

**Global Value Chains Governance, Suppliers' Environmental, Social and Governance
Greenwash, Adoptions and Business Performance**

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Linghua Zhang

ABSTRACT

Social screening activities from investors have led to the appearance of various social rating agencies, which focus on evaluations of firms' social performance of three pillars of environmental, social and governance (ESG). Both positive functions of ESG rating data and concerns on reliability of diversified ESG rating data are confused by public and doubt raters' independence issue. However, raters are complaining about the mass source of ESG data and the difficulty of interpreting firms' intention behind the disclosure of the data. Focal firms have more complicated positions than others. On one side, firms face fundamental motivations of business to increase the profit, which might lead a model of cost saving method in adoptions of ESG practices and policies by declaring more than doing, called as greenwash. On the other side, globalization of business has led firms to include their upstream and downstream suppliers' ESG adoptions in different countries, which is global value chains (GVCs) governance. The regulations in different countries did not remain the same, creating further difficulty in adopting ESG from firm's side. This difference of regulation reflects the reality of different social issues in different societies. For example, developed economies have focused on health issues on diseases of obesity while few developing economies are lacking food due to poverty issue. It thus integrated with those conflicts stands by various positions of observers in this study by evaluations of the objectivity of ESG rating measurement and the investigation of relationships between different factors of global value chains governance, ESG greenwash, ESG adoptions and suppliers' business performance.

First, this study evaluates the objectivity of four factors of ESG measurement input, ESG measures bias, measurement system, and measurement output. It finds that three original bodies and different observers have observers constructed differently in the structure of ESG and details ESG issues. The measures bias includes both own origin bias and bias created by the nature of ESG data. The measurement systems between different rating agencies are not transparent and misaligned. The empirical results of different treatments on missing data can lead various outputs of ESG measurement. This finding implies the

challenges of the reliability of ESG rating results. However, the aim of this study is not to deny the contribution of ESG rating, which has given pressure for firms to improve ESG practices and improve society's awareness on ESG issues. It thus recommends that different raters should make efforts on alignment of ESG measurement methods, move attentions to developing more ESG talents and try to ensure the reliability and quality of firms' ESG data. It also suggests different regulators, including disclosure standard bodies and national or regional governments to align what is real ESG under the increase trend of globalization.

Second, after construction of ESG rating measurement in this study, the developed theoretical model finds relationships between varied factors. It finds the significant role of GVCs in restraining suppliers' ESG greenwash activities. GVCs governance can also motivate suppliers to adopt more in the practices and policies of the environment. However, it does not find correlation of GVCs with total ESG adoptions and social and governance pillars adoptions. The empirical result indicates the suppliers' ESG greenwash has no impact on ESG adoptions. Suppliers' business performances are not correlated with factors of GVCs, ESG greenwash and ESG adoptions. This finding implies the key role of MNCs in sustainability development. It recommends different actors of raters, regulators, and investors to look carefully at adoptions activities from MNCs, because MNCs' global trading remained their GVCs governance impact can improve the efficiency of enhancement of ESG. It also implies that ESG cost is not a short-term returnable investment. The police should motivate firms to look for long term and firms' motivations should also remain on improving long-term value of shareholders.

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CHAPTER 1: Introduction

Introduction

Chapter 1 includes the introduction of this study. First, it presents the main concept in this study, Environmental, Social and Governance (ESG). Second, it follows the relevant research motivations and importance of this study. It then explains key concepts and terms in this study. It provides the research objectives and questions in the next. It follows the selections of research organizations and their background. The research theoretical framework and the research contributions are explained. The structure of the study is outlined at the end.

1.1 Introduction of ESG

Following the increase of public attention on the relationship between business and society, few investors, starting in the 1990s, looked carefully at their invested firms' or potential investing entities' social performance, which is the attention of social screening (Kinder and Domini 1998).

Those increases of social screening activities, consolidated by the organization of Principles for Responsible Investment (PRI), founded by 2006, have led to a comprehensive framework of investing principles, including three dimensions of environmental, social and governance (ESG) (Richardson 2009). Responsible investment principles requested that investing activities should focus on impacts of the environment by climate change and biodiversity issues, social by human rights related issues and

governance by the conduction of business ethics and optimized governance structure issues (Sandberg 2008).

Meanwhile, by reaching with social investors' demands on optimization of investor portfolio, few commercial rating agencies provide meaningful ranking of social performances of each firm for guideline of investing selection of firms, based on a statistic measurement system, which are called as "corporation social responsibility ranking" at early time (Adam and Shavi 2008). While most rating agencies claimed their service as ESG rating currently, which fits with the concept of ESG framework proposed by PRI. Similar structures created by three pillars of environmental, social, and governance, and different issues constructed for each pillar in the ESG rating. Each agency claimed that the ESG rating data is useful for different stakeholders (Scalet and Kelly 2009).

Focal firms, as both the screened object and the executor of social activities, worked on adoptions of policies and practices to reach expectation from different stakeholders in the society, which is concluded by the non-financial reporting at 1990s, CSR reporting later (Escrig-Olmedo, Muñoz-Torres and Fernández-Izquierdo 2010), and sustainability or ESG reporting recently (Galbreath 2013). As both regulators and firms demand to standardize ESG reporting, the ESG disclosure standard was founded, such as GRI in 2000s (Chatterji et al. 2016). ESG disclosure standards, proposed by standard bodies and used by firms to disclose firms' efforts and practices, have been adopted with focal firms' practices, are third origins of the concept of ESG.

Firms' ESG policies and practices have not been a simple task within adoption of different countries' regulation due to the globalization of business. They should consider the factor of globalization within business operations in ESG adoptions because firms connected and cooperated with their upstream and downstream suppliers around the

world to fit with regulations in different economic regions. Firms should manage challenges from the variances of ESG regulations between different regions. For example, environmental regulation of climate in Europe is to have carbon neutralization in 2050 (EU 2019), which is 2060 in China (Li. 2023). The focuses of human rights are different between developing and developed economics. For example, health and nutrition issues in developed regions are disease of obesity due to high availability and cheap price in high energy food (James and Nelson 1997), while health and nutrition issues in developing countries means the lack of food due to poverty issue (Marchetti and Secondi 2022). Therefore, firms' ESG practices cannot avoid considering globalization.

1.2 Research Motivations and Importance

Although all rating agencies claimed the positive value of their rating data for guidelines of social investment, few scholars disagree with it (Agle and Kelley 2001, Chatterji. et al. 2016 and Geng, Chen and Liu 2024). Because the rating results from different agencies are not consistent (Pang. et al. 2024, Wang. et al. 2024 and Zhou, Lei and Yu 2024). The concern on the reliability of CSR ranking started from the day the data released (Sharfman 1996). Coming to recent ESG rating, it found further disagreement on the scoping and constructing of ESG (Dorfleitner, Halbritter and Nguyen 2015). This may be due to the independence of rating agencies who are profitable organizations (Geng, Chen and Liu 2024). Berg, Koelbel and Rigobon (2022) have motivated this study, who asked the urgency to identify the reason for disagreement of ratings. Positioned on the theory of evaluation of objectivity for measurement process of four factors (Ijiri and Jaedicke 1966 and Wojdak 1970) and motivated by (Berg, Koelbel and Rigobon 2022), this study planned to investigate the objectivity of ESG rating measurement.

The second motivation of the study is the debate of globalization on firms ESG adoptions. Globalization (McKenzie 2019), here in ESG referred to global business

driven by multinational corporations (MNCs) and their upstream and downstream suppliers' ESG enhancement or resistance practices during the process of consolidation of ESG policies worldwide. The ESG adoptions regarded as firms ESG performance increase or decline and the truth of firms ESG practices, which called the term ESG greenwash (Ioannou, Kassinis and Papagiannakis 2023 and Seele and Gatti 2017) and will explain in next sections. Existing scholars have doubted the function of globalization in assisting MNCs to use ESG adoption as competition entry benchmarks instead of real ESG enhancement (Gereffi 2014, Hamish 2018 and Ponte 2020). Other scholars confirmed the MNCs took the lead in driving sustainability within its suppliers' network (Gai 2023, Huang and Zhang 2023 and Wang. et al. 2022). Therefore, the study is motivated and stood on the Global value chains theory (Gereffi, Humphrey and Sturgeon 2005) to investigate the influence of globalization on firms' ESG practices and the truthiness of those adoptions' activities.

Third motivation is the debate on the impact of firms' ESG greenwash and firms' ESG adoptions. Scholars widely doubted the truthiness of firms' ESG adoptions (Lyon and Maxwell 2011 and Lyon and Montgomery 2015), which is the issue of firms greenwash tendency. Scholars have claimed firms' doing less than what they talked about ESG (Long, Wang and Zhang 2024). Scholars have found the ESG greenwash has negatively impacted firms' ESG adoptions (He, Du and Yu 2022, Ioannou, Kassinis and Papagiannakis 2023 and Majeed and Kim 2023). While other scholars believed ESG greenwash has no relevant firms ESG adoptions (Arvidsson and Dumay 2022). It will thus investigate the relationship between the firms ESG Greenwash and ESG adoptions.

The fourth motivation is the debate of whether ESG adoptions are the single cost or the returnable investment. Scholars have various positions on the payback of cost on ESG activities. A part of scholars believes that spending on ESG will bring return and thus firms should implement the CSR strategy (Agoraki. et al. 2023, Ferrer, López-Arceiz and Rio 2020 and Hovatter 2022). While others treated ESG activities as the cost which will

reduce firms' profitability level (Wang, Liao and Zhang 2022 and He, Jing and Chen 2023). This idea also supports why firms prefer to say more than they do. But also, scholars found no correlation between ESG adoptions and business performance (Cortazzo, Bini and Marzo 2020). Therefore, this study found the gap of the debate of returns on ESG investment to investigate whether ESG adoptions and relevant activities have correlated with firms' business performance.

This study will have six points of importance. First, this study is important to stand in the position of rating agencies and applied framework of objectivity of four factors' ESG rating measurement to provide the challenges of rating process and the explanation of divergence of rating result. Second, this study will provide significant recommendations on the ESG regulatory side to improve the ESG rating's objectivity based on the review of those challenges. Third, it will further extend theory GVCs into ESG rating and Greenwash areas, especially offering the explanation of MNCs global business operation and ESG adoptions within different regulations in different economic regions. Fourth, it will give important recommendations on ESG practices and disclosure regarding the concern on truthiness of ESG adoptions. Fifth, this study could provide empirical data to investigate the relationship between ESG performance and ESG greenwash. Finally, this study could also give significant empirical results for the relationship between firms' ESG investment and business performance.

1.3 Key Concepts and Terms of the Study

This study started with three factors of ESG Greenwash, ESG Rating and Global Value Chains, which will represent in this section. However, ESG as the original terms of ESG greenwash and ESG rating will first introduce before the other three factors. ESG rating measurement objectivity and AMC rating are concepts to connect with ESG rating and ESG greenwash will introduce after ESG rating.

The first term is Environment, Social and Governance (ESG). ESG is the concept combined from three primary areas. First, the coalition of Environmentally Responsible Economies (CERES) and the United Nations Environmental Program (UNEP), Principles for Responsible Investment (PRI), founded by 2006, offered the responsible investment principles by the framework of ESG on guiding the investment activities (Richardson 2009 and Sandberg 2008). Secondly, firms, intended to present ESG activities to prove the efforts on engagement of social activities, have worked under certain disclosure bodies, such as the global Reporting Initial (GRI), established in 2001, which is the ESG disclosure standards (Galbreath 2013). Third ESG origin area is the commercial service providers for ranking of existing firms' ESG performance, such as Thomason, Bloomberg, and MSCI (KLD) (Adam and Shavi 2008). Each area in a term called ESG has same word while details concept of ESG issues is not in same understanding. The difference in the breakdown details will be present in the study later sections.

ESG Greenwash is in the second term. Greenwash means the actual firm's ESG practices and policies are less than its disclosure (Ioannou, Kassinis and Papagiannakis 2023). In other words, ESG Greenwash represented firms saying more than the actual doing in the ESG adoptions or selectively being without disclosure of bad ESG performance information (Lyon and Maxwell 2011). Furthermore, greenwash is the firms' reaction to the external accusation between the conflict of operational cost savings objective and unavoidable ESG enhancement expenditures (Long, Wang and Zhang 2024 and Seele and Gatti 2017). Operating cost is the key motivation to be green and greenwash. For example, the hotel industry has explained green activities by reducing use the one-time tower, while it has been without explanation of motivation by cost saving of the consumption reduction of one-time tower (Majeed and Kim 2023).

The third term is ESG Rating. ESG rating is the statistical measurement of firms ESG performance, which is the ranking service from different commercial agencies (Scalet and Kelly 2009). The measurement of ESG is sourced by companies ESG reporting, and other public media or government (Elbasha and Avetisyan 2018), and served for different customers, such as investors, internal employees, and other public actors (Scalet and Kelly 2009). The data source of ESG rating is focusing on non-financial information, which is different from credit agencies sourcing by financial data. However, users applying ranking service is similar function as distinguishing good or deficient performance of firms' credit as identifying ESG performance of firms (Escrig-Olmedo, Muñoz-Torres and Fernández-Izquierdo 2010).

