it mostly focuses on the social issues and its measurement is not accurate as the ESG score because it cannot quantify social efforts and related sustainability aspects like ESG; CSR only help firms account for social commitments qualitatively, so ESG can capture the topics missing in the traditional investment report better than CSR (Reber et al., 2021).

ESG is commonly used to measure corporate performance in numerous studies, which can assist investors and portfolio managers in constructing higher-return portfolios. However, little research has looked into the risk associated with ESG performance, particularly the idiosyncratic risk (MSCI[3], 2018). There are three categories of risk: total risk, systematic risk, and idiosyncratic risk or unsystematic risk. Total risk is influenced by both systematic and idiosyncratic risks, and it can reflect the firm's stock volatility. The systematic risk or market risk is determined by the firm's sensitivity to economic conditions, while the firm-specific characteristic determines idiosyncratic risk and is linked to a residual risk that cannot be captured by average changes in market portfolio returns; it reflects the firm's strategy and is unaffected by market conditions (Sharpe, 1964). As a result, idiosyncratic risk is a potential risk that businesses can manage and should pay greater attention to; it also accounts for a considerable amount of a company's total risks (Gaspar & Massa, 2006; Goyal & Santa-Clara, 2003), and it is a key factor of firm success (Orlitzky & Benjamin, 2001), influencing managers, investors, and all other stakeholders.

Empirical research has demonstrated that CSR and ESG performance can lower firm financial risk due to lower loan costs (Bauer et al., 2009; El Ghoul et al., 2011; Orlitzky & Benjamin, 2001), while some have identified a negative association between environmental disclosure and firm risk (Salama et al., 2011; Sharfman & Fernando, 2008). According to legitimacy and stakeholder theories, a firm's specific risk is caused by the likelihood that the firm will fail to meet the obligation, promise, or interest of its stakeholders; this failure will put the firm under more pressure, increase operational costs, and increase the likelihood of going bankrupt. For example, a corporation that is unable to control pollution in its operating area is likely to have a poor and unfair relationship with society and its employees, putting it at risk of financial loss as a result of fines, penalties, and operational halts. To the prior study (Bassen et al., 2006), the most significant risk arising from the firm's reckless business practices is reputation damage, which will result in a drop in stakeholder trust and loyalty. As a result, sensitive industries (also known as sin industries or controversial industries) face a greater risk than non-sensitive industries, because sensitive industries have a bad reputation due to the nature of their products and manufacturing processes, which can harm human beings, ethics, morals, society, and the environment (Jo & Na, 2012). Another study also suggests that poor CSR performance may lead to an event that customers boycott a company's products (Dickson & McCulloch, 1996). However, if a company conducts business responsibly, it is less likely to suffer penalties or customer boycotts, allowing it to operate with fewer constraints. Other studies have found that environmental information transparency can give investors a better picture of a company's success; it

[3] MSCI. (2021). ESG 101: What is ESG Investing? https://www.msci.com/esg-101-what-is-esg

can show the company's smooth transition to the new climate era (Benlemlih et al., 2018), and the signal can help the company not only improve its financial practice but also reduce its financial risk (Annisa & Hartanti, 2021; Endrikat et al., 2014; King & Lenox, 2001; Misani & Pogutz, 2015; Tzouvanas et al., 2020).

In addition, the firm scale is also important to ESG performance because the large-scale companies need to face more social monitoring and supervision, hence they have a high probability to disclose more information to get sustained support from their' stakeholders which can help the firm reduces risk (Kong et al., 2020; Liu & Anbumozhi, 2009). Additionally, high-leverage firms tend to strengthen information disclosure to gain more positive attitudes and trust from creditors and underwriters. The trust and transparency then help firms to illustrate their true performances, lower the cost of borrowing, operating cost and others; the information disclosure can help reduce the probability that firms are concealing the bad news (Kong et al., 2020; McMullen et al., 1996). Therefore, high leverage and high market value firms are normally considered to have lower risk due to good corporate governance (Jensen & Meckling, 1976). On the other hand, low leverage and low market value firms tend to have higher risk due to their specific-characteristics such as high information asymmetry, high uncertainty, and high cost of borrowing (Kong et al., 2020). Therefore, if a firm with low market value and low leverage initiate the ESG practices, it can have higher benefit due to higher risk reduction.

In the world financial crisis between 2007 - 2008, ethics problems in finance and corporate governance played the important role in the bankruptcy of many big companies and it caused a huge loss of wealth all over the world (Melé et al., 2017). Therefore, ESG disclosure is essential for measuring the uncaptured factors in those periods, and it also benefits stakeholders' judgment because it helps to signal firm financial health and firm true value and also increases firms' transparency in the volatile periods, solving asymmetric information problem. Moreover, in the Covid-19 pandemic, firms are also needed to pay more attention to ESG metrics because firms need good corporate governance, sustained strategy, collaboration between private and public sectors, product innovation, and good human resource development to signal the firms' preparation and flexibility for the 'new normal'[4] or the times after the pandemic. Those signals can help the firm gains a positive reputation and gain more trust from the stakeholders leading to a reduction in unsystematic risk.

In conclusion, ESG disclosure and idiosyncratic risk are important for firms and various stakeholders because they can reflect firms' financial and non-financial health, can provide investors the information used for portfolio management strategy, it also helps the consumers who have concerned about ESG related topics to choose products,

[4] According to EY article in 2020, 'new normal' can be defined as a new concept of human mobility (it explains that people is going to work from their remote places so the work pattern style will change, and workforce will diversify around the world). 2) Labor need for better welfare and protection 3) There will be more justice action within the society such as correcting systemic racism 4) Urban landscapes will be remapped (from health care concern and remote work) 5) Remote work will transform firm's human resource requirement and management 6) The new business model will be created due to the digital transformation and the view of long-term value: Gautam Jaggi (2020). Global Markets – EY Knowledge. https://www.ey.com/en_gl/covid-19/will-you-define-the-new-normal-or-watch-it-unfold

and can motivate firms to be more concerned about environmental, social and governance issues either.

1.2 Research Question

1. Does ESG performance affect firm's idiosyncratic risk?
2. How does ESG score affect idiosyncratic risk in sensitive and non-sensitive industries?
3. How does ESG score affect idiosyncratic risk in different firm scales?
4. How does ESG score affect idiosyncratic risk in different firm leverage strategies?
5. How does ESG score affect idiosyncratic risk in different periods such as in recession and COVID-19 pandemic periods?

1.3 Objective

The main purpose of this research is to see how ESG scores affect the idiosyncratic risk of businesses with various characteristics. The research will be based on data from a corporation in the United States and Canada, which are developed market countries in the North America area.

1.4 Research Contribution

First, while many researchers have investigated CSR and various risks in prior studies, there are few studies on ESG and idiosyncratic risk. Furthermore, most studies concentrate on environmental and social issues, leaving governance out. As a result, this study will cover this gap by utilizing an ESG score, which is more accurate than the CSR factor in quantifying all environmental, social, and governance actions. This research will focus on unsystematic risk, which is critical to a firm's risk management approach.

Second, several studies also conducted by using the sample from Western countries i.e., the United Kingdom (Benlemlih et al., 2018) and Europe (Sassen et al., 2016; Tzouvanas et al., 2020), including samples from China (Cao et al., 2022; Hu et al., 2021; Kong et al., 2020), whereas this study will look at a sample of the United States and Canada, two developed market countries in the North American region; the United States and Canada can be considered one market for goods and securities (Mittoo, 1992). In 2021, the United States' share of global GDP was 24.25 percent, making it the world's largest economy, while Canada's share was 2.13 percent, totaling 26.38 percent (IMF World Economic Outlook, October 2021). Furthermore, because of the availability and diversity of the observations, doing the research utilizing data from the United States and Canada is also reliable, allowing us to investigate larger samples. Finally, the results from the samples from the United States and Canada can be applied to other nations because U.S. is the world leading multinational companies (MNCs); one- third of the top MNCs are from the United State of America. From the study of Li and Hu in 2021 (Hu & Li, 2021), they show that MNCs established in developed countries can encourage firms in emerging markets countries (EMs) to adopt the ESG practices after the expansion of the MNCs, and the transparency of disclose information also motivate individuals to realize the important of ESG information within society

(Aggarwal & Dow, 2013). As a result, leveraging data from the United States and Canada will assist enterprises and their stakeholders in a variety of countries, as ESG data usage spreads from MNCs in developed markets to emerging markets and developing countries.

Third, we will extend the research to ESG practices in sensitive industry sectors to see if they can help firms decrease idiosyncratic risk since their goods can harm people, society, and the environment. Furthermore, we investigate the mechanism of ESG performance and idiosyncratic risk for a variety of business characteristics and time periods, including firm size, leverage strategy, recession, and the Covid-19 pandemic periods. As a result, this research will fill a gap in the literature by examining the impact of numerous business characteristics related to ESG performance on idiosyncratic risk, which has never been done before by other academics.

2. LITERATURE REVIEW

2.1. Concept and Theory

2.1.1 Idiosyncratic risk (Unsystematic risk)

Idiosyncratic (also called unsystematic risk and firm-specific risk) and systematic risk (also called market risk) are the two components of firms' total risk. Systematic risk is determined by the firm's sensitivity to overall market conditions that affect all stocks, while idiosyncratic risk can be defined by the firm's unique traits and tactics; it is also tied to residual risk that the average market portfolio return cannot explain (Sharpe, 1964).

2.1.2 Stakeholder Theory

According to the notion, businesses must fulfill and serve the interests of their stakeholders (Abdullah & Valentine, 2009; Freeman, 2010). It also explains that maximizing all stakeholders interest is important equally to shareholders' interest. According to Freeman (2010), a stakeholder is a person or a group of people who are involved in the cause and effect of the firm's goals and accomplishments (e.g., customers, employees, government, creditors, suppliers, public interest groups).

Stakeholder theory is often used to present that CSR performance can help firm increase its value (Clarkson, 1995; Donaldson & Preston, 1995; Freeman, 2010). According to Freeman (2010), not only do shareholders' interests need to be included in the firm's management, but so do stakeholders' needs; meeting stakeholders' needs is the most direct approach to build value for shareholders. Furthermore, stakeholder theory states that a strong bond between a company and its stakeholders can build long-term wealth, therefore releasing financial and non-financial data to stakeholders can help a firm boost contact with stakeholders while also demonstrating firm transparency. Stakeholder information disclosure can help reduce information asymmetry by alleviating stakeholders' concerns, strengthening trust and loyalty, developing investment strategies, and demonstrating ethical consideration. Therefore, if enterprises incorporate ESG practices into their business operations in order to meet stakeholder

expectations, they will gain a competitive advantage, resulting in the long-term maximization of firm value, which is the firm's achievement in terms of maximizing shareholder interest.

2.1.5 Legitimacy Theory

Suchman (1995) explains that firms are required to act consistency and appropriately with the norms, beliefs, values, and definition of the society. (Suchman, 1995). From SpringerLink definition[5], legitimacy theory explains the responsibility of the firm in terms of fulfilling the expectation of the society by voluntarily disclosing the information about their organization behavior. Specifically, businesses must fulfill the social contract to accomplish their goals and exist in those societies and environments.

A concept also explains why a firm's actions are limited where it operates. To avoid business pressure and penalties, enterprises must follow the rules and norms established by society; thus, voluntary reporting of ESG content will have a significant long-term impact on corporate performance. To summarize, firms will gain trust and permission to use resources such as capital and labor, as well as enjoy less restrictive rules, if they can meet stakeholders' expectation and standard in terms of social norms, values, beliefs, and rules.

2.1.6 Environmental, Social and Governance (ESG)

CFA institute website defines 'environmental' or 'E' as a means of protecting the environment, focusing on CO2 emissions, climate change, deforestation, energy use, and levels of pollution in the air and water, among other things. Human rights, gender equality, data privacy and protection, customer satisfaction, employee engagement, labor standards, and other issues are discussed in the 'Social' or 'S' category. 'Governance' or 'G' is a term that refers to a company's management standard; it focuses on bribery and corruption, lobbying, audit committee structure, board makeup, and whistleblower issues.

The study also reveals that the application of non-financial evidence for investment analysis process has expanded dramatically, and it is typically utilized to assess the firm's opportunity and risk. Although there is no rule requiring companies to declare their ESG performance in their financial reports, many companies are now doing so voluntarily.

2.1.7 Corporate Social Responsibility (CSR)

CSR is defined by the European Commission as the obligation of businesses to fix or solve problems arising from their operations and strategies by collaborating with

[5] Legitimacy Theory Definition by SpringerLink: https://link.springer.com/referenceworkentry/10.1007/978-3-642-28036-8_471#:~:text=Definition,%2C%20beliefs%2C%20and%20definitions.%E2%80%9D

relevant stakeholders; all problems relating to society, consumer concerns, human rights, ethical, and environmental issues (European Commission[6] 2011).

2.1.8 Difference between ESG and CSR

ESG and CSR are commonly used to assess a company's social responsibility. ESG is more efficient and straightforward than CSR since it allows users to quantify and measure social effort into qualitative data, whereas CSR is difficult to quantify into a number. ESG and CSR are frequently utilized in research and capital markets, particularly by rating agencies and other organizations that use ESG to evaluate social responsibility performance and related investments (Bassen & Senkl, 2011; Chang et al., 2014; Eccles et al., 2014).

2.1.9 Sensitive (Controversial) and Non-Sensitive Industry Sectors

The sensitive industries include both sinful and contentious businesses, which are those that can hurt people, ethics, morals, society, and the environment (Jo & Na, 2012). Other characteristics and topics considered include political pressure and other relevant environmental and social issues that have arisen in the new period. Alcohol, tobacco, adult entertainment, gambling, oil, weaponry, nuclear, mining and steel production, chemicals, paper and pulp, and cement are among the sensitive industries. (Garcia et al., 2017; Jo & Na, 2012).

2.2. Relevant Research

The literature review is conducted based on several references related to the effect of ESG disclosure on idiosyncratic risk. Furthermore, past research on corporate social responsibility (CSR), which are comparable to ESG, are included in this literature.

2.2.1 ESG Performance and Idiosyncratic Risk

Between 2005 and 2016, Tzouvanas et al. (2020) explored the association between environmental disclosure (E) and idiosyncratic risk in European manufacturing firms. The findings demonstrate that 'E' disclosure can help investors avoid idiosyncratic risk. Furthermore, they discovered that 'E' disclosure is associated with idiosyncratic risk higher than other types of risks. In contrast, they do not explain the influence of environmental disclosure on idiosyncratic risk in other industries since they exclusively focus on manufacturing enterprises that are closely inspected and governed by environmental legislation.

Benlemlih et al. (2018) use environmental (E) and social (S) disclosure data to evaluate the influence of enterprises on total risk, market risk, and unsystematic risk in the UK from 2005 to 2013. Despite finding no association between E and S disclosures and systematic risk, they detect a strong negative correlation between E and S

[6] European Commission (2011). A renewed EU strategy 2011-14 for Corporate Social Responsibility. COM (2011) 681 final. Brussels, 25 October 2011.

disclosures and a firm's overall risk and unsystematic risk (they define it as operational risk).

Sassen et al. (2016) looks at the effect of CSP (corporate social performance) as measured by ESG components on firm risks in Europe from 2002 to 2014. They evaluated three types of risks: systematic, idiosyncratic, and total risk. They discovered that if CSP is increased, both the total and idiosyncratic will drop. According to the analysis on different 3 pillars, they confirm that 'E' performance typically lower idiosyncratic risk, but it is relevant to total risk and systematic risk only in environmentally sensitive businesses. In addition, social practice can negatively affect those 3 risks, while corporate governance practice is not related to any type of risks.

Using data from the United States between 2002 and 2018, Reber et al. (2021) analyze whether ESG disclosure and performance can decrease idiosyncratic risks on IPOs firms (initial public offerings; the first times a private company sells its stock to the public). They discover that ESG disclosure lowers unsystematic risk as well as downside tail risk, and the higher level of ESG ratings confirms a reduction in both risks during the initial phase of aftermarket trade.

By investigating listed firms in China between 2011 and 2017, Kong et al. (2020) examine the influence of ECSR (Environmental corporate social responsibility) on idiosyncratic risk. The findings reveal that when ECSR increases, idiosyncratic risk decreases significantly, with the effect being more pronounced in state-owned organizations, particularly those with weaker external monitor procedures and internal controls. They also discovered that companies with higher ESCR reveal more information, lowering the idiosyncratic risk dramatically.

Annisa and Hartanti (2019) look at the bond of ESG performance and firm risk in ASEAN-5 countries from 2011 to 2017. They use various ESG performance indicators to assess total, systemic, and idiosyncratic risks. The study finds that ESG performance has an adverse effect on total and unsystematic risk after controlling for the law enforcement between countries and other variables. Furthermore, they discover that the ESG Controversy score has no evidence of relationship with the firm-specific risk, even though it represents the firms' involvement in ESG controversial events. Overall, their findings are consistent with earlier research, indicating that improvement of ESG performance supports firm’s risk-reduction model.

Fareed et al. (2022) investigates the influence of board governance on idiosyncratic risk in Chinese publicly traded companies. They show that unsystematic risk can be subdued if Chinese firm have strong board governance. They also illustrate that foreign and non-state-owned enterprises are more effective in terms of limiting unsystematic risk than state-owned and private companies. All in all, they find that board governance has a considerably higher influence on idiosyncratic risk (Fareed et al., 2022).

2.2.2 ESG Disclosure and Stock’s Performances and Volatility

Broadstock et al. (2021) explores the connection between ESG performance and the firms' performance as well as firms' risk in the period of COVID-19 pandemic. They discovered that low-ESG application portfolios underperformed high-ESG portfolios, using a dataset from CSI300 between 2019 to 2020. Additionally, they discovered that ESG practice minimizes firms' risk during financial crises although it has less impact during regular times (Broadstock et al., 2021).

2.2.3 CSR Disclosure and Idiosyncratic Risk

According to Cheng et al. (2014), companies with high disclosure of CSR activities can subdue idiosyncratic risk or they are relatively independent from capital restrictions, and it is simpler to raise more funds from stakeholders due to increased openness (Cheng et al., 2014). Furthermore, Husted (2005) demonstrates that investing in CSR is a vital technique for managers to reduce a company's business risk (Husted, 2005).

Hu et al. (2021) examines the connection of firm's CSR and idiosyncratic risk during 2010 to 2018 by using data from the Shanghai Stock Exchange. They discovered that increasing in CSR level leading to the lower level of company-specific risk. They also discover that there is a stronger negative bond between CSR and unsystematic risk in a state-owned corporation (Hu et al., 2021).

Becchetti et al. (2015) introduced that the relationship between the idiosyncratic risk and aggregated CSR performance is positive since CSR might limits firms' flexibility in responding to the shocks. Specifically, CSR will not allow firms to freely lower stakeholder well-being in times of high volatility, resulting in a cost-benefit trade-off condition so their performance will be more volatile, and it can cause a conflict between stakeholders and firms (Becchetti et al., 2015).