The fourth term is ESG rating measurement objectivity. ESG measurement objectivity in this study is the extension of the concept of the objectivity evaluation of accounting measurement to ESG rating measurement. ESG measurement objectivity connected due to the issues of ESG rating's result disagreement between different agencies (Chatterji. et al. 2016, Pang. et al. 2024 and Zhou, Lei and Yu 2023), which link with the doubt on independence positions of different ESG rating agencies. It will discuss separately ESG agencies' independence concerns (Geng, Chen and Liu 2024 and Wang. et al. 2024), by the framework of objectivities of four factors evaluation, including input object, measurer bias, measurement system, and measurement output (Ijiri and Jaedicke 1966 and Wojdak 1970). The recognition of measurement objectivity is "the consensus among a given group of observers or measurers" (Ijiri and Jaedicke 1966). Therefore, ESG rating measurement objectivity means the recognition of consensus on four factors of rating process. The factor of input means the measurement objects within the ESG rating. The measurement system is the methodology of ESG rating measurement. Measure's bias means the ESG raters or analysts' preference or judgements during ESG rating measurement process. The factor of output means the rating result after the ESG rating measurement process.

The fifth term is the AMC rating. Existing studies used the model of awareness-motivation-capability (AMC) proposed by Buckley and Liesch (2023), to evaluate the relationship of regulatory adoptions between multinational companies and their upstream and downstream suppliers within global value chains governance. This model in the study is collecting suppliers' awareness, motivation, and capabilities on ESG regulation adoptions, which is link to the part of ESG greenwash, as green talking (Lyon and Maxwell 2011). The integration of AMC model and rating is thus a ranking method to assess the performance of suppliers ESG talking through interpreting and analyzing the collected content by interviews. The AMC rating can provide two main functions. First, green talking as a part of greenwash, it can provide the foundation to evaluate the ESG greenwash, which includes the calculation of the deviations of the rating results from AMC rating methods and ESG questionnaires methods. The lower variance of two methods indicates less greenwash tendency for the firm. Second, the vertical comparison of two methods by ESG questionnaires rating and AMC rating can increase the robustness of the analysis results, which are linked to the ESG rating objectivity.

The final term is global value chains (GVCs). Globalization, the increase of interactions flow of international business trading, transportation and culture between local residents and international travelers (McKenzie 2019), been explained by GVCs (Gereffi, Humphrey and Sturgeon 2005) that global economics are distributed by different GVCs governance between lead firms (MNCs) and their suppliers located in worldwide, in which the standard production process has been allocated to emerging economies while the high value of innovation activities are remained in developed regions (Buciuni and Finotto 2016). GVCs theory has explained the power of lead firms in influencing their suppliers differently through different governance strengths including governance types of market, modular, relational, captive and hierarchy (Gereffi, Humphrey and Sturgeon 2005). For example, a market governance type has less influence than other governance types on suppliers by lead firm because such business is less complex and high competition driven by market price. Consequently, this study expected that the

governance power from MNCs based on GVCs theory may influence the adoption of ESG unequally based on different governance strength, which have also confirmed by scholars (Hamish 2018 and Ismail, Dilshod and Mehmet 2021).

1.4 Objectives and Research Questions of the Study

This study is aimed to explore relationship between suppliers' ESG activities by two factors of ESG greenwash and ESG adoptions, and business performance within the GVCs governance and integration of ESG measurement objectivity to improve the reliability of data analysis by involving firms of a Europe multinational company operating in China and its supply chains. Existing studies have found the importance measurement of ESG performance by agencies' rating (Elbasha and Avetisyan 2018 and Scalet and Kelly 2009), while a part of scholars criticized the disagreement of agencies rating result (Pang. et al. 2024, Wang. et al. 2024 and Zhou, Lei and Yu 2023), and doubt about the rating agencies independence (Geng, Chen and Liu 2024). Whether ESG adoptions is an adding cost (Wang, Liao and Zhang 2022 and He, Jing and Chen 2023), or a long-term beneficial investment (Agoraki. et al. 2023, Ferrer, López-Arceiz and Rio 2020 and Hovatter 2022), were debate on ESG practices' impact on business performance (Cordazzo, Bini and Marzo 2020). As the conflict between regulating pressure and shareholders' profitable intensions, corporations trying to communicate ESG more than doing on ESG or selectively disclose on ESG information, which is greenwash (Lyon and Maxwell 2011 and Lyon and Montgomery 2015), are other factors may impact firms' business performance and rating disagreement. Scholars are debate whether globalization deteriorate ESG issues (Gereffi 2014, Hamish 2018 and Ponte 2020) or improve the management of ESG issues by global governance based on GVCs theory (Gai 2023, Gereffi, Humphrey and Sturgeon 2005, Huang and Zhang 2023 and Wang. et al. 2022). Therefore, this study will explore four objectives. First, positioned on the evaluation of four factors' objectivities proposed by (Ijiri and Jaedicke 1966 and Wojdak 1970), it will explore the challenges of the objectivity of ESG rating from the rater's point of view.

Second, positioned on GVCs theory (Gereffi, Humphrey and Sturgeon 2005), it will investigate the relationship between global value chains governance and two ESG factors of greenwash and ESG adoptions within a network of EU MNCs and the Chinese suppliers. Third, it will explore the relationship between ESG greenwash and ESG adoptions. Finally, it will explore the impact of a range of factors of GVCs, ESG greenwash and ESG rating on corporations' business performance. Therefore, following four research questions are presented.

1. What are the challenges of four factor's objectivities of ESG rating measurement from a rater's view?
2. Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?
3. Are firms' ESG adoptions impacted by firms' ESG greenwash?
4. Are suppliers' business performances impacted by factors of GVCs governance, ESG adoptions and ESG greenwash?

To explain the challenges of recognition of ESG measurement objectivities to fill the research gap of finding reasons behind the rating disagreement, it extends the four factors' objectivities proposed by (Ijiri and Jaedicke 1966 and Wojdak 1970) in the study. After the evaluation, this study is thus able to measure firms' ESG rating development, greenwash and GVCs to fulfill the gaps of influence of GVCs (Gereffi, Humphrey and Sturgeon 2005) on ESG adoptions. Furthermore, it will fulfil the gap of relationships between firms' business performance and factors of GVCs, ESG adoptions and ESG greenwash. Follow table 1 has concluded the gaps, objectives and questions of this study.

Table 1: Gaps, objectives and research questions summary

Research Gaps	Research Objectives	Research questions
Reasons for ESG rating disagreement (Agle and Kelley 2001, Chatterji. et al. 2016 and Geng, Chen and Liu 2024)	Explore the challenges of the objectivity of ESG rating from the rater's point of view	1. What are the challenges of four factor's objectivities of ESG rating measurement from a rater's view?
Critical role of MNCs in assisting suppliers' sustainability development or using sustainability as benchmark gate (Gereffi 2014, Hamish 2018 and Ponte 2020)	Investigate the relationship between global value chains governance and two ESG factors of greenwash and ESG adoptions	2. Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?
Widely double about firms greenwash tendency on ESG adoptions (Lyon and Maxwell 2011 and Lyon and Montgomery 2015)	Explore the relationship between ESG greenwash and ESG adoptions	3. Are firms' ESG adoptions impacted by firms' ESG greenwash?
Whether ESG adoption is a single cost (Agoraki. et al. 2023, Ferrer, López-Arceiz and Rio 2020 and Hovatter 2022) or a returnable investment (Wang, Liao and Zhang 2022 and He, Jing and Chen 2023)	Explore the impact of several factors of GVCs, ESG greenwash and ESG rating on corporations' business performance	4. Are suppliers' business performances impacted by factors of GVCs governance, ESG adoptions and ESG greenwash?

1.5 Research Organizations Background

This section will present information about research organizations suitable for reaching research objectives. First, it will introduce the background of factors linked to the research organizations. Second, it will explain why this study selects those research organizations. Finally, it will explain the limitations of sample selections.

First, selected research organizations linked with research factors of GVCs, ESG greenwash, ESG adoptions and corporation business performance. The lead firm in this study is one MNCs from Europe in food and nutrition industry who has more than one hundred years history and operated in China since 2000s. It invested subsidiary in China owned 100% by the lead firms, which is the hierarchy firm, has made adoptions of ESG under both regulations from EU and China. The business operation activities between lead firm, hierarchy firm and connected suppliers located in China have illustrated by theory of GVCs. Those adoptions of ESG practices and policies by corporations between different suppliers have provided research value for investigating factors of ESG greenwash and ESG adoptions. To measure those ESG greenwash and ESG adoptions activities, ESG rating measurement in the study offered other opportunities to understand challenges of ESG rating process.

Second, there are three main reasons why the study chooses those research organizations. The first reason is the business operation activities from those research organizations fitted with research factors. The second reason is the high resource availability in the position of researcher. Since the researcher has been employed by the hierarchy firm as a management role in China, it has been more possibility to get different resources to achieve the research objectives. Those research organizations also remained high diversity of the interviewees' age, gender, and work positions, such as senior managers, key account managers, vice general managers, general managers, and various locations of organization around China. Finally, the valuable conflicts with the ESG adoptions before conducting the research have motivated this study. The hierarchy firm's manager stayed various positions on the expenditures on investing ESG. Commercial teams prefer not to

spend cost on the ESG adoptions, while operation teams have selectively followed the order from headquarters requirement by more efforts of investment in energy and water consumption. The researcher also found the complicated cooperation of adoptions of ESG between upstream and downstream suppliers. A part of suppliers followed while others also partially followed.

It remained several limitations for the selection of research organizations. First, the high availability of resources may also follow the risk of the dual conflict of this study. Due to the important management role from the hierarchy firm, the interviewee and selected organization might not be fully open for this study to eliminate business risk with the researcher role or the hierarchy firms. Second, the intention of agreement on participating in the research project might have subjectively selected the high GVCs governance strength firm. It means those research organizations, which have not agreed to join in the research, might result in low GVCs governance strength and result in missing data in the analysis of correlations. Third, GVCs governance is dynamic. This dynamic of governance strength might cause a mismatch of periods during the analysis by the correlation between GVCs and other factors. However, this study has taken few measurements to minimize the effects of dual role conflicts in this study, which will present in methodological parts. The researcher has always declared selective organizations from beginning to end for the pure position from the academic research view and provided the declaration letter from the employer to strength this position. This study also completed data collection in short term as 3 months to minimize the impact of dynamic GVCs between suppliers.

1.6 Research Theoretical Framework

This part will present two theoretical frameworks applied in this study. The first framework developed from the evaluation of the objectivity on four factors of

measurement process (Ijiri and Jaedicke 1966 and Wojdak 1970). The second framework motivated by the theory of GVCs (Gereffi, Humphrey and Sturgeon 2005) gathering suppliers ESG practices and policies adoptions. Final part will explain why this study integrates these two selected theories in this study.

Figure 1 developed from the framework by (Ijiri and Jaedicke 1966 and Wojdak 1970) will apply to evaluate the reasons for ESG rating divergence. The challenge of recognition of the consensus from different observers or measurers on those four factors will include as main content for explanation of difficulties for ESG rating measurement. First, as the measurement input objects (Ijiri and Jaedicke 1966), it will identify the challenge of the construction of concepts of general ESG and details ESG issues. Second, the measurer subjective judgement will be the second factor of ESG measurer. The third factor is the objectivity of measurement system (Ashton 1977), which evaluates the standard that measurers can understand and apply the method with same understanding. Fourth factor represents the output factor (Ponemon 1995), which should align with the output by whole measurement process.

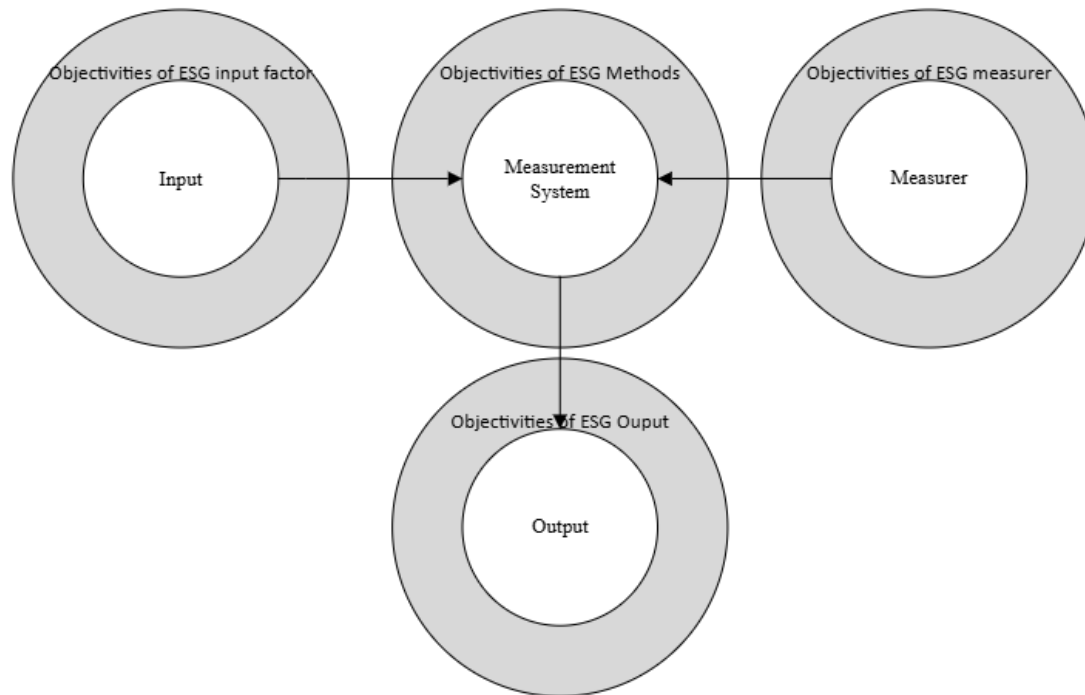


Figure 1: Four factors of the objectivity of measurement process (Ijiri and Jaedicke 1966 and Wojdak 1970)

Figure 2 has explained the framework of GVCs governance (Gereffi, Humphrey and Sturgeon 2005) applied to this study and the relevant research questions integrated with including factors. The GVCs governance explains in the top part of the chart that represented by the business operation activities between one lead MNCs and those suppliers in China. As mentioned in the background of the organization, under GVCs governance, those suppliers are cooperated to adopt ESG regulations from EU together with the regulator in China. Those adoptions of ESG practices and policies measured by ESG rating measurement can help reach the first research question of assessing the objectivity of ESG rating. To measure ESG greenwash, it will apply the rating of AMC (Buckley and Liesch 2023), by assessing the deviation between what suppliers talked about and what suppliers have done. After the construction of ESG adoptions measured by ESG rating and ESG greenwash, the second and third research questions can be evaluated by three relationships of GVCs and ESG greenwash, GVCs and ESG

adoptions, and ESG greenwash and ESG adoptions. Finally, by presenting the measurement of GVCs, ESG greenwash and ESG adoptions, research question 4 will explain with their impact on suppliers' business performance.

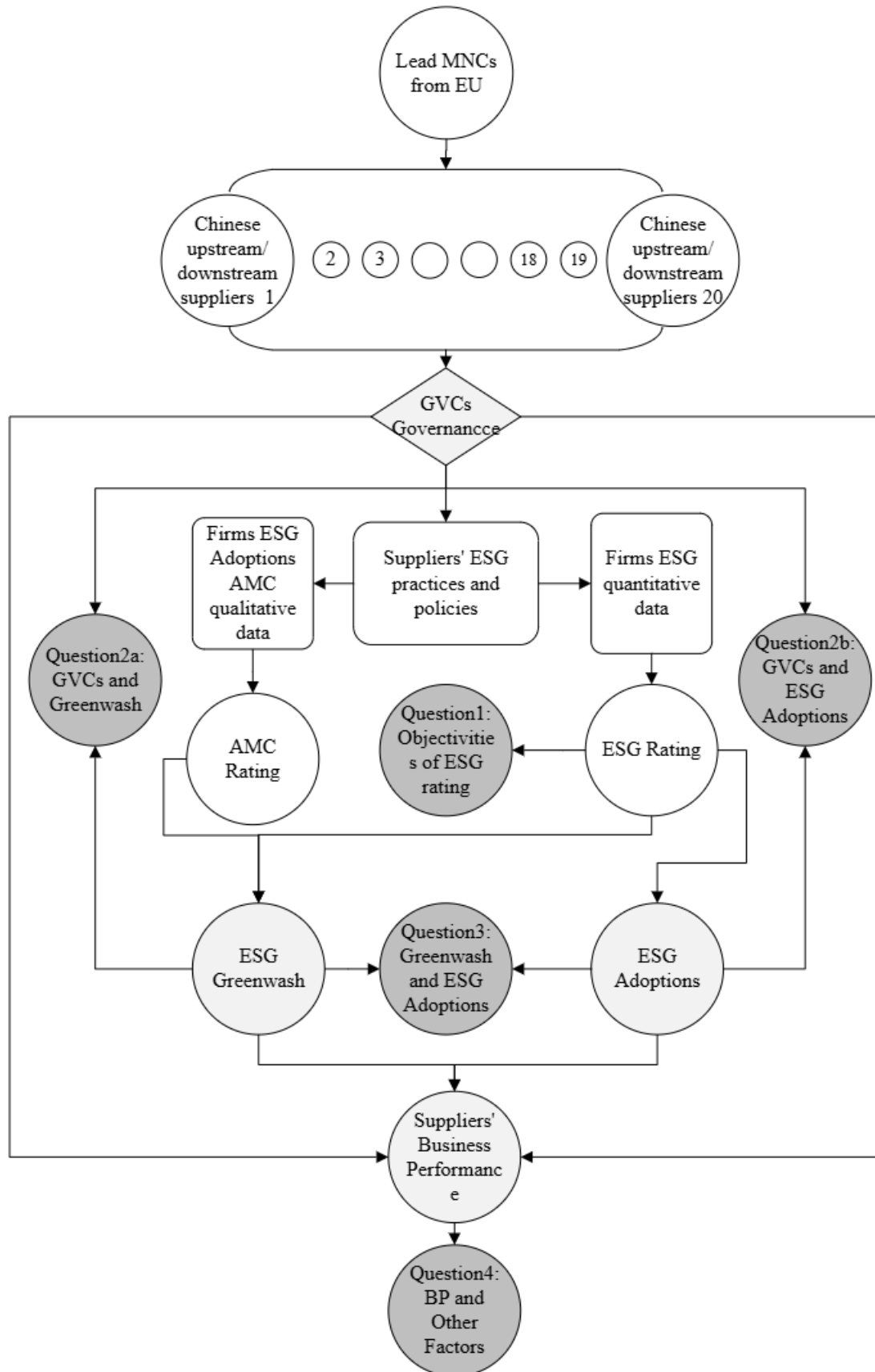


Figure 2: Theoretical roadmap of integration of factors of GVCs governance, ESG greenwash, ESG adoptions and suppliers' business performance

Three reasons are in this study for the connections of theories of GVCs governance (Buckley and Liesch 2023 and Gereffi, Humphrey and Sturgeon 2005) and accounting measurement objectivity (Ijiri and Jaedicke 1966 and Wojdak 1970). First, the full analysis of ESG measurement objectivity by extension of accounting knowledge can provide the foundation of data robustness in the part of analyzing influences of GVCs on ESG activities. On one side, it can avoid overclaim of the influence of GVCs on suppliers' ESG performance by providing the restriction of ESG rating measurement procedures. On the other hand, it can help explain the limitation of the characteristics of dynamic on GVCs governance within supply chain networks. Second, connections of two theories can improve the reliability of research design on the questionnaires and data collections procedures. Measurement objectivity evaluation helps reduce the subjectivities of data preparations and collections. Finally, these connections can help the involvement of different actors in the implications analysis, including different regulators, investors, raters, and managers of suppliers and MNCs.

1.7 Research Contribution of the Study

The study has contributed to two primary areas. In the first area, it will explain the reason for challenges of ESG rating measurement by positioning on the four factor evaluations from Ijiri and Jaedicke (1966) and Wojdak (1970). The second area, stood on the theory of GVCs (Gereffi, Humphrey and Sturgeon 2005), this study will investigate relationships between several factors of GVCs, ESG greenwash, ESG adoptions and suppliers' business performance.

This study thus framed the evaluation of ESG rating measurement objectivities by Figure 3. First, the assessment of ESG measurement input is presented on the top left side. It found that the construction of ESG structure was misaligned by three main origin bodies of Principles of Responsible Investment, ESG disclosure standard body, such as GRI, and ESG rating agencies. Meanwhile, a part of issues can be different within the different structure by various positions from external observers, such as different regulators, citizens from different economics and different scholars. In the top and right side of the chart, second factor of measurer's bias are found by few perspectives of owned origin bias of financial orientation bias, hello bias and clients' changing demand, and external data origin bias of mass of data sources and lack of data by firms' restriction in data preparation and firms' unwilling to share.

In the middle of the chart, it has explained third factor challenges. Raters have rated different methodologies due to the lack of transparency of methodologies and lack of alignment on the methods between raters. It found that business confidentiality and pressure of market competitions are two main drivers of lack of transparency of method. Dynamic understanding of ESG issues cross the time and between raters and different business vision of raters are reason for misalignment of methodologies.

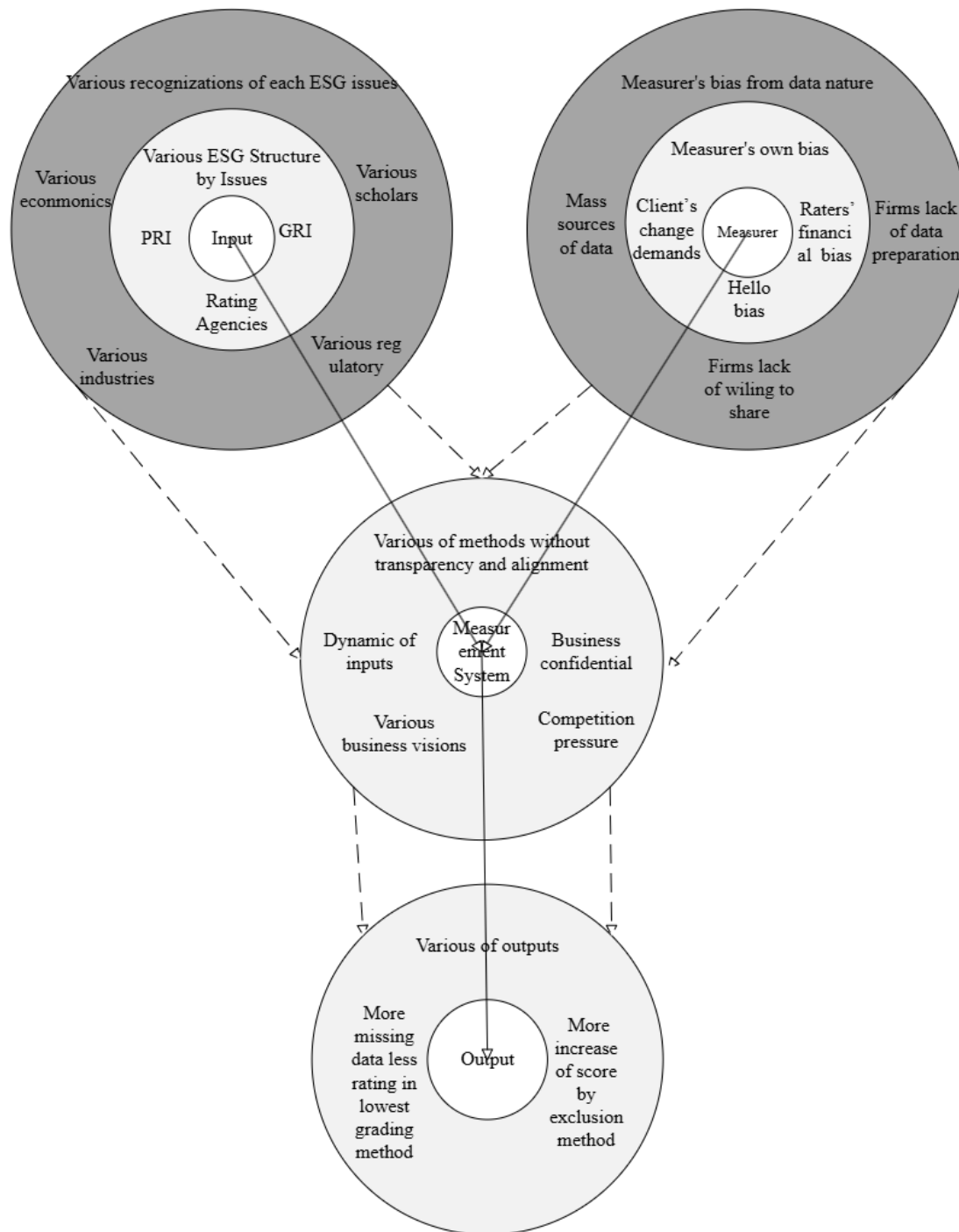


Figure 3: Challenges of the objectivity of ESG rating measurement

The investigation of correlations between factors has framed the second contribution. Two main findings presented. First, the role of GVCs governance has a positive impact on reducing greenwash risk on suppliers' side. Furthermore, it also confirmed the significant impact on each ESG greenwash pillar. This means the higher governance strength followed with lower suppliers' ESG greenwash tendency. Second findings are the impact from GVCs governance on ESG adoptions in environment pillar. It found that the order of GVCs governance strength improves the suppliers' ESG adoptions in environmental pillar. In other words, the higher strength of GVCs governance received by the supplier is the high motivation and capabilities of the firm to improve environmental practices and policies. However, it has not found evidence related to evaluation of total ESG adoptions, and social and governance pillars adoptions. Furthermore, it found no evidence of correlation between ESG greenwash and ESG adoptions. Finally, it also found that supplier business performance is not correlated with several factors of GVCs, ESG adoptions and ESG greenwash.