2.2.4 Impact of CSR/ ESG in Sensitive Industry Sectors on Firm's Performance and Risk

Garcia et al. (2017) investigate whether ESG performance is relevant to a company's financial profile in sensitive industries, using a sample of BRICS countries from 2010 to 2012. According to the findings, organizations designated as sensitive industries do better in terms of environmental performance.

Jo and Na (2012) use data from firms in the United States since 1991 to 2010 in order to find the connection between CSR and firm total risk in controversy industries (alcohol, gambling, tobacco, adult entertainment and others) and they discovered the adverse relationship between CSR and firms' risk in those sectors. They also look into the differences between CSR engagement in controversial and non-controversial enterprises, finding that CSR activities in controversial industries are more substantial or have a negative influence on the firm than in non-controversial industries. As a result, their findings are consistent with those of others, and they suggest that enterprises in sensitive industries are always more risk averse than those in other industries, and that CSR policies aid their risk management efforts.

2.3. Hypothesis Development

The connection between ESG or CSR practice and idiosyncratic risk has been pointed as a negative relationship according to the concept and theory described in the preceding sections. Furthermore, they demonstrate that the ESG performance has a negative association with the idiosyncratic risk of several corporate features. As a result, this study will employ those literatures to build the hypothesis and present the concepts and theories that were used in the hypothesis.

To begin, stakeholder theory is one of the most essential theories for measuring the impact of CSR and ESG performance since it suggests that businesses are responsible for the interests of their stakeholders (which include consumers, employees, suppliers, creditors, governments, and public interest groups). CSR and ESG-related actions can assist a company develop a positive reputation and improve relationships and sentiments with its stakeholders; a positive reputation can also help a company reduce operational risk, which is described as an idiosyncratic risk (Annisa & Hartanti, 2021; Miralles-Quirós et al., 2018). Moreover, a positive coordination between a company and its stakeholders can generate long-term wealth for the company because it can creates a competitive advantage, resulting in long-term value maximization and shareholder satisfaction (Connelly et al., 2011). ESG disclosure also aids companies in reducing information asymmetry, increasing transparency, and building trust among stakeholders. As a result, stakeholders prefer to deal with companies that are more transparent since they have lower capital costs, reduced operating costs, and smoother company operations, all of which reduce operational risk (Husted, 2005; Jones, 1995; Kong et al., 2020; Miralles-Quirós et al., 2018).

Legitimacy and favorable stakeholder attitudes also serve to minimize a corporation's idiosyncratic risk since it provides the justification that a firm that implements a corporate responsibility strategy has an easier time obtaining financial resources than a non-legitimized firm because of excellent connections with regulators, society, and other stakeholders (Cheng et al., 2014; Jo & Na, 2012; Miralles-Quirós et al., 2018). Furthermore, a corporation with strong legitimacy is less vulnerable to criticism since their institutional standards can reduce external agent inspections and financial restraints which also help lowering operating and capital costs (Cheng et al., 2014; Reber et al., 2021).

All in all, if enterprises engage in ESG practices, they can cut operational costs, cost of capital, risk of penalty, inspection, and regulation from external agents, as well as the likelihood of customers boycotting their products; these aspects are referred to as idiosyncratic risk. Based on these principles, we suggest the first hypothesis:

H1: ESG overall score has a negative relationship with idiosyncratic risk.

According to the prior studies, the impact of the ESG factors on business activities are different depending on the nature or industry of those companies, hence ESG disclosure need to be analyzed on an industry-specific basis (Eccles et al., 2012; Sassen et al., 2016).

This study will follow the description and recommendations found in previous literatures on CSR in sensitive industry sectors. The sensitive industries are those that must adhere to reasonable socially responsible norms, as well as those that are associated with societal taboos, moral disputes, political pressures, and emerging environmental, social, or ethical challenges (Cai et al., 2012; Garcia et al., 2017; Jo & Na, 2012; Lee & Faff, 2009).

Furthermore, previous study has looked into CSR practices in controversial companies and discovered that they have a detrimental impact on firm-specific risk. They also discovered that the risk-reduction benefit is greater in sensitive industry firms than in non-sensitive industry firms because sensitive firms are more likely than other industries to implement CSR-related policies and procedures to meet their public legitimacy needs.

To conclude, if firms in sensitive industries have good ESG performance, the impact on idiosyncratic risk is going to be significantly negative than the non-sensitive industries (firm that has less concern on the idiosyncratic risk), and this leads researcher to the second hypothesis:

H2a: ESG overall score of sensitive industry has higher negative relationship with idiosyncratic risk than other industries.

Different dimensions in ESG practice aggregated in ESG overall score might have various contribution to firm-specific risk because those three dimensions highlight different types of stakeholder concerns and standards (Bouslah et al., 2013; Eccles et al., 2012; Sassen et al., 2016). As a result of those 3 pillars diversity , market will have differentiated reaction on unsystematic risk: although two companies in different industries may have the same overall ESG score, their E, S, and G scores may differ leading to various effect on idiosyncratic risk depending on industry characteristic (Bouslah et al., 2013; Sassen et al., 2016). To illustrate, local community may concern about pollution emission from nearby factory more than corporate governance issue, so firm are forced to pay more attention and consideration on eco-friendly policy and environmental responsibility. Hence, E pillar in this manufacturing sector may have a greater impact on idiosyncratic risk than other pillars.

According to previous research, the environmental pillar is more likely to reduce the risk of manufacturing companies. Others agree that E and S pillar disclosure can reduce idiosyncratic risk by boosting stakeholders' positive perceptions of companies' goals, and social irresponsibility is associate with higher firm's risks (Benlemlih et al., 2018; Cheng et al., 2014; Tzouvanas et al., 2020). Furthermore, companies ,who incorporate environmental and social responsibility in their investment, can publish their transparency and can boost stakeholder trust, which leads to a relaxation of environmental and social rules and monitoring. (Reinhardt & Stavins, 2010; Tzouvanas et al., 2020). To conclude, enterprises that practice environmental and social responsibility can benefit from strong relationships with a variety of stakeholders, such as lower operational and capital costs, and greater access to financial

resources, all of which are consistent with the legitimacy and stakeholder theories (Jones, 1995; Tzouvanas et al., 2020). Lastly, several research suggest that board quality and other corporate governance (included in the G pillar) might influence firms' idiosyncratic risk, and that long-term shareholder can guide managers to implement additional CSR investment and lower company risk. (Kaiser, 2020).

To sum up, this research would like to give an additional aspect on the impact of the three dimensions of ESG on idiosyncratic risk and also accumulate the sensitive industries analysis who are likely to be exposed to higher risk level due to their product natures and manufacturing processes. Environmental, social, and governance practices (as measured by the E, S, and G pillar scores) are expected to assist business reducing idiosyncratic risk since E-S-G activities can help firms serve the interests of stakeholders.

H2b: E, S and G pillar scores have higher negative relationship with firm-idiosyncratic risk in sensitive industries.

Large-scale enterprises tend to confront more social monitoring and public inspection than small-scale companies, so they normally provide more information in order to promote their transparency and maintain stakeholders support leading to a low risk-profile and can benefit less from ESG performance (Kong et al., 2020).

High-leverage firms generally announce firm financial and non-financial information frequently as a result of creditor and underwriter demand for assessing new loan or new investment. Those disclosures are contributed to a higher level of firm transparency and trust, resulting in a reduction in firm-specific risk; creditors can use the revealed information to assess firm's true performance and there is less likelihood that firms can conceal the bad news (Kong et al., 2020; McMullen et al., 1996).

As a consequence of their solid corporate governance and high transparency, high leverage and high market value companies are typically assumed to have lower risk than low-leverage and low-market value firms (Jensen & Meckling, 1976). Specifically, those low leverage and low market value enterprises are more likely to face higher risk due to their characteristics such as high information asymmetry, low transparency and low chance of being certificated by external organizations, resulting in a low trust and low credit as well as a high cost of operating and borrowing (Kong et al., 2020). In conclusion, if a company with a low market value and low leverage implements ESG practices, it can reap greater benefits due to greater risk reduction; the risk-reduction hypothesis is as follows.

H3: ESG overall score has higher negative impact on idiosyncratic risk if firm is low market value type.

H4: ESG overall score has higher negative impact on idiosyncratic risk if firm is low leverage firm.

During the recession period when the economic growth is below zero percent, several companies faced the financial difficulties and some went bankruptcy due to their fragile corporate governance structure, unsustainable development plan and low

ethical issue concerns. As a result, ESG disclosure is critical for measuring unquantified aspects during such a high-risk time, and benefit stakeholders' judgment by signaling firm's strong financial health and flexibility including well-sustainable development plan, resolving asymmetric information problems, and boosting their creditworthiness and increase stakeholders' trust over time. Hence, we will inspect the influence of ESG performance on idiosyncratic risk during recession period comparing to a normal time (recession periods are 2008, 2009, and 2020, when the US's GDP growth is less than zero percent); the risk-reduction hypothesis will be as follows.

H5: ESG overall score has high negative impact on idiosyncratic risk in recession period.

Besides, in the case of the Covid-19 pandemic, companies must pay more attention to ESG metrics because companies must deal with a lot of business uncertainty and difficulty, and ESG practice is one of the key roles that can protect them from unexpected events such as bankruptcy, factory shutting down and supply chain disruption; good ESG practice can demonstrate good corporate governance, a sustainable development plan, and good human resource structure, all of which help them signal their readiness and their flexibility to move on to the 'new normal'[7]. According to those development aspects in covid-19 period, company are believed to have good fundamental, competitive advantages and high chance of survival, so they can acquire more shareholders and stakeholders' trust as well as gaining higher creditworthiness, resulting in a lower idiosyncratic risk (Broadstock et al., 2021); the risk-reduction hypothesis will be as follows:

H6a: ESG overall score has high negative impact on idiosyncratic risk in the period of Covid-19 pandemic.