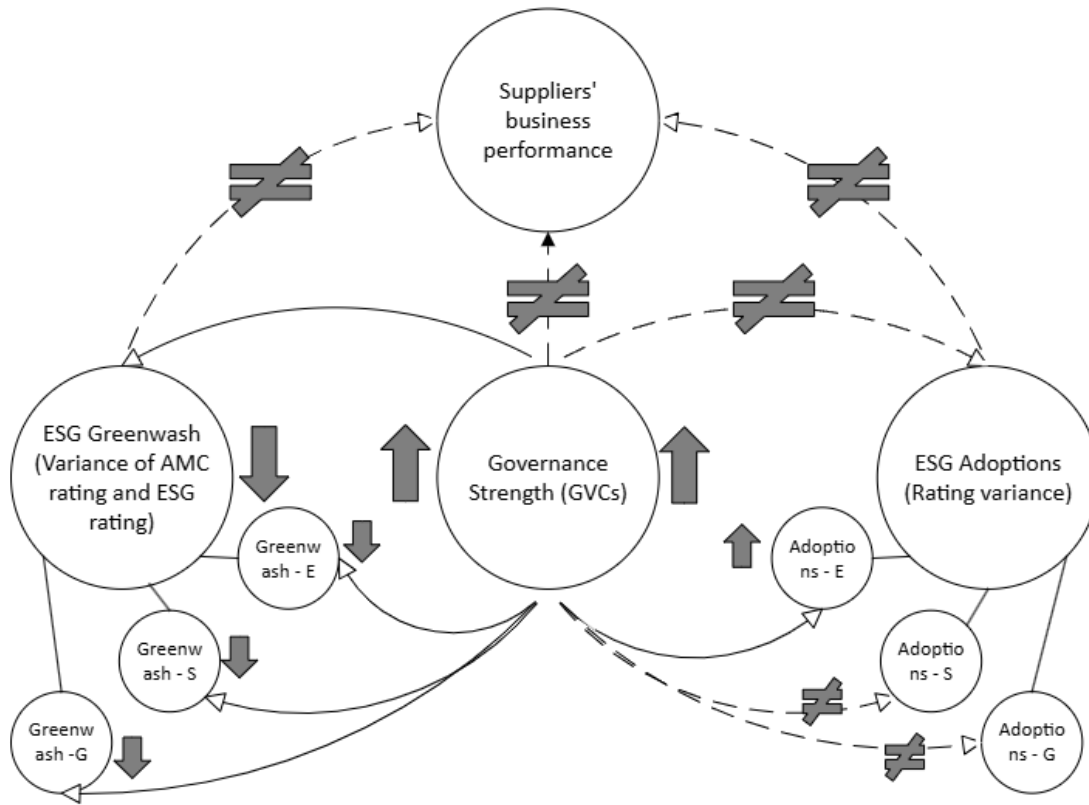


Figure 4: Correlations analysis between varied factors of GVCs governance, ESG greenwash, ESG adoptions and suppliers' business performance

1.8 Structure of the Study

Chapter 1 introduces the background of the concept of ESG and motivations and importance of study. It further provides the key concept and terms of this study. The research objectives and questions followed. The research organizations background and reasons for choosing the research organizations presented. The research framework developed by the objectivity of four factors' measurement process (Ijiri and Jaedicke 1966 and Wojdak (1970) and Global Value Chains Governance (Gereffi, Humphrey and Sturgeon 2005) then introduced. The empirical results and findings presented with two theoretical models as research contributions at the end of this part.

Chapter 2 conducts the literature review for the investigation factors in this study. First, ESG concepts and ESG breakdown issues reviewed for the purposes of recognition of objectivities of input in ESG measurement and construction of ESG questionnaires and semi-structured ESG interviews. Following the first research question, factors of ESG greenwash and issues of ESG rating divergence reviewed to illustrate how the challenges of ESG rating procedures are. Secondly, the concept of globalization, GVCs and ESG content variance under EU and China reviewed. This will offer motivation to link the role of GVCs and ESG relevant factors. Finally, it will review the existing findings between factors of GVCs, ESG greenwash, ESG adoptions and Business performance and present the research question between 2 to 4.

Chapter 3 explains how research methodologies are framed in this study. The ontological and epistemological positions, research approach, research strategy, research choice, research techniques presented at the beginning part. The introduction and reflection of the pilot study before the main study followed. Furthermore, it introduced the research survey which will be used for collections of data in the main study. The details of research organizations, the diversity of participants and challenges from participants' side present. The research procedure and data collections and the impact considerations provided. The data analysis part at the end introduces how the data will be treated by different tools in this study.

Chapter 4 provides the findings and relevant analysis in this study. It will first provide the findings in the challenge of the objectivities of four factors' ESG rating measurement. This part investigates the factors of role of GVCs governance with the relationship between factors of ESG greenwash and ESG adoptions. It also explains the relationship between ESG greenwash and ESG adoptions. In the end, the relationship between

suppliers' business performance and other factors of GVCs, ESG greenwash and ESG adoptions illustrated.

Chapter 5 will provide the developed theoretical models from empirical findings. The research contribution follows. The implications and recommendations for practices of firms and rating agencies, and for regulators of ESG disclosure standard bodies and national ESG regulators will discuss separately. It will then discuss the limitations of this study and the possibility for future research in the end.

CHAPTER 2: Literature Review

2.1 Introduction

Two primary areas of ESG rating and Global value chains governance are included in this study. It starts with the first section on relevant conceptions of ESG and follows the origin of general concept first. After comparisons of three origin bodies of PRI, GRI and rating agencies' ESG structure, the study selects the structure of ESG rating agencies to go further review on the each ESG issue in three pillars of environmental, social and governance for purposes of reviewing deviations from different observers on the construction ESG issue and investigating potential research gaps for next step of generation of research question.

Second, the review concepts of ESG greenwash and ESG rating divergence will be provided. It will address the doubt that external stakeholders have about greenwash and connect this with the concept of ESG ratings. The connections of greenwash and ESG ratings will help measure firms' actual adoption of ESG performance. It will further find the ESG rating divergence issues, which has been the concerned to use ESG data from externally stakeholders. This will identify the first gap to investigate the reason behind the rating divergence. It will then link the similar issue in accounting measurement for the doubt of measurement objectivities. The framework is based on the review of ESG greenwash and serves as the starting point for investigating its impact on ESG rating objectivity, followed by the first research question.

Third, this part will extend the ESG concept to increase globalization, which has made the globalization of the concentrations on ESG issues. The review of ESG in EU and China will match with the regulation background of research organizations. The

comparison of ESG development in context of EU and China will find the deviations and connections of ESG in different society. It will then propose looking at the role of GVCs in sustainability development and finding the AMC model from lead firm in guiding suppliers to adopt in the regulations, which provides the detection tool of greenwash in this study. The debate between the role of GVCs and suppliers' ESG adoptions will be presented and followed with second research question.

Final part will review the connections between the ESG greenwash and ESG adoptions with the gaps for presenting research question 3. This section will propose the research questions after the identification of gaps of the debate when ESG adoption cost is returnable or not.

2.1 ESG and Issues

Environment, Social and Governance (ESG), is a concept given by the community of socially responsible investors in the 1970s who focused on screening the performance of their investing companies' environmental and social activities (Kinder and Domini 1998 and Richardson 2009). The social investors' attentions are extended and aligned by the appearance of Principles for Responsible Investment (PRI), founded by 2006, combined with the coalition from Environmentally Responsible Economies (CERES) and the United Nations Environmental Program (UNEP), raised the framework of ESG guidance on investment activities (Richardson 2009 and Sandberg 2008). Meanwhile, as requested to present ESG activities by the social screening attentions (Kinder and Domini 1998), the global Reporting Initial (GRI), established in 2001, provided standard guidance with different ESG issues for corporations to prepare ESG information, which is ESG disclosure standard (Galbreath 2013). Furthermore, the commercial service providers, a couple of ESG rating agencies, come together to the market by offering service of the assessment on companies' ESG issues by the adoptions of responsible investment

principle to help investors to evaluate companies' ESG performance, such as Thomason, Bloomberg and MSCI (KLD) (Adam and Shavi 2008 and Scalet and Kelly 2009).

Therefore, the main three areas of ESG Investment Principles issues (via PRI), ESG disclosure issues (via GRI) and ESG Rating issues (Via rating agencies), have used and developed the concept of ESG.

The conception of three pillars in ESG observed in a same term, but details issues are not equal. Table 2 provides a comparison of issues listed by three areas. The comparison has used MSCI as an example, due to the broader conceptions of issues than other rating agencies (Semenova and Hassel 2015).

ESG Investment Principles issues are less detailed than the other two bodies, while ESG disclosure issues lack major parts of governance in its standard. Furthermore, ESG Rating issues provided more issues not in both ESG Investment Principles issues and ESG disclosure issues.

Table 2: ESG issues by three original bodies

ESG	ESG Investment Principles Issues	ESG Rating Issues	ESG Disclosure Issues (Standard Code)
Environment	Climate Change	Carbon Emissions	Emission 305
		Climate Change Vulnerability	Energy 302

		Financing	
		Environmental Impact	
		Product Carbon Footprint	
		Opportunities in Cleantech	
		Opportunities in Green Building	
		Opportunities in Renewable Energy	
	Biodiversity loss	Biodiversity and Land Use	Water and Wastewater 303
			Biodiversity 304
		Raw Material Sourcing	Procurement Practices 204
			Supplier Environmental Assessment 308
		Electronic Waste	
		Packaging Material and Waste	Materials 301
		Toxic Emissions and Waste	Waste 306
Social	Human Rights	Health and Safety	Occupational Health and Safety 403
			Security Practices 410
		Human Capital Development	Training and Education 404
			Diversity and Equal Opportunity 405

		Labor Management	Market Presence 202
			Employment 401
			Labor-Management Relations 402
		Supply Chain Labor Standards	Non-discrimination 406
			Freedom of Association and Collective Bargaining 407
			Child Labor 408
			Forced or Compulsory Labor 409
		Chemical Safety	
		Consumer Financial Protection	
		Privacy and Data Security	Customer Privacy 418
		Product Safety and Quality	Customer Health and Safety 416
			Marketing and Labeling 417
		Responsible Investment	
		Community Relations	Indirect Economic 203
			Economic Performance 201
			Local Communities 413
			Rights of Indigenous Peoples 411
		Controversial Sourcing	
		Access to Finance	

Governance		Access to HealthCare	
		Opportunities in Nutrition and Health	
	Corporate Governance	Board	
		Pay	
		Ownership and Control	
		Accounting	
		Business Ethics	Anti-corruption 205
			Anti-competitive 206
			Public Policy 415
		Tax Transparency	Tax 207

Therefore, it needs to validate each issue by a literature review in the next sections. Since ESG rating issues has provided more issues than other two bodies, the review of issue by structure of ESG rating issues with combination of issues follows in table 3. The driven key of combination of issues is the link between issues. For example, carbon emissions, one of the key drivers for climate change issues, and opportunities in cleantech, the solution for climate change issues, are within climate change issues.

Table 3: ESG issues structure in the literature review

ESG	ESG Rating Issues	Literature Review ESG Issues
Environment	Carbon Emissions	Climate Change
	Climate Change Vulnerability	
	Financing Environmental Impact	
	Product Carbon Footprint	

	Opportunities in Cleantech	
	Opportunities in Green Building	
	Opportunities in Renewable Energy	
	Biodiversity and Land Use	Biodiversity and Land Use
	Water stress	
	Raw Material Sourcing	Raw Material Sourcing
	Electronic Waste	Toxic Emissions and Waste
	Packaging Material and Waste	
	Toxic Emissions and Waste	
Social	Health and Safety	Health and Safety
	Chemical Safety	
	Human Capital Development	Human Capital Development
	Labor Management	Labor Management
	Supply Chain Labor Standards	Supply Chain Labor Standards
	Consumer Financial Protection	Consumer Financial Protection
	Privacy and Data Security	Privacy and Data Security
	Product Safety and Quality	Product Safety and Quality
	Responsible Investment	Responsible Investment
	Community Relations	Community Relations
	Controversial Sourcing	Controversial Sourcing
	Consumer Financial Protection	Access to Finance
	Access to Finance	
	Access to HealthCare	Access to HealthCare
	Opportunities in Nutrition and Health	Opportunities in Nutrition and Health
Governance	Board	Board
	Pay	Pay
	Ownership and Control	Ownership and Control

	Accounting	Accounting
	Tax Transparency	
	Business Ethics	Business Ethics

2.1.1 Environmental Issues

Environmental issues include four sections of climate change, biodiversity and land use, raw material sources and toxic emissions and waste in table 4. This section will review each environmental issue by identifying the concept and the research of existing literature on the specific ESG issue.

Table 4: Environmental issues structure in the literature review

ESG	ESG Rating Issues	Literature Review ESG Issues
Environment	Carbon Emissions	Climate Change
	Climate Change Vulnerability	
	Financing Environmental Impact	
	Product Carbon Footprint	
	Opportunities in Cleantech	
	Opportunities in Green Building	
	Opportunities in Renewable Energy	
	Biodiversity and Land Use	Biodiversity and Land Use
	Water stress	
	Raw Material Sourcing	Raw Material Sourcing
	Electronic Waste	Toxic Emissions and Waste

	Packaging Material and Waste	
	Toxic Emissions and Waste	

2.1.1.1 Climate Change

The corporate climate change issues included three types of risk including regulatory risk, business risk and physical risk (Labatt and White 2007), in which regulatory risk is the set of cost to capture indirect and direct carbon emissions by corporations against the regulation's policies and business risk includes parts of litigation refusal, reputation concern and business competitive challenges (Jung et al., 2016). The regulatory and business risk can combine as transitional risk, referred to the risk for corporations to transit to low carbon economy (TCFD 2016). Physical risk is the direct consequence of climate change, such as increasing sea levels and floods, exposed in different industries such as forestry, fisheries, and agriculture (Labatt and White 2007 and TCFD 2017). The scope of climate change issue is aligned by its risk together with opportunities to mitigate the risk, in which firms face transitional risk is talking more about meeting of regulation and considering the opportunities of taking green technologies to mitigate carbon emissions, for example, applications of renewable energies, green building and other clean technologies (Chen. et al. 2023, Dong. et al. 2022 and Li. et al. 2022), while firms related to physical risk focused on meteorological events (Chou, Clark and Kimbrough 2023). Compared with transitional risk, public awareness might put more attention on physical risk (Ardia. et al. 2023).

Firms' awareness of climate change has improved if the regulation increased in the disclosures demand, which has shown in the ESG reporting after SEC guidance in U.S (Chou, Clark and Kimbrough 2023). However, due to the variance risk of climate change issues, existing literatures have found that responses to risk are different compared with different firms. Reputation concern, the society awareness on climate change, measured

by the news index, Ardia. et al. (2023) found that climate change awareness for those firms with less intensity of carbon emission positively impacted their stock performance, while it negatively impacted for high intensity carbon emission firms. In the bank industry, Ali. et al. (2023) found the negative impact of carbon emission exposure on the bank's stability both significantly and economically. In the shale gas industry in China, the climate change announcement is adding value for long term and but decrease stock return at the beginning weeks (Hui. et al. 2023).

Firms' investment activities on climate change remained in discussion. Lowering carbon emissions required less capital expenditure in UK after investigating data of all UK FTSE All-share non-financial firms' data between 2013 and 2019 (Karim, Albitar and Elmarzouky 2021). However, it is not the case for the investment of technology innovations. Albitar. et al. (2023) applied the company data in London stock exchange between 2016 to 2020 to analyze the relationship between environmental innovations and carbon emissions and found innovation investment lead a reduction of emissions. It found similar investment strategy on digital transformation in China. Ren, Zeng and Sun (2023) included the Chinese A-stock listed company data between year 2010 to 2021 to evaluate the effects of digital transformation on corporations' environmental performance, which is measured by IT information assets, IT employees, and information system applications and found the digital transformation level is improving the carbon emissions management, which can alleviate corporate financing constraints. Managing existing investment following ESG principles helps to mitigate the carbon risk (Ali. et al. 2023). Furthermore, in the adoptions of emission trading system, Han, Wang and Zhao (2023) also found firms in China improve utilization capability through ways, stimulating green innovation, restricting over-investment, and alleviating financing constraints.

The external regulator might improve firms' capability of managing climate change directly while institutional investors are softer. Due to high attention of climate change in EU regulator, Hsueh (2019) found that European firms are in a higher level of execution

of carbon emission mitigating strategy compared with other global business with global 500 companies, which found higher level of participation in a corporate vision for environmental sustainability, adopt ESG principles, and invest in complementary assets compared with others. Corporations in China might take more advantages of EVs transformation to a low carbon transportation because the high demanding of electric vehicle in Chinese market leads the entire supply chain of EVs including the minerals industry to move into China (Holslag 2022). Meanwhile, Hui. et al. (2023) also found stated own companies, closed to regulators, suffered less than private firms after announcement of climate change regulations.

The firm's characteristics, referred to corporation governance, are significant for climate change adoptions, because managing climate change not might not always bring in benefits but also cost, depending on the firm executive's attitude and management structure, which is reflecting the capability of firms to handle climate change risk (Han, Wang and Zhao 2023). Executives resulted in a worst 10% of firms' carbon emission performance within staggered board governance, a weak board independence due to protection on board from market principle (Tanthanongsakkun, Treepongkaruna and Jiraporn 2023). However, Oyewo (2023) provides contrast results that board independence is not helping reduce carbon emission, means more independence board members more carbon emissions. Meanwhile, Oyewo (2023) also found CEO duality unexpectedly negatively influenced the carbon mission, which means less emission within CEO duality. Gender equality in board, ESG pay, committee and audit assurance can help performance of carbon emissions (Albitar, et al. 2023, Karim, Albitar and Elmarzouky 2021). While Oyewo (2023) argued that ESG compensation is negatively impacted on carbon emission in non-carbon emission industry, while it turned around for the carbon emission industry, indicate that same rule for different industry might not have the same result, because to achieve carbon reduction in different industries is different.

In summary, this part found the concept of climate change, referred to as the psychological event risk and risk of transition to low carbon emission. It required firms to invest more in green technologies. Otherwise, negative impact from climate change issues has found on firms' business performance. The focus on climate change remained different in different regions, in which European adopted higher level of overall issue, while Chinese invest more on EVs.

2.1.1.2 Biodiversity and Land Use

Biodiversity is the incomparably fast speed human history of the diversity declining within species, between species and of ecosystems, in which change of land/sea use is the first direct driver (IPBES 2022). While the issue of Biodiversity did not occur independently, which linked to the local communities' issues (Coolsaet. et al. 2020). Because it included other key drivers of climate change, pollutions, increase of human population, economic expansion and increasing pressure on nature resources governed by Indigenous people (IPBES 2022). However, corporate discussions on biodiversity do not link with other issues. (Coolsaet. et al. 2020).

The integration of biodiversity issues in ESG framework has improved the firm's awareness on conversion of biodiversity risk (Kopnina. et al. 2023). While Biodiversity protection is at the beginning phases, the challenges for firms to have effective actions remain, because it is missing with a framework to measure of cost and benefits of actions (White. et al. 2023). This can be found in the study by comparison with other environmental issues. Cole (2023) found the biodiversity and land use risks are low and medium in the mining industry in South Africa. Meanwhile, natural resource unequal distribution is also another reason for regulation difficulty. For example, Zhang. et al. (2024) found the marine natural resource values in south of China significantly higher than north China areas. Furthermore, with different motivations on projection of

biodiversity due to different resource allocation, benefits of the protection, such as growth in forestry, did not distribute unequally between in Scottish local player and global actors, due to the beardless flow of those commodities (Sharma. et al. 2023). The accountability of actors on the firm's side is not there, for example, Zu Ermgassen. et al. (2022) found that the commitment of nature-positive practice to improve biodiversity is not accountable now, because this is still a new concept for firms within Fortune 100 firms.

Existing literature found few opportunities against biodiversity issues. For example, Kopnina. et al., (2023) found that firms have realized the business model of circular economy and degrowth evolution against biodiversity issues, while it remained challenge to convince and engage with other stakeholders in those new business models. Zu Ermgassen et al. (2022) found the innovation of pace of accounting frameworks and policies is developing fast for the implementation in the futures of the protection. The firm within natural resources related industry has engaged in contribution of biodiversity protection, because environmental issues for those firms, are more key factor amount social and governance in sustainability reports (Quayson. et al. 2023).

This part has concluded the concept of Biodiversity and Land Use issue, which refers to issue of using land or seen by human beings affecting the fast speed of species decline. It found that biodiversity and land use issues have connected to other ESG concerns, but firms should give more attention to them. It also found few opportunities by the recycling business to overcome this issue.

2.1.1.3 Raw Material Sourcing

Raw material sourcing is the status of the traceability (Sohal 1997) and quality certificates of firm's main raw material suppliers (Rábade and Alfaro 2006), which result by issues if the firm could not trace well on the raw material sourcing in its supply chain. Traceability is coming together with the use of quality control procedure system of ISO 9000/BS 5750, which asked the firm to have the ability to retrace production steps and verify each certain events during the manufacture (Cheng and Simmons 1994).

Original traceability might look like internal trace including production status, performance, and target traceability (Cheng and Simmons 1994). Traceability becomes a quality tool within the tracing system to manage information externally between suppliers (Rábade and Alfaro 2006). Meanwhile recent technology also supports detection and measuring on a full traceability of supply chain in the market, asked by European regime (Schwägele 2005). To improve quality control and internally in identifying the direct and indirect cost during production, both for legal and contractual requests from customers needed a complete tracing system (Sohal 1997), which can help trace the cause of production failures and adverse events (Skilton and Robinson 2009).

Current literature of raw material sourcing remained the discussion on the functionality of ISO certification/traceability. First, ISO certificated firms are engaged with CSR activities, which thus increase the firms' profitability in Ghana (Gyekye. et al. 2024). The adoptions of ISO 14001 in the construction industry improved the degree of facilitating sustainable practices, for example, more associations with air pollution reduction (Bashir. et al. 2022). Second, the adoptions of ISO management system could help discover firms' demand and opportunities for the improvement of sustainability (Ronalter, Poltronieri and Gerolamo 2023, Fonseca. et al. 2022). Furthermore, the management system helps act as the scanning role to identify the issues of firms towards to the sustainability (Hahn 2013) and integrate actions as a framework to do the project base improvement on sustainability (Arana-Landin. et al. 2024).

However, the user faces several difficulties with the adoption of ISO systems. First, the frequency of environmental practice use varies even low in the study of the twenty-eight main practices in the adoptions of ISO 14001 in the construction industry. Second, capital demand is the most significant barrier for successful adoptions (Arana-Landin. et al. 2024). Furthermore, different management systems remained on different focus. For example, B Corp certificates are more on social, community and workers, while ISO9001/14001 are more on environmental directions. Finally, the development and implementation of a firm's sustainability strategy cannot solely depend on adopting standards, as these are internal matters that firms must address themselves (Hahn 2013).

This part has concluded that the issue of raw material sourcing refers to firms' implementation of traceability systems and adoptions of quality certifications. It has found evidence of the benefits stemming from focusing on improving raw material sourcing issues. However, this area has found few difficulties, including increased costs and competition among different quality certifications.

2.1.1.4 Toxic Emissions and Waste

Toxic, the hazardous air pollutant emissions, was based on the debate of environmental justice and health in 1990s (Susan et al., 1995), that the association between air pollution and health risks unequally distributed across ethnic groups or by individual economic levels in the United States (Sexton. et al., 1993). The existing database of toxic, such as the toxics Release Inventory, provides more than 650 chemical data and includes a wide range of firms while they are self-reported by firms instead of the actual measurement of toxic emissions (Kim. et al. 2019).

Waste is all kinds of useless or unwanted disposal materials derived from different activities occurred in the place such as houses, manufacturing industries, and other public areas (Bailie 2001). The waste generation is increasing around the world, estimated by 2.24 billion tons in 2020 and further increased by 73% in 2050 due to human population growth and urbanization (World Bank 2022). Corporation waste disclosure included the volume of waste produced or discarded by the firm including both hazardous and non-hazardous waste (Samuel et al., 2020).

Toxic management does not have the same meaning for different firms. The unequal distribution of natural resources exists across different regions. For example, Luo. et al. (2019) found the unbalanced SO₂ resources distribution in China and proposed a monetary way to exchange the toxic between each province to mitigate the unbalance of environmental impact. Management of waste management in ESG implementation face three parts challenges in China, including the missing of comprehensive regulation framework, lack of funding for technology adoptions and eco-design facility (Liu, Ge and Wang 2024).

The relationship between corporate governance and toxic and waste also remained in discussion. ESG based compensation policy can help mitigate the motivation of firms to release more toxic and waste when firms profit is over budget (Gull. et al. 2022). While Selahudin. et al. (2021) found Waste reporting in ESG did not show a meaningful relationship with Board diversity, board independence, board meeting, board size and CSR committee in Malaysia where the waste disclosure is in a medium low level. Corporation business ethics might help manage toxic and waste. A set of stock listed companies' data in China between 2017 and 2019 is applied to analysis the relationship of the air pollution level and business corruption and found that higher business corruption will decrease ESG practices and cause a lower performance of air pollution (Meng, Li and Yang 2023).