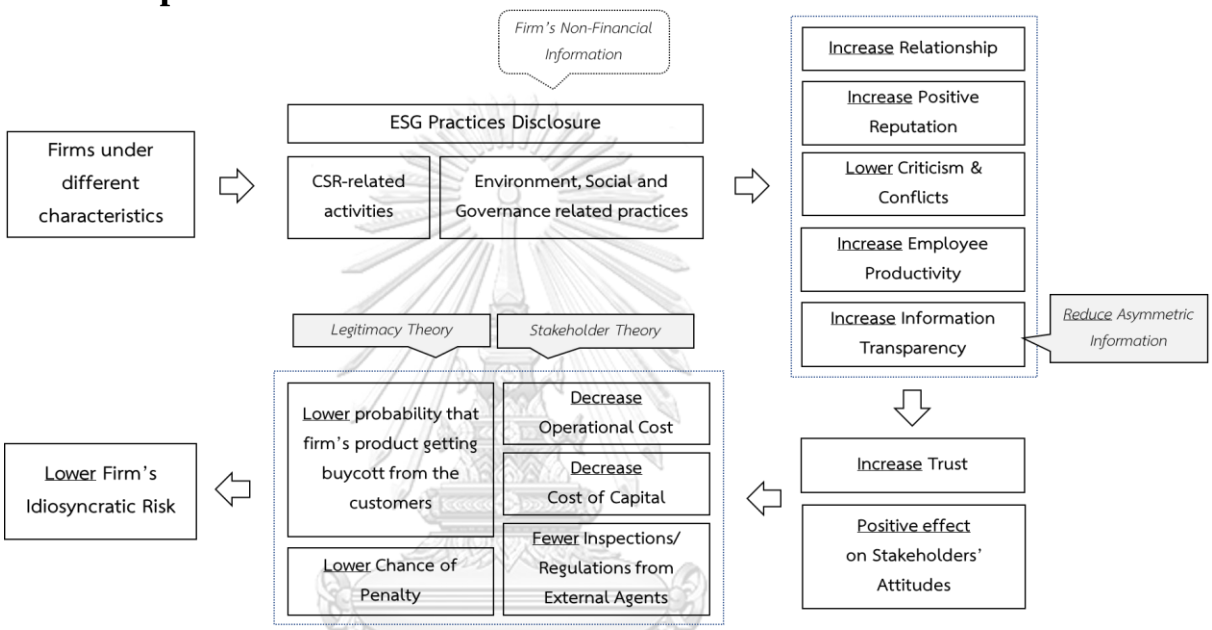
Further, the E, S, and G pillars can have diverse effects on business risk in the Covid-19 period since they reflect firms' different fundamentals and strategies. The environment pillar can be applied to highlight a company's R&D strategy or product innovation in order to adapt to the new normal. The social pillar may reflect the firm's human resource structure, which is strongly linked to the main stakeholder (employee) during the pandemic; the virus has directly affected human resource, so if any companies have good working conditions, good career development & training plans, including good health and safety procedures, they can continue operating their businesses as usual (still have cash flow) or have less impact from the pandemic. Strong corporate governance (G pillar) and good treatment for shareholder should help safeguard a firm's stability and provide more resilience to any shock event (Broadstock

[7] According to EY article in 2020, 'new normal' can be defined as a new concept of human mobility (it explains that people is going to work from their remote places so the work pattern style will change, and workforce will diversify around the world). 2) Labor need for better welfare and protection 3) There will be more justice action within the society such as correcting systemic racism 4) Urban landscapes will be remapped (from health care concern and remote work) 5) Remote work will transform firm's human resource requirement and management 6) The new business model will be created due to the digital transformation and the view of long-term value: Gautam Jaggi (2020). Global Markets – EY Knowledge. https://www.ey.com/en_gl/covid-19/will-you-define-the-new-normal-or-watch-it-unfold

et al., 2021). As a result of the robust business structure and creditworthiness of the firms in this unpredictable market, those three characteristics of ESG practice may assist firms decreasing idiosyncratic risk greater than in the pre-Covid-19 times; the hypothesis is as follows.

H6b: E, S and G pillar scores have higher negative relationship with firm-idiosyncratic risk in the period of Covid-19 pandemic.

2.4 Conceptual Framework



3. DATA

3.1. Data Sample

This study chooses the developed market countries in North America, namely the United State of America (U.S.) and Canada as the locus of the study; U.S. and

Canada can be assumed as one market for goods and securities (Mittoo, 1992). According to the past research, there are not enough studies in the US and Canada context presenting the connection of ESG and firm's idiosyncratic risk highlighting on firm different characteristic: most of the studies on this topic and related topics frequently examining the Europe countries (Sassen et al., 2016; Benlemlih et. al., 2018, Tzouvanas et al., 2020),as well as China (Fareed et al., 2022; Cao et al., 2022; Hu et al., 2021; Kong et al., 2020) and the emerging market countries such as BRICS countries (Garcia et al., 2017) and ASEAN-5 Countries (Annisa & Hartanti, 2021). Although there are other studies which are done in the U.S., those research focus on different points of view from this study (Habib et al., 2015; Jo & Na, 2012; Reber et al., 2021).

The initial sample consist of all active companies in the U.S. and Canada countries that are collected from Refinitiv Datastream from 2007 to 2020 in a column name "Country of Headquarter" (also known as Country of Domicile). Researcher uses this source due to the available of long-term data period. The number of companies that are selected equal to 480, hence the number of observations equal to 6,720 firm-year. In addition, we also collect the stock price in daily basis from Refinitiv Datastream and other variables used in FAMA-French 3 Factors model are retrieved from Kenneth R. French's website using North American 3 Factors [Daily] for Developed Markets data set, hence we get 1,808,730 firm-day sample for the idiosyncratic risk calculation.

Researcher follows the prior studies in terms of choosing sensitive industries. The sensitive industries covering both sinful and controversial industries as well as environmentally sensitive industries which are the types of industry that can harm human being, ethic, moral, society and environment. It also considering other aspects and issue such as political pressure and other related environmental, social issues arising in the new era. Therefore, the sensitive industries will comprise of alcohol, tobacco, adult entertainment, gambling, oil and gas, weapons, nuclear, mining and steel making, chemicals, paper and pulp (Garcia et al., 2017; Jo & Na, 2012; Lee & Faff, 2009; Richardson & Welker, 2001). However, after observing the available of the data, there are some missing industries such as adult entertainment, weapons and nuclear and the left industries are relatively related to environmentally sensitive industries. After we got all the available data, we grouped all the sensitive industry in 1 group and the rest will be non-sensitive industries: the industry name is defined by NAICS (International Industry Name; Primary North American Industry Classification System). The table 1 will show the number of companies in each industry.

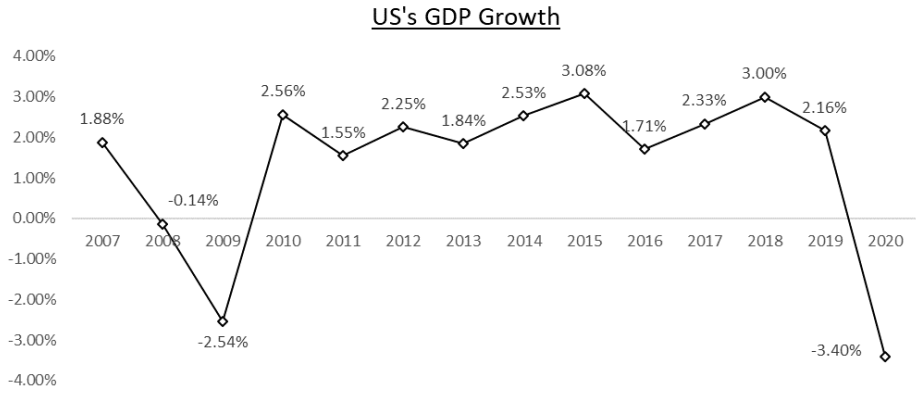
Table 3.1 Samples by Industry

Industry	Company	Observations
1. Sensitive Industry	**104**	**1456**
Casino Hotels	3	42

Chemical Manufacturing	26	364
Mining (Except oil and Gas)	22	308
Nuclear Electric Power Generation	2	28
Oil and Gas Extraction	25	350
Paper Manufacturing	5	70
Petroleum and Coal Products Manufacturing	4	56
Plastics and Rubber Product Manufacturing	3	42
Primary Metal manufacturing	4	56
Support Activities for Mining	9	126
Tobacco	1	14
2. Non-Sensitive Industry	**376**	**5,264**
Total	**480**	**6720**

In addition, the market value and leverage will be retrieved from Refinitiv Datastream. The high (low) market value firms will be defied by the median of the firm's average market value: firm with average market value higher (lower) than the median is high (low) market value firm. The high (low) leverage firms will be defied by the median of the firm's average leverage: firm with average leverage higher (lower) than the median is high (low) leverage firm.

The periods of recession are 2008, 2009 and 2020 when the US's GDP growth is less than zero percent as shown in the graph below. In addition, the Covid-19 pandemic event is occurred in US in 2020, then we will use the observation in year 2020 for analyzing.



3.2. Dependent Variable: Idiosyncratic Risk

There are several methods for calculating the idiosyncratic risk (IDIOR): most prior studies picked the Fama French (FF) three-factor model since its application are not complex and the result are relatively reasonable (Fu, 2021; Habib et al., 2015; Hu

et al., 2021; Kong et al., 2020; Reber et al., 2021). The Fama French (FF) three-factor model is illustrated below:

$$R_{i,d} - R_{f,d} = \alpha_i + \beta_i (R_{m,d} - R_{f,d}) + s_i SMB_d + h_i HML_d + u_{i,d}$$

The left part of the equation, $R_{i,d} - R_{f,d}$ is the excess returns of stock *i* on day *d* while $R_{i,d}$ is stock *i* rate of return on day *d* and $R_{f,d}$ is risk-free rate on day *d*. For the right side, alpha (α_i) shows the stock performance relative to the market portfolio (regression constant term of stock *i*), $(R_{m,d} - R_{f,d})$ is the excess return on the market portfolio, SMB_d measures the return of small over large stocks, and HML_d is the return of value stock over growth stocks while $u_{i,d}$ is the residuals of stock *i* on day *d*.

To find the idiosyncratic risk, researcher first perform the Ordinary Least Squares (OLS) model regressed on FF three-factor model, repeating this step until we get SERs (standard deviation of residual) of all companies per year. Then, we calculate the idiosyncratic risk ($IDOR_i$) by annualizing the SERs with $T \approx 251$ (*T* is corresponded to trading days of each year, Tzouvanas et al, 2020), and *t* defines the '*year*' of the sample so $IDOR_{i,t}$ is the idiosyncratic risk of stock *i* on year *t*.

$$IDIOR_{i,t} = SER_{i,t} \times \sqrt{T}$$

3.3. Independent Variable: ESG Factors

ESG factors comprises of 10 major issues and the overall score are weighted 3 pillar scores, the scores are ranged between 0 and 100 based on Refinitiv Datastream. The description of those 3 pillars is presented in the table below:

Table 3.3.1 ESG pillar score description by Refinitiv Datastream

ESG Factor		
Environmental	**Social**	**Governance**

Resource use - Reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.	**Workforce** - Measures a company's effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.	**Management** - Measures a company's commitment and effectiveness towards following best practice corporate governance principles
Emissions Reduction - Measures a company's commitment and effectiveness towards reducing environmental emissions in its production and operational processes.	**Human rights** - Measures a company's effectiveness in terms of respecting fundamental human rights conventions.	**Shareholders** - Measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.
Innovation - Reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes, or eco-designed products.	**Community** - Measures the company's commitment to being a good citizen, protecting public health and respecting business ethics.	**CSR Strategy** - Reflects a company's practices to communicate that it integrates economic (financial), social and environmental dimensions into its day-to-day decision-making processes
	Product Responsibility - Reflects a company's capacity to produce quality goods and services, integrating the customer's health and safety, integrity, and data privacy.	

3.4 Control and Moderator Variables

We included various firm characteristics as control variables based on the prior studies (Sassen et al, 2016; Annisa & Hartanti, 2019; Kong et al, 2020). **(1)** We control the firm size (Size) measured as natural log of total assets in USD because big firms are better at managing risk, particularly during periods of high. **(2)** We control Book-to-market ratio (BTM) because firms with low BTM could have more volatility in price and higher crash risk, BTM is calculated by book value per share divided by share price. **(3)** We control return on assets (ROA) because larger firm's profit contributing to a lower level of firm risk, a ratio of net income to total assets. **(4)** We use loss (Loss) as a dummy variable because firms with high loss will become more risky: net profit less than $0, then it is defined as 1. **(5)** We control for the board of directors' size (Board), the total number of directors, because the prior study finds that the larger Board resulting in less risk level. **(6)** We control the annual stock return considering the reinvestment of cash dividends (RET) because the previous study finds the positive connection between firm risk and *RET*. **(7)** We control leverage ratio (LEV); total debt to total assets ratio, in order to control the influence of capital structure of the firm on business risk **(8)** We lastly include a total asset growth (Asset_G) in control variable

because the larger a company's asset growth, the riskier it is: *Asset_G* equal to the growth of total asset between current and previous year.

The moderator variables consist of **(1)** Industry Dummy (sensitive industry equal to 1), **(2)** Market Value Dummy (low market value equal to 1), **(3)** Leverage Dummy (low leverage equal to 1, **(4)** Recession Dummy (recession periods equal to 1) and **(5)** Covid-19 Dummy (Covid-19 period equals to 1).

3.5 Variable definitions and measures

The table 2 will show the various variables that we use in this study including description, type, concept, source, and the researchers from prior studies.

Table 3.5.1 Variable Description

Variable	Description	Frequency	Source
R (*i, d*)	Returns of stock *i* on the d day calculated by using stock price in USD unit; (%)	daily	Refinitiv
R *(f,d)*	The risk-free rate (U.S. one month T-bill rate); (%)	daily	Refinitiv
R *(m,d)*	Market Returns is the return on a region's value-weight market portfolio; (%)	daily	Refinitiv
SMB *(d)*	Excess returns of small-cap companies over large-cap companies; (%)	daily	Refinitiv
HML *(d)*	Excess returns of value stocks (high book-to-price ratio) over the growth stocks (low book-to-price ratio); (%)	daily	Refinitiv
IDIOR	Idiosyncratic Risk (%)	annual	Calculation
ESG Score	ESG Score (score ranged from 0 -100)	annual	Refinitiv
E Score	Environmental Pillar Score (score ranged from 0 -100)	annual	Refinitiv
S Score	Social Pillar Score (score ranged from 0 -100)	annual	Refinitiv
G Score	Governance Pillar Score (score ranged from 0 -100)	annual	Refinitiv
Size	Log (natural log) of total assets; (USD)	annual	Refinitiv
BTM	Book-to-market-ratio (%)	annual	Refinitiv
ROA	Return on asset (%)	annual	Refinitiv
Loss	Net profit of companies <0 = 1 (dummy)	annual	Refinitiv
Board	Size of board of directors; total number of directors (person)	annual	Refinitiv
RET	Annual stock returns considering reinvestment of cash dividend (%)	annual	Refinitiv
LEV	The total debt to total assets ratio (%)	annual	Refinitiv
ASSET_G	Total Asset growth between year t and t-1; (%)	annual	Refinitiv
D_Ind	Industry name defined by NAICS; Dummy: Sensitive industry = 1	static	Refinitiv
D_MV	Dummy: Low Market Value Firm = 1	static	Refinitiv
D_LEV	Dummy: Low Leverage Firm = 1	static	Refinitiv
D_Rec	Dummy: recession period = 1 (Use GDP as indicator: Y2008,2009,2020)	static	-
D_Covid	Dummy: Covid-19 period = 1 (Y2020)	static	-

4. METHODOLOGY

To fulfill the objectives and examine the hypotheses of this research; to examine the existence of a connection between idiosyncratic risk and ESG implementation in U.S. and Canada between 2007 and 2020.

To obtain idiosyncratic risk data, we compute the idiosyncratic risk by applying Fama French three-factor model, running Ordinary Least Square (OLS) regression with 1,808,730 firm-day observations. After obtaining the SERs of each company per year, we annualize them with 251 (the number of trading day per year) then we get 6,720 firm-year observations of idiosyncratic risk.

The relationship of ESG overall score and idiosyncratic risk is estimated by panel data regression model. The first equation to be tested is:

Equation 1

$$IDIOR_{i,t} = \beta_1 \, ESG\ Score_{i,t} + \sum_{k=1}^{8} Y_k \, Control_{k,i,t} + u_{i,t}$$

Equation 2

$$IDIOR_{i,t} = \beta_1 \, ESG\ Score_{i,t} + \beta_2 \, ESG\ Score_{i,t} * D\_Ind_i + \sum_{k=1}^{8} Y_k \, Control_{k,i,t} + u_{i,t}$$

Equation 2.1

$$IDIOR_{i,t} = \beta_1 \, E\ Score_{i,t} + \beta_2 \, S\ Score_{i,t} + \beta_3 \, G\ Score_{i,t} + \beta_4 \, E_{i,t} * D_{Ind\,i} + \beta_5 \, S_{i,t} * D_{Ind\,i} \, \beta_6 \, G_{i,t} * D\_Ind_i + \sum_{k=1}^{8} Y_k \, Control_{k,i,t} + u_{i,t}$$

Equation 3

$$IDIOR_{i,t} = \beta_1 \, ESG\ Score_{i,t} + \beta_2 \, ESG\ Score_{i,t} * D\_MV_i + \sum_{k=1}^{8} Y_k \, Control_{k,i,t} + u_{i,t}$$

Equation 4

$$IDIOR_{i,t} = \beta_1 \, ESG\ Score_{i,t} + \beta_2 \, ESG\ Score_{i,t} * D\_LEV_i + \sum_{k=1}^{8} Y_k \, Control_{k,i,t} + u_{i,t}$$

Equation 5

$$IDIOR_{i,t} = \beta_1 \, ESG\ Score_{i,t} + \beta_2 \, ESG\ Score_{i,t} * D\_Rec_t + \beta_3 \, D\_Rec_t + \sum_{k=1}^{8} Y_k \, Control_{k,i,t} + u_{i,t}$$

Equation 6

$$IDIOR_{i,t} = \beta_1 \, ESG\ Score_{i,t} + \beta_2 \, ESG\ Score_{i,t} * D\_Covid_t + \beta_3 \, D\_Covid_t + \sum_{k=1}^{8} Y_k \, Control_{k,i,t} + u_{i,t}$$

Equation 6.1

$$IDIOR_{i,t} = \beta_1\, E\ Score_{i,t} + \beta_2\, S\ Score_{i,t} + \beta_3\, G\ Score_{i,t} + \beta_4\, E_{i,t} * D\_Covid_t + \beta_5\, S_{i,t} * D\_Covid_t + G_{i,t} * D\_Covid_t + \sum_{k=1}^{8} \Upsilon_k\ Control_{k,i,t} + u_{i,t}$$

While:

i = 1 to 480

t = 2007 to 2020

k = 1 to 8 (control variables: Size, BTM, ROA, Loss, Board, RET, LEV, ASSET_G)

According to hypothesis, we apply the equation 1 to 6 in order to examine the connection of ESG overall score on idiosyncratic risk (IDIOR). After testing all the above equations on both fixed effect (FE) and random effect (RE) models, we found that FE estimators fit to our data better than RE estimators; we have done the Hausman test to examine the better model for our data and the result presenting that we can reject the null hypothesis, hence the FE estimators are the best fit model for our data. Therefore, the unobserved fixed effects or the time-invariant factors of each individual in our models are now eliminated.