Furthermore, ownership of firms resulted by toxic waste issues differently. Sustainable regulations such as the National Plan for Sustainable Development of Resource-based Cities in China significantly improve the high resource dependent cities' environmental performance and thus improve the ESG rating in firms in those cities, while non stated own companies are more sensitive on it than stated own companies (Wang, Chen and Wang 2023). It might also relate to the firm's existing ESG rating. He, Zhao and Zheng (2023) found the environmental protection tax law has a more significant impact on the high existing ESG rating firms than lower ESG firms, while they impact delays during the initial period. Institutional ownership investors can influence it. Kim. et al. (2019) found that according to US EPA data, institutional ownership in corporations consistently has a negative impact on chemical toxic releases, in which the Local social funds or public pension funds showed more meaningful relationship than other institutional impact.

The relationship between toxic and waste management and business performance remained in discussions. High profit might motivate the release of more toxic and compensate by the greenwash of higher ESG rating. Yao, Zhang and Zhu (2022) found that firms meet or beat the profit target followed with a higher toxic emission, which is more significant when the firm has better ESG rating, according to study on Environmental Protection Agency (EPA) database. Similar situations exist in waste management corporations. Gull. et al. (2022) found that both hazardous and non-hazardous waste released are negatively correlated with the business performance of firms, which means that higher business performance tends to be associated with higher levels of waste. Another indication of business performance, cash holdings may also reflect the same trend. Samuel et al., (2020) found the amount of waste disclosed has positively impacted the cash flow ratio to assets. But this is applicable for firms with a decent quality of governance and is not applicable for firms in environmentally sensitive industries. It might be a different view on long term and short performance. By applying

sample 361 U.S. firms between 2007 and 2016, Hoang. et al. (2020) found that environmental transparency positively impacted the stock market performance in short term while negatively impacted the return on capital employed on long term, because the lower environmental transparency will cause the loss of efficiency on water use and waste management which cause the lower performance in short term.

This part identified the issue of toxic and waste referred to the hazardous emissions and disposal materials. It has found the significant role of firm's governance, including board and ownership, has impacted firms' behaviors on this issue. However, existing studies could not conclude whether a more profitable company tends to release more toxic and waste or not.

2.1.2 Social Issues

Social issues include thirteen issues followed in table 5. In this section, it will review each social issue for the concept and the related research result.

Table 5: Social issues structure in the literature review

ESG	ESG Rating Issues	Literature Review ESG Issues
Social	Health and Safety	Health and Safety
	Chemical Safety	
	Human Capital Development	Human Capital Development
	Labor Management	Labor Management
	Supply Chain Labor Standards	Supply Chain Labor Standards

	Consumer Financial Protection	Consumer Financial Protection
	Privacy and Data Security	Privacy and Data Security
	Product Safety and Quality	Product Safety and Quality
	Responsible Investment	Responsible Investment
	Community Relations	Community Relations
	Controversial Sourcing	Controversial Sourcing
	Consumer Financial Protection	Access to Finance
	Access to Finance	
	Access to HealthCare	Access to HealthCare
	Opportunities in Nutrition and Health	Opportunities in Nutrition and Health

2.1.2.1 Health and Safety

Employee health is a person's both psychological and physical conditions, which turned from not only traditionally employee's physical condition but also the change of external multidimensional environmental conditions on the employee's stress level (Beehr and Newman 1978). Incongruences between employees' psychological condition and work environmental, including both of mismatch between employee's capabilities and job demanding and mis match between employee's goals or expectations and offerings from the job environment (French, Caplan and Harrison 1982). Employees' unhealth level, such as individuals under physical chronic conditions, tend to quit a full-time job or retire early (Pan. et al. 2021). Occupational Safety is the frequency of workplace injuries or accidents (Pouliakas and Theodossiou 2013). Corporation safety performance included the investment and expenses that consist of actions to increase the safety of working operation (Rosenberg 1999), and the prevention safety culture or climate (Moghaddam 1998 and Zohar 1980), which towards to the reduction of risks before the workers injury and assess the reasonable workload of employees (Lunda and Aarøb 2004)

Employees' health and safety are important, while the public did not pay enough attention to those improvement efforts. For example, Olsen, Awuah-Offei and Bumblauskas (2021) found that market reaction did not respond to the safety number disclosure of US mining firms by including the mandatory disclosure requirement. Furthermore, the adoptions of Universal Demand laws, which are in tendency to reduce shareholder litigation threat of directors, caused an increase of workplace injuries, because managers are tending to be saving cost from safety with lower attention from public, especially, when the firms facing higher ex ante derivative litigation risk, less product market competition and weaker union power.

Existing literature also found that adoptions of different ESG issues impacted on employees' health and safety conditions. ESG activities on water stress management and adoption of clean technology, based on MSCI ESG database, can help reduce employees' stress and improve the health of employees (Piao, Xie and Managi 2022). Meanwhile, Caskey and Ozel (2017) also found that increase in cost and investment on technology positively impact health performance. However, ESG activities on carbon emissions and raw material sourcing management proved to be harmful for employees' psychological health (Caskey and Ozel 2017 and Piao, Xie and Managi 2022). This might relate to the distance of benefits to the employees whether the ESG activities link to employees' benefits. Gong, Guo and Wang (2023) have explained by the employee share plan and found firms with share plan for employee's performance are less tendency to save cost in the safety.

This part has found that health and safety is employees' physical and psychological condition and injuries and accidents from workplaces. It found a lack of public attention on this issue and employees' benefits are the direct driver to link employees' health and safety performance and ESG adoptions activities.

2.1.2.2 Human Capital Development

Human resources theory (Becker 1964) illustrated that relationship between investment on human capital development on employee skills and knowledge through ways of education and training and enhancement of the return on corporations' labor costs and employee's income, while it remained challenges for firms to avoid the losing of human capital investment to be transferred from own firms to other firms (Lepak and Snell 1999). The tool of training and recruiting in successful talent war in the human capital development brings the unit competitive for firms in the market and helps reach operational goals of the organization (Guerrero, Cayrat and Cossette 2022).

Existing literature has found several key factors for human resource development, including training, social activities, incentives plan and female gender ratio. Organizational learning and training significantly and directly supported the implementation of corporation social activities by enhancement of leadership for learning, connecting system and group training, while it indirectly impacts operational level (Osagie et al. 2022). Employees attending more social activities together can strength the employees' compassion and psychological ownership of firms (Ali et al. 2021). Equity shares incentives plan sharing the return together and retaining employees, who is looking for long term development of the firm, help engaged the environmental performance and increase the ESG rating, according to 3450 listed companies' data in Chinese stock market (Kong et al. 2024). Females are more important in sustainability adoptions, while it could not live with high physical pressure work conditions. it showed that females are in stronger impact on group activities than male employees (Ali et al. 2021). While Pan et al. (2021) found that females are in higher tendency of leaving full time job than man when they are under physical chronic conditions.

In conclusion, it has been found that human resource development means the focus on employee's education and on-the-job training. It further explains importance factors of organizational training, attending social activities, employee incentives plan and female gender in the issue of human resource development.

2.1.2.3 Labor Management

Labor management is management activities of labor adjustment cost, including gross cost of hiring/firing and net cost of changing employment when firms face the voluntary mobility of labor (Hamermesh 1995). Gross labor adjustment cost may need more attention (Hamermesh 1995), because it is a part of the firm's market value, which is forward-looking behaviors, as the expectation of increase on present firm's value (Merz and Yashiv 2007). While maintaining the market price by changing employment's professional level is also important, because Danthine and Donaldson (2002) indicated that the low frequency variations in the share of labor cost in the production output value remained a significant risk, which might be not to be insured.

Investment in labor management can improve firms' overall ESG performance because this motivates employees to contribute to firms. Li. et al. (2023) developed the indicator of labor investment efficiency by comparison of firm's labor headcount increase rate and revenue increase rate and found that ESG performance is positively associated with firm's labor investment efficiency by optimization of both overinvestment and underinvestment in labor, by using data from A – share listed companies in China from 2015 to 2020 and ESG data from Sino-security ESG rating. Schochet, Benlemlih and Jaballah (2022) applied U.S public firms' data of corporate tax avoidance and MSCI ESG sub dimension data of employee treatment and found the positive relationship between corporate tax avoidance and employee treatment. It is aligned with the compensation

differentiation theory that the employee who takes considerable risk of tax avoidance should receive different compensations compared with other employees.

This part has concluded that labor management issues are the management adjustment cost on employees new hiring or leaving or internal development. It found evidence that good labor management is the key factor in enhancement of ESG performance.

2.1.2.4 Supply Chain Labor Standards

The supply chain labor standards issue started from the misalignment of labor standards around different nations during the global trading between developing and developed countries (Block. et al. 2001). For example, child labor issues get worse in those developing nations in which globalization created jobs, but child labor is less regulated and jumped into work market (Basu and Pham 1998 and Basu 1999). Few international standards and nongovernment standards have dealt with those misalignments of labor standards (O'Rourke 2003), however, both increasing of global trading and value of nations' sovereignty may lead to the difficulty to create a unit standard (Block. et al. 2001). More scholars are asking for more transparencies on the adoptions of standard, referred to as supply chain transparency (O'Rourke 2003). Therefore, the current supply chain labor standard issue is the status of firms' supply chain transparency.

Supply chain transparency means that the disclosure availability of firms' supply chain reporting is possible for firms' external impact by their business activities (Egels-Zandén, Hulthén and Wulff 2015). Firms sustainable supply chain transparency means the sustainable supply chain information, including traceability, financial transactions, sustainable policies, and actions between different suppliers within and outside of the

network is visible and informative for external review (Gardner. et al. 2019 and Schafer 2023).

Few literatures have discussed the benefit of supply chain transparency improvement. A transparent supply chain improves the possibility for the public and different actors to collect sustainability improvement information (Wu. et al. 2024). The increase of manufactures' supply chain transparency level helps the environmental sustainability (Wang. et al. 2023) and promote responsible sourcing (Baik. et al. 2024)

Different external actors make efforts and expect the improvement of supply chain transparency. Both subsidies' strategies and extension of regulation from the government actor have helped the increase of transparency (Baik. et al. 2024 and Wang. et al. 2023). NGOs also played an effective power to put pressure on those connected companies to improve the supply chain transparency. However, NGO gave pressure of higher supply chain transparency and resulted by turning a negative impact on the transparency performance (Schäfer, Petersen and Hörisch 2024). Furthermore, firms with less transparency normally have an advantage of better trade credit usage limit from its buyer, which may have recognized the importance of transparency but practices another direction by giving more credit for less transparency firms (Wang. et al. 2023).

Gardner. et al. (2019) explained the complexity of firms inside motivations decide if the supply chain transparency can empower or disempower firms. For example, firms with less complexity supply chain network, represented by concentration of main suppliers in whole chain, are likely to improve transparency because less complexity demand a low capability and cost to achieve the transparency (Feng, Zheng and Shen 2024).

Existing literature measured supply chain transparency performance by using ESG rating score, such as Bloomberg ESG and Wind ESG (Feng, Zheng and Shen 2024 and Wu. et al. (2024). This application has led to the equalization of both concepts of supply chain transparency and ESG scores.

This part has found that supply chain labor standards refer to the level of firms' supply chain transparency including the disclosure of the supply chain network and policies. It found that government pressure can help improve supply chain labor standards issue, while it is not the case from NGO. It found that the motivation of firms to improve supply chain transparency depends on the cost and benefits related to this issue from the firm's side.

2.1.2.5 Privacy and Data Security

Privacy is a boundary controlling process between people optimized by both the restriction of interaction and searching of interaction, which includes three kinds of functional roles of controlling and managing interpersonal interactions, planning, and defining roles and strategies of working with others and featuring self-identity (Altman 1975). Privacy issues have added protection of information privacy in which the public emphasized the importance of handling information in working organizations (Fusilier and Hoyer 1980). Furthermore, the public has recognized data security issues since Information Technology gained the competitive advantage of web-based systems communication without border to exchange of data (Baumer, Earp and Poindexter 2004). Data security is the measurement to protect data in collection restrictions, data qualifying, data purpose, use restriction, safeguards security, openness, participation, and data accountability (The OECD Guidelines 2000).

Both regulators and firms should make more efforts on privacy and data security. Firm's ESG reports disclosure most often cited content of data protection and cybersecurity in the digital materials (Jordan 2023). However, Information Technology firms lack a comprehensive program to protect online privacy, resulting in ongoing moral talk with less doing (Irene 2011). The EU's regulation framework of data protection remained in the moral and ethical view because of the high development speed of technology coming with new ethical dilemmas (Ioana, Constantin and Sonia 2022).

Existing research also found that regulations and ESG investment are key factors on enhancement of privacy and data security issues. Due to the power-responsibility equilibrium between corporation security protection regulatory and consumers' trust, privacy concerns and privacy empowerment, the more regulations to consumers will turn back with more defensive behaviors (Ruwan, Mario and Shahriar 2021). While more investment on ESG can increase customer's trust and reduce the privacy risk concern, as result by influencing on the customer's repurchase intention and switching intention (Huang, Wang and Qu 2023). Huang and Liang (2022) also found promotion of ESG activities through both online and offline channels in the electronic industry can help improve consumers privacy concern and result by best earning, while if the company only promote CSR in offline not online, the profit level will be in worst situation among other industries.

This part concluded that privacy and data security mean the human beings' physical boundary and invisible data controlling procedures within the interaction with external environment. It has found the lack of attention from the public on these issues while the investment in ESG activities on the firm's side will help reduce concern about privacy and data security.

2.1.2.6 Product Safety and Quality

Product quality, formulated by the conformance to requirements, which is definable for managing nonconformance issues (Crosby 1979). Product safety is the safe aspect of product consuming caused by product design or manufacturing failure and discrepancies (Peters 2001), which requires coverage of product insurance on consumers' welfare (Epple and Raviv 1978). Non-constant cost within product price can decide the product quality information carried to consumer (Cooper and Thomas 1984), while firms face market competition pressure to reduce the quality resulted as the potential risk of product safety, which needs to consider the public priority principle (Chen and Hua 2017 and Rory 2023). For example, the consumer law focusses on microeconomics areas, transferred from traditional economy efficiency development into protection of consumer's interest by considerations of the environment, the economy, distribution, health, democracy, and beyond (Rory 2023).

The investment of ESG has impacted on product quality and safety, while the effects were found in both positive and negative directions. Firms increase their investment in social responsibility, while it will reduce the product quality to competitive in the market (Sumitro and Luc 2017). However, the firm might increase product quality by saving the investment of social reputation investment. However, the investment in CSR has assisted the quality improvement in agricultural products (Qin and Lin 2022). However, an experiment with business school students showed that consumers might not prefer to compensate for the product quality with the reliable performance CSR of firms but impact on the job preference (Berens, Van Riel and Van Rekom 2018)

Improvement of product quality and safety focused on technology development and firms' leadership. By using the data between 1965 to 2005 in U.S, Fonseca. et al. (2021) found that technological development on medical services and products lead to the increase of people's longevity while an increase of society welfare on medical coverage

also makes citizens to be more affordable for increase of quality and safety. Khurshid, Amin and Ismail (2018) found the importance of consistent management and leadership in the integration of adoptions of ESG and product quality management.

This part found that product safety and quality mean that the risk of product failure on safety and quality prospectives leading to not conform with customers' requirements. It found that investment in ESG, development technology and enhancement of organizational leadership are key factors for this issue.

2.1.2.7 Responsible Investment

Responsible investment issue is origin with the term of “social screen” which is refer to an ethical investment decision process from the investment managers, not depending only on financial criterions, but including non-financial factors of the social, ethical, and religious concerns. (Kinder and Domini 1998). Responsible investment standards are not equally comparable between different regions, for example, Europe and North America have a stronger standard than other developing countries (Dunning 2003). A consolidated principles proposed by the Principles for Responsible Investment (PRI), is the term “ESG” as mentioned in beginning sections (Sandberg 2008). Therefore, responsible investment is duplicated concept of ESG which asked firms to follow investment activities by ESG screening principles.

2.1.2.8 Community Relations

Community relations are manifest and latent neighborliness social relationships among residents in a residential, observable, and delimited geographical area (Mann 1954).

When it is related to firms, community relations issue means the social responsibility performance of firms by evaluating decisions and actions made by the corporation both internally and externally on managing the community neighborliness (Kemp and Owen 2013).

It is urgent to operate firms as neighborliness with the community relations, by three proposed principles by the access to awareness of local issues, respect for local communities, and readiness to help if it needs (Yoann and Maja 2023). Existing study has found the community relations' religious value positively impacted the firm's ESG performance. Nebojsa, Veda and Sami (2024) investigated the relationship of firms ESG score and firms' Christian values by the sample of ninety-eight large US firms between 2012 and 2020 and identify a positive relationship between those two items, specially, significantly impacted the social and environmental performance. While the sub-categories are not all liked, Christian value is assisting more on product responsibility, emissions reduction, and responsible use of resources. On the other hand, labor management related not positively impacted by Christian value, is fundamental in different value compared with the assessment cataria in ESG. Hassan. et al. (2022) applied to the nonfinancial firms in US between 2002 to 2018 to investigate the Sharia-complaint value to help the firms ESG scores and confirmed the positive relationships.

In summary, community relations are the connections between firms and neighborliness social relationships among domestic residents. It found that current research focuses on the value of religion playing a key role in community relations.

2.1.2.9 Controversial Sourcing

Controversial sourcing issue is the raising of judgment of consumer' ethical awareness on the firms' sourcing practices (Bregman, Peng and Chin 2015), which is the impact of "ethical consumptions" (Crane and Matten 2010), on the firms' behaviors of using "controversial materials". Consumer's focus on controversial sourcing raised in 1990s, has played a significant role in a higher increase of moral consumptions compared with normal product consumptions, which include a wide range of moral consumptions activities by fitting with individual's beliefs and value, such buying non-animal-tested product and avoiding buying goods made by child labor (Crane and Matten 2010). However, controversial sourcing issue might not the same in worldwide, for example, not liked Western world, public awareness in China treated controversial sourcing for the private product, such as condoms more resistance from individuals, while those "public" product such as alcohol, is less offences by consumers (Fam, Waller and Yang 2008).

The focus on controversial source issues has been important for society. First, it might have improved the food system. For example, Capecchi (2019) found that consumers' concern on the consumption of palm oil issues has been effective for the improvement of sustainability in the food industry. Second, firms' efforts of ESG initiatives on controversial sourcing issue have positively influenced the customer's ethical consumptions (Shahzad. et al. 2024). Furthermore. Controversial industry brings accounting performance than other industries during the economic recession period (Chatjuthamard 2020).

Existing literature may focus on controversial sourcing disclosure activities in ESG reporting from firms' side. Kuokkanen and Sun (2020) believed that it is a good chance for firms to disclosure negative controversial issues to consumers because the correction actions will give consumers more confidence and thus improve firm's reputation. However, the explicitly persuasive intention of CSR actions could make consumers recognize more negative single to lead to a jeopardization of the goal of supporting firms' reputation (Lee, Lee and Cho 2018). But firms within higher controversial sourcing risk

have shown more disclosure of ESG policies and transparency certificate tools than other companies (Conte 2023).

This part concluded that controversial sourcing issue is the risk from firms' side on procurement of controversial materials which lead the defense of consumers' ethical consumptions behaviors. It found that the firms are struggling to present more detailed controversial sourcing or not in their ESG reporting.

2.1.2.10 Access to Finance

Access to finance is the availability of reaching a set of financing resources, including the bank credit, start-up capital (Barrett 1999), short-term funding and long-term loans (Beck, Demirguc-Kunt and Maksimovic 2005). Beck, Demirguc-Kunt and Levine (2005) listed out four kinds of obstacles for access to finance of increasing financing difficulty, financing with collateral request, access to long term loans and bank bureaucracy of special connections demand. Few literatures have found issue of inequality to distribute access to finance, such as the constraint of growth finance demand in small and midsize enterprise (Berg, Kölbelt and Rigobon 2022), less financing possibilities in countries with less-developed financial institutions (Demirguc-Kunt and Maksimovic 1988) and more financial obstacles for ethnic minority business (Barrett 1999). Cheng, Ioannou and Serafeim (2014) illustrated that less government intervention in banking systems improves the efficiency of banks and thus improves firms' access to finance. Society can also benefit by the improvement of access to finance (Bertrand, Schoar, and Tesmar 2007). Therefore, the issue of access to finance is the request to ask firms including financial institutions to take care more of the issue of inequality distribution of financial resources, by looking more at small companies, minority group business and more investments in undeveloped regions.

Much literature has illustrated the positive impact of firms ESG to firms' access to finance. A better ESG performance can reduce the capital constraints in access to finance (Cheng, Ioannou and Serafeim 2014 and García-Sánchez. et al. 2019), because it can increase creditworthiness from the financial institution between different stakeholders by improving ESG activities engagement, which can provide cheaper capital to replace higher cost trade loan (Boubaker. et al. 2020 and Jadiyappa and Shette 2024). García-Sánchez. et al. (2019) also found that the more availability of firms' CSR information can improve the firms' access to finance by analysis of international data between 2007 to 2016. However, engagement of ESG might not be good at the beginning. Lian and Chen (2024) found that improvement of CSR disclosure demand by mandatory way created greater constraints for access to finance in China for the listed firms which are in the mandatory regulation scope.

This part found that the issue of access to finance is the unbalanced distribution of financial and banking resources into the developed and developing regions and the small group such as SMEs, which asked firms' side to deal with those unbalances. It was found that investment in ESG will help optimize firms' issue of access to finance while it might face few difficulties at the beginning.

2.1.2.11 Access to Healthcare

Access to Health care is the entry of individuals or a group into the system of health care (Aday and Andersen 1975). The access has four dimensions of complexity, including the availability, barriers, effectiveness and equity of the health care services (Gulliford. et al. 2002). Current literature focus on the issue of equity of the access to health care, such as the minor group as new immigrant (Gabriel. et al. 2023), within a community with

diverse neighborhood (Pemberton. et al. 2019). Meanwhile, the barrier of access is an issue between complexity of health service supply and unit demand of individuals (Shea et al., 2022). Furthermore, mental health service should also be included in the issue (Filia. et al. 2024).

Existing literature links ESG to access to health care by focusing on sustainability of the health sector. Bosco. et al. (2024) recommend the health sector to consider innovative and efficient ways by mapping ESG issues to take specific corrective and improvement actions connecting with social and governance aspects. Tomaselli. et al. (2018) also found that besides doing CSR, communicating with new ITC tools are also helping health care system to deliver efficient sustainable impact to society. Furthermore, the employees' health of health care sector is the key for sustainability delivery. Ahmad. et al. (2023) found that employees in hospital showed stronger commitment and energy in the work if there is a set of well-planned and well-executed CSR policies.

In summary, access to health care issues refers to the inequality distribution of health care system into different individuals or groups, which asked for health care sector to take efforts to overcome this unbalanced. It found that innovative technologies implementation and well-organized ESG policies are key factors in dealing with this issue.

2.1.2.11 Opportunities in Nutrition and Health

Opportunities in Nutrition and Health issue is the gap between different social class to have different chance to live with health diet and natural nutrition, which is usually reflected by the difficulty of those lower socioeconomic group to reach with rich natural fruit, vegetables, unrefined cereal and small volume of qualified vegetable oils, instead of

actually consuming cheap energy food in the diet, such as sugar, fat and potatoes (James and Nelson 1997). This gap caused worse health conditions for low-income households, for example, increase of the obesity disease (Tiffin 2012). Furthermore, the inequality of nutrition for women and children not only impact low-income countries (Phuong. et al. 2022), but also the developed country, such as Italy, can also find 22.3% of the population suffering the food poverty issues (Marchetti and Secondi 2022). The same issue happened between rural and urban populations (Vassilopoulou 2023). National policies might not be fully functioning at this moment (Heidkamp. et al. 2020), for example, a simple fiscal fat tax could not ask to improve the fat intake (Tiffin 2012). Therefore, society requires the responsibility of firms to deliver cheaper and healthier nutrition.

It has been urgently calling different actors to act the accountability to improve the food nutrition and health since obesity prevention has been an issue for the health of citizens (Robinson. et al. 2022). Meanwhile, existing literature showed the benefits of nutrition efforts on firm's side. For example, Ye, Cronin and Peloza (2015) found that enhancement of the product's nutrition information disclosure in ESG reporting can improve the customers' evaluation of the restaurant's service quality, including experience satisfaction and value attributed. Lee. et al. (2016) found that the listing of healthy nutrition information on menus has improved the family's perceptions of CSR and intentions of buying. However, the disclosure of nutrition can lead to fake impression management only. Peloza, Ye, and Montford (2015) found that the impression management of firm's ESG reputation has misled the consumers in which it underestimated the product's calories content and caused the overconsumption of it. Potvin. et al. (2020) also confirmed that the self-regulation initiative has not significantly improved public health which did not reduce the expose of unhealthy food advertisement to children. There are few reasons caused by this misleading. First, funding the source of nutrition programs is not independent. The funding from food and beverage companies could not regulate themselves to reduce the profit from those unhealthy products if they

are funding provider (Potvin. et al. 2020). Second, those food companies lack independent monitoring procedures and further evaluations during the implementation of nutrition improvement initiatives and strategies (Barata). et al. 2020). Finally, the investors of food companies did not take nutrition as seriously. Robinson. et al. (2022) found that Australian investment funds have limited in the availability of a comprehensive framework of activities aimed at addressing nutrition issues by preventing unhealthy diets.

In this part, it has concluded that issue of opportunities in nutrition and issue of Health is the unhealth nutrition diet in low-income social classes. It found that taking part in nutrition disclosure will help firms' business by attracting more customers, while it needs more independent regulations to avoid misleading impression management from firms' side.