First, we perform the tests on equation 1 for the hypothesis 1. Second, model 2 with interaction terms will be tested for hypothesis 2a to compare the difference in ESG-effect size between sensitive and non-sensitive industries, while equation 2.1 with separated E-S-G scores and interaction terms will be tested for hypothesis 2b which will explain the different effect of ESG on IDIOR between those 2 industries. Third, we will test equations 3 and 4 for hypothesis 3 and 4 to examine the different levels of impact of ESG on idiosyncratic risk between high and low market value firms as well as high and low leverage firms. In addition, we will test equation 5 for hypothesis 5, so we can see the result of the interaction between ESG and recession period, and we can also illustrate the different impact size of ESG in the times of recession and normal period. Lastly, we will test equation 6 and 6.1 for hypothesis 6a and 6b, the model 6 will confirm us the different levels of the impact of ESG on IDIOR for both Covid-19 period, and pre-Covid-19 period, while model 6.1 will compare the level of the connection between those 2 periods with separated E-S-G pillars.

Table 4.1 Summary Methodology

Hypothesis	Equation	Best-fitting Model
H1: ESG overall score has a negative relationship with idiosyncratic risk.	1	FE
H2a: ESG overall score of sensitive industry has higher negative relationship with idiosyncratic risk than other industries.	2	FE
H2b: E, S and G pillar scores have higher negative relationship with firm-idiosyncratic risk in sensitive industries.	2.1	FE
H3: ESG overall score has higher negative impact on idiosyncratic risk if firm is low market value type.	3	FE
H4: ESG overall score has higher negative impact on idiosyncratic risk if firm is low leverage firm.	4	FE
H5: ESG overall score has high negative impact on idiosyncratic risk in recession period.	5	FE
H6a: ESG overall score has high negative impact on idiosyncratic risk in the period of Covid-19 pandemic.	6	FE
H6b: E, S and G pillar scores have higher negative relationship with firm-idiosyncratic risk in the period of Covid-19 pandemic.	6.1	FE

5. RESULTS AND DISCUSSION

5.1 Descriptive Statistics

Table 5.1.1 reports the descriptive statistics of all variables used in this study. It shows that the mean value of the idiosyncratic risk (IDIOR) is 26.498%, while the standard deviation is 15.865%; this shows that the idiosyncratic risks of firms are significantly volatile. According to the ESG scores, their ranges are between 1 – 100 and the mean values of the ESG score, E score, S score and G score are 51.434, 44.316, 52.719 and 56.896 respectively. Hence, we can describe that firms on average are concerned and do better in governance practice, while environmental performance is concerned the least. In addition, the standard deviation of the E score is the highest with 28.807, while the standard deviations of ESG score, S score and G score are quite close to each other with 19.989, 21.936 and 21.621 respectively. Therefore, it can be interpreted that firms are concerned about the level of environmental performances differently.

Table 5.1.1 Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Dependent					
IDIOR (%)	6720	26.498	15.865	7.34	171.661
Independent					
ESG Score	6720	51.434	19.989	0.51	95.15
E Score	6720	44.316	28.807	0	98.55
S Score	6720	52.719	21.936	0.16	97.89
G Score	6720	56.896	21.621	0.45	99.51
Control					
Size	6720	16.411	1.518	9.543	21.943
BTM (%)	6720	53.474	59.672	-666.667	1000
ROA (%)	6720	5.748	8.485	-113.65	57.35
Loss (Dummy)	6720	0.144	0.352	0	1
Board (%)	6720	10.818	2.506	2	35
RET (%)	6720	13.681	47.78	-97.253	1774.262
ASSET G (%)	6720	8.556	32.477	-97.603	662.849
LEV (%)	6720	27.229	17.874	0	126.41

Table 5.1.2 provides the descriptive statistics of firm with different characteristic and periods. According to the data, the means of idiosyncratic risk (IDIOR) of firms in sensitive industry are higher than non-sensitive industry and their standard deviation are wider than the latter industry either. Additionally, the high market value and high leverage firms are on average less risky and have smaller standard deviations than low market value and low leverage firms respectively. Lastly, the idiosyncratic risk mean values are much greater in recession and covid-19 periods as well as the standard deviations. To sum up, the levels of idiosyncratic risk of each firm characteristic and in different time periods are all supporting this study's assumptions and previous studies (Broadstock et al., 2021; Garcia et al., 2017; Kong et al., 2020).

Table 5.1.2 Descriptive Statistics of firms' characteristics and in different periods

Variables		Characteristic										
		Conso.	Industry		Market Value		Leverage		Recession		Covid-19	
			Sensitive	Non-Sensitive	High	Low	High	Low	Yes	No	Yes	No
IDIOR	Mean	26.498	33.41	24.59	25.16	27.84	25.65	27.35	41.05	22.53	38.88	25.55
	SD	*15.865*	*18.83*	*14.37*	*14.78*	*16.78*	*15.23*	*16.44*	*20.49*	*11.51*	*18.95*	*15.19*
ESG Score	Mean	51.434	50.5	51.69	60.62	42.25	52.24	50.63	50.01	51.82	62.16	50.61
	SD	*19.989*	*21.92*	*19.42*	*17.44*	*18.06*	*20*	*19.95*	*20.91*	*19.71*	*16.78*	*19.98*
E Score	Mean	44.316	46.45	43.73	53.64	34.99	45.31	43.32	42.16	44.91	57.93	43.27
	SD	*28.807*	*28.33*	*28.91*	*26.88*	*27.63*	*28.83*	*28.76*	*29.46*	*28.6*	*24.51*	*28.85*
S Score	Mean	52.719	48.81	53.8	59.34	46.1	53.21	52.23	51.98	52.92	64.52	51.81
	SD	*21.936*	*24.24*	*21.13*	*20.95*	*20.88*	*22.35*	*21.51*	*22.66*	*21.73*	*19.84*	*21.83*
G Score	Mean	56.896	59.13	56.28	69.61	44.18	58.35	55.45	55.26	57.34	62.27	56.48
	SD	*21.621*	*22.53*	*21.32*	*16.07*	*18.8*	*21.36*	*21.78*	*22.33*	*21.4*	*19.48*	*21.72*
Observations		6720	1456	5264	3360	3360	3360	3360	1440	5280	480	6240
Companies		480	104	376	240	240	240	240	480	480	480	480

5.2 Correlations

Table 5.2 presents the Pearson correlations for all variables. It illustrates the significant negative correlation between idiosyncratic risk (IDIOR) and all ESG score variables at 1% level for all variables. This result can be interpreted that ESG, E, S and G performances can reduce idiosyncratic risk providing the initial evidence for this study's hypothesis. Furthermore, all control variables have weak levels of correlation among themselves, so they show that this study is unlikely to face the multicollinearity problem.

Table 5.2 Pearson correlation coefficient matrix

Variables	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13
(1) IDIOR	1												
(2) ESG_Score	-0.225***	1											
(3) E_Score	-0.197***	0.873***	1										
(4) S_Score	-0.213***	0.893***	0.750***	1									
(5) G_Score	-0.134***	0.682***	0.416***	0.398***	1								
(6) Size	-0.311***	0.485***	0.513***	0.465***	0.242***	1							
(7) BTM	0.248***	-0.107***	-0.070***	-0.126***	-0.028**	0.047***	1						
(8) ROA	-0.332***	0.076***	0.045***	0.089***	0.030**	-0.047***	-0.246***	1					
(9) Loss	0.454***	-0.135***	-0.110***	-0.138***	-0.067***	-0.169***	0.157***	-0.584***	1				
(10) Board	-0.218***	0.286***	0.319***	0.303***	0.055***	0.493***	-0.063***	-0.013	-0.143***	1			
(11) RET	-0.150***	-0.018	-0.013	-0.008	-0.039***	-0.009	-0.181***	0.184***	-0.162***	-0.011	1		
(12) LEV	0.013	0.060***	0.031**	0.055***	0.075***	0.008	-0.161***	-0.077***	0.096***	-0.013	-0.017	1	
(13) ASSET_G	-0.035***	-0.048***	-0.054***	-0.027**	-0.045***	0.035***	-0.042***	0.111***	-0.117***	0.050***	0.097***	-0.023*	1

**** p<0.01, ** p<0.05, * p<0.1*

5.3 Empirical Result and Discussion

Table 5.3.1 provides result of fixed effects model on the impact of ESG overall score (ESG_Score) on idiosyncratic risk (IDIOR) based on equation 1, we find that the coefficient of ESG_Score is negative and statistically significant at 1% level which is **in line with our H1** and other previous studies (Annisa & Hartanti, 2021; Kong et al., 2020; Sassen et al., 2016). In addition, the effect is economically significant: the ESG_Score coefficient of -0.078 on IDIOR indicates that an increase in firm's ESG performance by one standard deviation (19.989 point) is associated with a relative decrease in IDIOR by -1.56 percentage point (-9.83% relative to IDIOR's SD; 15.865%). Therefore, we can conclude that ESG overall performance can help firm subdue their own specific risk. The ESG practices can help firm boost reputation and trust as well as reducing information asymmetry leading to the lower cost of operation, cost of capital and also other specific risks; our finding are correspond to our hypothesis 1 and previous studies (Annisa & Hartanti, 2021; Kong et al., 2020; Sassen et al., 2016).

Table 5.3.1 Regression Result for ESG overall score

Dependent Variables	IDIOR
ESG_Score	-0.078***
	(0.015)
Size	-3.875***
	(0.400)
BTM	0.029***
	(0.003)
ROA	-0.129***
	(0.026)
Loss	9.431***
	(0.578)
Board	-0.155
	(0.111)
RET	-0.034***
	(0.003)
LEV	0.142***
	(0.017)
ASSET_G	0.012**
	(0.005)
Constant	90.078***
	(6.100)
Observations	6,720
Adjusted R^2	0.168
Number of companies	480

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In table 5.3.2, we report the results of 2 models based on equation 2 and 2.1. Column one (1) shows the result of ESG score with interaction term of sensitive industry (ESG_IND), the additional impact of ESG performance of sensitive industry on IDIOR are not statistically significant, which can be interpreted that the effect of ESG performance on IDIOR in both industries are not different while the coefficients of ESG_Score are -0.074, so if ESG_Score increase by 1 SD (19.989 point), IDIOR will decrease 1.48 percentage point for both industries and it is economically significant (-9.32% relative to SD of IDIOR at 15.865%).

From the estimation results in column (2), it reports the effects of each ESG pillar with interaction terms of sensitive industry based on equation 2.1. According to the results, only environmental score in sensitive industry (E_IND) is apparently show a negative statistically significant at 5% level. Specifically, we can interpret that there is an additional negative impact of E score on IDIOR when firm is in sensitive industry compared to non-sensitive industry Their negative relationship also explains that firms in this industry are facing greater risk than another one as a result of their business activities, so firms who implement environmental practices in their business will benefit from the lower chance of facing the local environmental penalties and being monitored by related stakeholders leading to an increasing in good reputation and lower cost of operation as well as cost of capital resulting in a lower idiosyncratic risk. For the size

of the additional impact of sensitive industry, the impact level is also economically significant; change in E_score by 1 SD (28.807) will decrease 3.3704 percentage point of IDIOR (0.044+0.073 x 28.807/15.865; -21.24% relative to IDIOR's SD) or more negative than non-sensitive industry by 2.103 percentage point (-13.26% relative to IDIOR's SD). Therefore, it **supports our hypothesis 2b (for E pillar)** since E score in sensitive industry can reduce IDIOR larger than it does in non-sensitive industry. On the other hand, the result shows that there is no extra effect of G_Score on IDIOR for sensitive industry because of the non-significant of G_IND. Additionally, the S_Score does not have any connection to IDIOR on both industries or both S_IND and S_Score are non-statistically significant. For the non-association between S_Score and IDIOR, it might be the result of high unemployment rate in the U.S. which have always been high during our observed years (by approximately 6.4%[8]), thus there is excess supply for labor leading to the ignorance of employees' benefits and working conditions as well as human rights.

To sum up, the results from table 5.3.2 columns (1) **do not support our hypothesis 2a**, so we can conclude that the effects of ESG overall performance on IDIOR are not significantly different between sensitive and non-sensitive industries. According to the study of Garcia et al. (2017), they explain that the effects of ESG overall performance on firm's risk between sensitive and non-sensitive industries are not different, but the significant different impacts can occur when firms in sensitive industry contribute to some specific types of practices especially environmental practice which support our result in column (2) for E pillar score. In addition, our data are not well-diversified in terms of sensitive industries, so the ESG overall score calculated by weighted average of 3 pillars might not be suitable for explaining the IDIOR of firm in sensitive industry; our sensitive industries are mostly concentrated in environmentally sensitive industries such as chemical, mining as well as oil and gas, which are highly related to environmental score, thus our sample industries lack alcohol, tobacco, gambling, adult entertainment, firearms and military industry which are highly related to human rights, business ethics, safe workplace, product responsibility and corporate governance as well as management. Hence, environmental pillar performance is more suitable for explaining the idiosyncratic risk in our sensitive industry than other pillars including ESG overall score as result of the concentration in our observation profiles; they are mostly concentrated in environmentally sensitive firms, so they have high probability to expose to the risk related to environmental issues which cause them to consider more about environmental legitimacy issue in order to protect their reputation and gain trust from the stakeholders resulting in the reduction in firm-specific risk.

[8] Source: U.S. Bureau of Labor Statistics

Table 5.3.2 Regression Results for Sensitive Industry Analysis

Dependent Variables	(1) IDIOR	(2) IDIOR
ESG_Score	-0.074***	
	(0.016)	
ESG_IND	-0.018	
	(0.033)	
E_Score		-0.044***
		(0.013)
S_Score		0.012
		(0.018)
G_Score		-0.030***
		(0.012)
E_IND		-0.073**
		(0.032)
S_IND		0.068
		(0.038)
G_IND		-0.007
		(0.025)
Size	-3.875***	-3.887***
	(0.400)	(0.403)
BTM	0.029***	0.028***
	(0.003)	(0.003)
ROA	-0.129***	-0.130***
	(0.026)	(0.026)
Loss	9.441***	9.448***
	(0.578)	(0.578)
Board	-0.155	-0.156
	(0.111)	(0.111)
RET	-0.034***	-0.034***
	(0.003)	(0.003)
LEV	0.143***	0.140***
	(0.018)	(0.018)
ASSET_G	0.012**	0.011**
	(0.005)	(0.005)
Constant	90.067***	89.578***
	(6.101)	(6.182)
Observations	6,720	6,720
Adjusted R^2	0.168	0.171
Number of companies	480	480

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Columns (1 and 2) of table 5.3.3 provide results of equation 3 and 4 which are adopted for testing the hypothesis 3 and 4.

According to table 5.3.3 column 1, it is apparent that ESG performance (ESG_Score) has negative statistically significant with idiosyncratic risk (IDIOR) in both low and high market value firms, however the ESG practice in low market value firms help decrease IDIOR less than in high market value firm which is **not consistent with our hypothesis 3**. For the economic significance of MV_H firms, the impact of 1 SD change in ESG performance (19.989 point) will decrease IDIOR by 2.18 percentage point (-13.73% relative to IDIOR's SD), while 1 SD change of ESG score for MV_L (19.989 point) decrease IDIOR by 1.00 percentage point (-6.30% relative to IDIOR's SD). Therefore, the negative association and also economic importance between ESG score and IDIOR is found to be stronger for MV_H firm than MV_L firm. According to the other studies, the relationship between ESG and IDIOR are also shown to be stronger for more well-known companies (MV_H) and weaker for less well-known (MV_L) because any potential effect of ESG performance related to market value depends to some extent on the visibility of a firm's social behavior to stakeholders (Aouadi & Marsat, 2018; Servaes & Tamayo, 2013). Specifically, MV_H firms are normally known by many individual investors more than MV_L firms, so they tend to rely on reputation more than the o MV_L firms, thus ESG performance which can help firms build more positive reputation and credibility will have an extra benefit on firm in high market value than low market value resulting in the lower chance of undervalued or lower business costs leading to greater risk reduction in MV_H firm than MV_L firm. Additionally, small firms usually have low financial resources so the cost of ESG investment might closely exceed the benefit or improving ESG practices is a cost-benefit trade-off, the ESG investment in small firms is very costly compared to their revenue, so small firms can afford ESG cost less than the big firms who have more financial resources leading to the less benefit from ESG practices in small firms if we compare to the large firm.

Based on the result of column (2), it presents that the IDIOR of low leverage firms (LEV_L) are more affected by ESG than high leverage firms (LEV_H) which is **consistent with our hypothesis 4** and other research (Kong et al., 2020). For LEV_H firms, the impact of 1 SD changed in ESG performance (19.989 point) can decrease IDIOR by 1.04 percentage point (-6.55% relative to IDIOR's SD), while 1 SD change of ESG score for LEV_L (19.989 point) decrease IDIOR by 2.20 percentage point (-13.86% relative to IDIOR's SD). Therefore, we can conclude that low leverage firms, who face high risk due to low information disclosure, can benefit from the ESG performance larger than high leverage firms because low leverage firms can show their true quality by doing CSR activities, increasing corporate governance transparency, and showing product responsibility leading to a good reputation, high trust and low information asymmetry benefiting the firm in terms of cost and risk reduction.

Table 5.3.3 Regression Results for H/L Market Value and Leverage

VARIABLES	(1) FE_MV	(2) FE_LEV
ESG_Score	-0.109***	-0.052***
	(0.021)	(0.019)
ESG_LMV	0.059**	
	(0.027)	
ESG_LLEV		-0.058**
		(0.027)
BTM	0.029***	0.029***
	(0.003)	(0.003)
ROA	-0.132***	-0.129***
	(0.026)	(0.026)
Loss	9.403***	9.434***
	(0.578)	(0.578)
Board	-0.167	-0.154
	(0.111)	(0.111)
RET	-0.034***	-0.034***
	(0.003)	(0.003)
LEV	0.143***	0.144***
	(0.017)	(0.018)
ASSET_G	0.012**	0.012**
	(0.005)	(0.005)
Constant	90.795***	89.389***
	(6.107)	(6.106)
Observations	6,720	6,720
R-squared	0.169	0.169
Number of company1	480	480

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In table 5.3.4, we report the results of 3 models based on equation 5, 6 and 6.1. Column one (1) shows the result of ESG score with interaction term of recession periods (ESG_REC), it shows that the additional impact of ESG performance of recession periods on IDIOR is statistically significant at 1% level, which can be interpreted that the effect of ESG performance on IDIOR in recession periods is larger than normal periods **supporting our hypothesis 5** and other previous study (Ferriani & Natoli, 2021). In contrast, the effects on recession periods are economically significant: decreases 2.32 percentage point for recession (-14.62% relative to IDIOR's SD) and 0.54 percentage point for normal periods when their ESG scores increase by 1 SD or by 19.989 point. In conclusion, ESG performance can help firms subdues idiosyncratic risk better during times of recession periods compared to normal periods because ESG score is one of the factors that can reflect firm's strong financial health, good corporate governance, and sustainable development and investment plan as well as providing downside protection during financial crisis leading to the positive reputation, higher stakeholders' trust and improvement of firm's creditworthiness leading to less shareholders and stakeholders' concerns for firms' failure and default risk in these high-risk periods (Ferriani & Natoli, 2021; Vanhamme & Grobben, 2009).

In column (2), it reports the effect of overall ESG with interaction terms of Covid-19 periods (ESG_Covid) based on equation 4. According to the result, ESG_Covid is statistically significant at 5% level so it can be interpreted that ESG performance in Covid-19 period has an additional effect on IDIOR compared to pre-Covid periods and it is **in line with our hypothesis 6a** including the previous research (Broadstock et al., 2021) . Furthermore, the results are economically significant or if firms increase their ESG score by 1 SD (19.989 point), the IDIOR will decrease by 4.48 percentage point during Covid-19 pandemic (-28.22% relative to IDIOR's SD): additional impact of 1.28 from 3.20 percentage point in pre-Covid periods (-8.06% and -20.16% relative to IDIOR's SD).

Additionally, column (3) presents the effect of different ESG pillars with interaction terms of Covid-19 periods (E_Covid, S_Covid and G_Covid) based on equations 4.1. As revealed in the table, only social performance in Covid period (S_Covid) has a negative and statistically significant at 5% level. Accordingly, we can interpret that there is an additional impact of S_score on IDIOR when firm faces covid-19 pandemic compared to pre-covid periods, and the impact level is also economically significant; change in social score by 1 SD (21.936) will decrease 2.70 percentage point of IDIOR in covid period (-17.01% relative to IDIOR's SD) and decrease 0.81 percentage point for during pre-covid periods (additional negative impact of 1.89 percentage point; -11.89% relative to IDIOR's SD). On the other hand, the additional effects of environmental (E_Covid) and governance (G_Covid) performances are not statistically significant, so we can imply that E and G pillars do not have any extra impacts on IDIOR comparing between covid and pre-covid periods which are consistent with the other research (Broadstock et al., 2021). Hence, we can summarize that **only social practice supports our hypothesis 6b** and the reason might be due to the characteristic of the covid-19 pandemic which is highly related to human resource than other aspects. Good human resource structure in covid-19 period such as good working conditions including good health and safety procedures (i.e., social distancing policy and work from home procedure) as well as regular skill development training (i.e., new technologies for doing business and communicating to customers) will greatly benefit firms in terms of high worker productivity, loyalty and lower turnover rate resulting in efficiency and consistency of firms' business activities. For environmental concerns in time of covid-19 pandemic, it might not play a significant role because there is an excess demand of non-eco-friendly products in this period such as plastic (i.e., PPE suit, plastic gloves, and plastic for packaging) as well as chemical products (i.e., air sprays, hand sanitizers, and surface cleaners) leading to disregard in environmental issues, so environmental score (E_IND) in covid period do not have extra affect firm's idiosyncratic risk (Steinemann et al., 2021). Lastly, the reasons why corporate governance in time of covid-19 do not have an extra effect on IDIOR, might be the result of no obvious specific additional treatment requirements for shareholders as well as no obvious change in management structure (board and executive) in time of coronavirus, hence firms need to choose their own mechanism to cope with the pandemic. According to the research of (Jebran & Chen, 2021), company may or may

not be able to adopt the appropriate corporate governance practices in covid time, so there is no guarantee that governance attribution can benefit firm; although their governance score increase, there is no extra effect on firm performance.

On the other hand, the dummy variables of recession period and covid-19 period are found to be statistically significant at 1% level which means systematic risk can affect idiosyncratic risk of the firms. This finding can be supported by other studies, first, idiosyncratic risk could change as the economic environment changes, if the capital allocation is more distorted due to the market uncertainty, then idiosyncratic risk increases. After that if the recovery occurs, then the trends reverse: productivity immediately increases, idiosyncratic risk starts to fall (Brunnermeier et al., 2020). Second, there is significant increase in idiosyncratic risk observed across all industries in Covid-19 compared to pre-covid-19 periods; the largest shift in idiosyncratic risk, associated with the petroleum and natural gas industry, is driven by plunging oil prices and uncertainty regarding the long-term effect of the shutdown on consumer demand for oil and gas. Ongoing reduced levels of travel further depress the demand for oil, restricting cashflow and potentially curtailing future drilling and production. (Baek et al., 2020). Therefore, it is reasonable that systematic risk can influence idiosyncratic risk.

Table 5.3.4 Regression Results for Recession Periods

Dependent Variables	IDIOR		
	(1)	(2)	(3)

	Recession	Covid-19	Covid-19
ESG_Score	-0.027**	-0.160***	
	-0.012	(0.014)	
ESG_REC	-0.089***		
	-0.013		
E_Score			-0.082***
			(0.011)
S_Score			-0.037**
			(0.015)
G_Score			-0.031***
			(0.010)
ESG_Covid		-0.064**	
		(0.031)	
E_Covid			0.019
			(0.031)
S_Covid			-0.086**
			(0.039)
G_Covid			0.013
			(0.028)
Size	-2.376***	-5.154***	-5.096***
	-0.317	(0.378)	(0.380)
BTM	0.023***	0.026***	0.025***
	-0.003	(0.003)	(0.003)
ROA	-0.096***	-0.119***	-0.119***
	-0.02	(0.024)	(0.024)
Loss	7.279***	7.989***	8.056***
	-0.458	(0.544)	(0.545)
Board	-0.153*	-0.065	-0.042
	-0.087	(0.104)	(0.104)
RET	-0.013***	-0.043***	-0.043***
	-0.003	(0.003)	(0.003)
LEV	0.149***	0.119***	0.117***
	-0.014	(0.016)	(0.016)
ASSET_G	0.005	0.012***	0.012***
	-0.004	(0.004)	(0.004)
D_REC	21.461***		
	-0.736		
D_Covid		19.777***	19.440***
		(1.968)	(2.153)
Constant	59.242***	114.301***	112.288***
	-4.86	(5.789)	(5.855)
Observations	6,720	6,720	6,720
Adjusted R^2	0.482	0.268	0.269
Number of companies	480	480	480

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

This study analyzes the effect of ESG performance on idiosyncratic risk of 480 listed companies in the US and Canada covering the period of 2007-2020. We perform the fixed effect regressions with a large set of control variables since it is more appropriate for our data set. We also examine ESG performance on idiosyncratic risk with different firm profiles such as sensitive/non-sensitive industry, high/low market

value and high/low leverage firm, we also investigate the association of them in different time periods such as recession periods and covid-19 periods.

The empirical results show that the improvement of ESG performance can significantly reduce firms' idiosyncratic risk. For the analysis on different firms' characteristics and time periods, we obtain 5 research findings. First, ESG performance can help firm subdue the idiosyncratic risk in both sensitive and non-sensitive industries at the same impact level. In addition, different pillars of ESG can affect firms' idiosyncratic risk differently in both industries: based on our data, only environmental practice in sensitive industry has an additional negative influence on idiosyncratic risk which might be due to the problem of sample concentration; our observations are relatively concentrated in environmentally sensitive industry. Second, the high market value firms tend to benefit more from improving ESG performance than the low market value firms because those firms are more relying on their reputation, thus enhancing ESG practices can directly increase reputation and admiration leading to a strongly reduction in idiosyncratic risk of the high growth firms. In addition, small firms usually have low financial resources so the cost of ESG investment might closely exceed the benefit causing the low market value to benefit from ESG practice less than the high market value firm. Third, the ESG performance of high leverage and low leverage firms have significant negative impact on idiosyncratic risk and the effect size of low leverage firms are larger than high leverage firms. Fourth, ESG practice shows more considerable effect in times of recession periods compared to normal periods because it can help firms signal their true capacity and flexibility under the high-pressure times leading to a large reduction in idiosyncratic risk. Lastly, ESG performance is also important during covid-19 period, it can subdue idiosyncratic risk of firms in covid-19 period higher than pre-covid-19 periods. Additionally, only social performance is found to have extra influence on idiosyncratic risk in this event which might be the result of the covid-19 characteristic that is highly related to human resource. In addition, the results are found to be economically significant for all of the firms' characteristics and time periods. Based on our findings, it should be worthwhile for the company to invest in ESG practices in order to reduce idiosyncratic risk. Moreover, it also benefits retail investors who might not be able to do a well-diversify portfolio or cannot eliminate the idiosyncratic risk. In terms of academic contribution, our research can make further knowledge on the relationship between ESG and idiosyncratic risk in different kinds of firms' characteristics and time periods that other prior studies did not consider.

We acknowledge that this study still has some limitations. The observations in this study are only restricted in US and Canada companies leading to a concentration in environmentally sensitive industry (not well-diversified in terms of sensitive industry analysis), so further research can add more samples in other different countries. In addition, we do not analyze the effect of ESG performance on idiosyncratic risk of firms in different sub-sensitive industries, though every industry can have different risk profiles, so further research can also incorporate this part in the analysis. Lastly, further study can apply other models for measuring the idiosyncratic risk since Fama-French 3 factors model might not fully capture exact idiosyncratic risk.

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