2.1.3 Governance Issues

This section will review five issues, which are in table 6. Each part will review each by identification of definition and the existing research around it.

Table 6: Governance issues structure in the literature review

ESG	ESG Rating Issues	Literature Review ESG Issues
Governance	Board	Board
	Pay	Pay
	Ownership & Control	Ownership & Control
	Accounting	Accounting

	Tax Transparency	
	Business Ethics	Business Ethics

2.1.3.1 Board

The board is a board of directors under corporation law to direct the management initiatives, evaluate business performance and distribute rewards and penalties to management (Eisenberg 1976). Board of directors are not as individuals but as a class, to be accountable for the shareholders' interests under the legal view (Wang and Coffey 1992). The board acts as a consultant, to provide operational discipline value and act directly in crisis situations, while the challenge of the board role is to balance the high involvement of details management work and major influence on corporation decision making procedure (Mace 1972).

Directors normally included two groups of insiders and outsiders with different personal backgrounds (Kesner 1988), while structure of the insiders and outsiders are related to the strategic decision-making processes (Baysinger and Hoskisson 1990). More board diversity could bring more various view to be considered (Kesner 1988) and improve the independence of boards and broadens the knowledge and power Kesner, Victor and Lamont (1986), for example, outsiders making more charitable contributions (Wang and Coffey 1992) and less involvement in illegal activities (Kesner, Victor and Lamont 1986). When linked ESG and board, existing literature discusses the impact of composition of outsider and insider board structure and board member diversity, including gender and age.

There is no conclusion about whether outsider or insider board members are more important for ESG. Cucari, De Falco and Orlando (2018) found that independent

directors and CSR committees are positively correlated with firms ESG performance in Italy by applying Bloomberg ESG rating system. Zaid. et al. (2020) further explained the independent directors from outside improved the ESG performance in Palestine by transferring external pressures, including government, institutional and foreign investors of ESG expectation to firms. However, insider directors have more accountabilities for ESG result when it recognized the importance of ESG. Patricia, Elena and Nicolas (2019) investigated the corporate governance with ESG performance by board directors' structure and investor relations officers' strategy by top 120 France firms data and found that board director structure with more internal directors normally follow a better sustainability performance because the internal directors have to team up to deal with all the stakeholders, while the higher part of external experts in the board resulted as a lower sustainability performance.

Most of the literature has confirmed the importance of gender diversity in board members. Cambrea Paolone and Cucari (2023) found that firms' ESG performance is high properly improved under governance with more female directors, who is in a better strategic board position with more influence in the organization. Radu and Smaili (2022) found board gender diversity showed a positive association with the improvement of cybersecurity disclosure based on the listed company data on SandP/TSX 60 Index over the period 2014–2018. Radu and Smaili (2022) and Cambrea Paolone and Cucari (2023) both confirmed the certain number of female directors by three or more in the correlations. Alkhawaja. et al. (2023) applied the global database by worldwide sample of 8262 firms listed across forty-eight countries from 2005 to 2019 and found the gender-diverse in board has positive impacted the firms' ESG issues disclosure level around the world. Beretta. et al. (2023) and Temiz and Acar (2023) also confirmed the board gender diversity improved firms' CSR disclosure. Increase of female director appointment of firms resulted the decrease of sexual harassment rate, which is counted by 21.81% decrease with one added female director, because the female director has resulted by pushing improvement of social policies, by using the data from US online job review data

(Au, Tremblay and You 2023). Qiu. et al. (2023) explained the gender equality governance might decide by social trust level of external environment. While not liked most of literatures, Cucari, De Falco and Orlando (2018) found a negative correlation between gender diversity and ESG rating in Italy. Furthermore, not only gender diversity but also age diversity helps ESG performance. For example, Cosma. et al. (2021) found the firm's board with young directors indicate a better quality of ESG disclosure.

In summary, this part concluded that the issue board refers to the independence and diversity of board members in the corporations. It found few debates about whether outside board members are more important than outside board members or not. While existing literature confirmed the importance of gender diversity in board members.

2.1.3.2 Pay

The issue of pay is related to the public concern on the agent costs (Jensen and Meckling 1976), of the reliability and rationality of compensation for of firms' executives, including the issues of performance to pay, compensation to peers, compensation of compensation negotiation and procedures and alignment between shareholder interest to pay (Bebchuk and Fried 2004). It is doubtful that the high pay to executives may not be reflected by the contribution to firms' value (Chang, Sudipto and Hilary 2010). Faleye, Reis and Venkateswaran (2013) explained that executives have better bargaining power to discuss with the board and the relevant stakeholder to decide a higher pay than normal employees.

The stronger pay gap motivated more transparency by more expenses on audit fees (Ge and Kim 2020). The increase of pay gap follows with the increase of CEO's firm's size compared with peer firms (Gabaix and Landier 2008). However, the pay gap remained

more issues. Lower different pay between normal workers and managers leads a result by increase in product quality, because workers are willing to increase their commitment to the product quality in such a pay situation. (Cowherd and Levine 1992). It suggested to have better controlled governance structure, which will lead to a tendency to pay more to ordinary employees (Cronqvist. et al. 2009)

Linking with executives' compensation to ESG activities, especially to climate change, is urgent but not widely applied at this moment, since 2% of performance conditions related the pay of the board specifically to the sustainability or environmental performance in UK FTSE 350 companies (Ritz 2022). Without incentives for ESG activities, Homroy, Mavruk and Nguyen (2023) explained the executives need more motivations from ESG incentives to help shareholder derive utility from ESG in addition to wealth. Zhang. et al. (2023) applied data of 2012 to 2020 A-shared list company and found that executive salary gaps positively impact ESG disclosure ratings, specifically from Bloomberg's ESG data. However, the pay of ESG certainly improved the ESG ratings but may not for improvement of business performance (Cohen. et al. 2023)

The additional ESG compensation policy supports the overall ESG payment. Baraibar-Diez, Odriozola and Fernández (2019) found the listed companies from Spain, France, Greek, and the United Kingdom in the period 2005–2015 have shown the positive influence ESG pay policy in the ESG scores, especially when firms have a corporate social responsibility committee acting as control mechanism and supporting the achievement of those objectives, triggering better nonfinancial performance. Keddie and Magnan (2023) also confirmed the finding, but the evidence did not find a direct impact on social performance. However, Park and Song (2019) found that the more bonus when it based on equity structure showed a tendency from CEO to reduce the engagement in ESG activities. Keddie and Magnan (2023) explained that the ESG incentives may occupy the original bonus and as result by reducing 32% of ordinary bonuses of top managers. Furthermore, Lu (2023) found the incentives on ESG did not help increase the

sustainability performance of UK FTSE 350 companies and double if ESG offers a reason to help executives to increase their income.

This part has found that the issue of pay is public awareness of the pay to high management team members in the firm whether it is reasonable or not. It asked for more transparency and a reasonable pay gap in the peer market level. It was found that few companies have implemented ESG incentives to the pay packages, while the debate stayed on whether it is helpful for ESG performance.

2.1.3.3 Ownership and Control

The issue of ownership and control is the separation of ownership interest and the control of firms through public of firms' shares to diffuseness interest groups which may give the managers more resource determine works and maximize the profit of firms without restrictions by only one main ownership group (Blair 1996, Demsetz 1983 and Demsetz and Lehn 1985). It is also related to the equity-based compensation of contracting managers (Mehran 1995), or a low level holding of equity by managers, who may be motivated to maximum value for firms and their interest together but the insiders' shares could not be too high, such as over 10% (Morck, Shleifer and Vishny 1986) or over 5% (McConnel and Servaes 1990) because when managers may think a own interest, such as a higher salary, when the ownership level allowed manager to determined work by their own (Morck, Shleifer and Vishny 1986).

Ownership and control in ESG are related to different ownership structures that may affect the management reacting to ESG issues. Few scholars have found the positive impact of separation of ownership and control on firms' ESG performance. For example, Duygu, Ece and Yasemin (2021) found the ownership concentration level of firms has

negatively impacted on the ESG performance after applied firms from forty-four countries between the year 2002 and 2017. It might be due to the minor shareholders' investment behaviors. Cordeiro, Profumo and Tutore (2021) explained that the minor stakeholders did not tend to reduce the shares when firms positively increase the environmental investment and activities, especially on family-owned firms. However, few evidence showed that a closer link between ownership and control shows better ESG performance. Dong. et al. (2024) found that ultimate controlling owners played a stronger role to improve ESG when their ownership and controlling right improved after applied 852 Chinese stock listed firms in China between 2008 to 2017. Yeon. et al. (2021) also found the family member involvement in the management board control in family-owned company would improve the CSR activities. It might be hard to draw a conclusion. After reviewed by 146 literatures, Christian and Dodo (2018) found it is difficult to derive a clear settlement for the impact of diverse types of ownerships on the CSR engagement. The ownership structures of MNEs have positive impact on ESG practices. Cordeiro. et al. (2018) and Sahasranamam, Bindu Aryaand Sud (2020) found MNEs in India are engaged with ESG activities. Cheng. et al. (2024) explained foreign intuitional ownership shifting the international ESG regulation to the invested firms in China. Ahmed. et al. (2024) found similar influence from foreign institutional investor impact in non-financial Chinese firms. Furthermore, Deng (2021) found foreign direct investment in China pay less pollution fee, receive less punishments and is more likely to have the higher performance in environmental credit rating system than domestic firms.

ESG.

State owned and family-owned ownership structures performed differently to ESG in different regions. In China, Ahmed. et al. (2024) found the stated owned instructional investor pushed the firms to improve the ESG performance. However, it is not the case in India (Cordeiro. et al. 2018). Contrarily, family-owned firms in India tends to invest more in ESG (Cordeiro. et al. 2018 and Sahasranamam, Bindu Aryaand Sud 2020), while not for the family-owned ownership in China (Ahmed. et al. 2024).

In summary, it found that the ownership and control issue mean the public preference on separation of ownerships and controlling ship of the firms. It has confirmed that the ownership of MNEs' investment played an outstanding ESG performance in different regions, which proofed the separation is functionable. However, a stated own company, who has clear owner ship and control ship separation, is not the same performance of ESG in China and India, where the Chinese state own company are good ESG performance while the Indian are not.

2.1.3.4 Accounting

Accounting is a system with information that gives reports to users including business economic activities and indications business status, which reports by a set of transactions (Warren and Jones 2020). It includes processes of finding business relevant transactions, measuring in monetary terms, classifying, and recording the business transactions and communicating by accounting reports with different users (Carlton 2019). Since accountants manually booked transactions, it follows a general principle, proper internal control, external audit, and taxation regulations (Warren and Jones 2020). Accounting issues are the evaluation of accounting system, procedures, audit, internal control, and regulations against the business fraud caused by incorrect accounting reporting.

Existing literature linked accounting to ESG by external audit, internal control, and taxation regulations. When firms focus on ESG risk management, it is recommended to spend service fees with audit firms even a non-audit service, because the external audit firms are always providing preassessment of firms including an overall ESG risk assessment before conducting the appointed service (Bright and Tamara 2023). While lower audit pricing also indicates an increase of firms' ESG performance (Song, Wu and

Ma 2023). An improved internal control system might bring improved ESG performance as well in Italy (Harasheh and Provasi 2023). However, it is better to have an independent ESG/CSR committee (Aladdin. et al. 2020), with a longer tenure of members (Paolone. et al. 2023), and executives with audit experience (Bose. et al. 2022). Taxation in environment brings a significant impact on ESG performance of firms, however, this impact has limited to heavily polluting industries (He, Jing and Chen 2023).

In this part, the accounting issues are the proper booking and reporting of firm's financial information to meet requests of public interest, including compliance with accounting rules and taxation regulations. It found the importance of the role of external audit, ESG committee and taxation in this issue.

2.1.3.4 Business Ethics

Business ethics is addressing issues as morally right and wrong in business situations, activities, and decisions (Crane and Matten 2015). Business ethics are linked to all level employees in an organization because all employees are facing a problem of decision making to deal with different stakeholders, such as customers, suppliers, distributors, residents, and shareholders, when challenges of cost reduction or sales promotion are there (Hosmer 2010). Ethical conflicts are not isolated individual issues, rather than codes, principles and informal communications deeply connected in by everyone of the organization (Ferrell, Fraedrich and Ferrell 2013).

Firm has improved the business ethics in ESG disclosure. Loughran, McDonald and Otteson (2023) found that the major firms in SP 500 having added 29% more words in length of code of ethics in 2019 average than in 2008 average, which have shown that the society is expecting an increasing moral business environment. This found in European

business ethics raised by the European Commission, who tried to unify the business ethics code amount that diversity of nations and economics.

Big technology companies may significantly influence the distribution of individual income, work, and leisure time, it thus needs more cares on business ethic before the achievement of transformation of technology (D'Cruz. et al. 2022). On the other firms, firms can receive help from ethical practices improvement to have increase on sustainability performance and competitive with other companies (Waheed and Zhang 2022). More outsider board directors can help the firm's anti-corruption disclosure in Italy, while it is not the case when CEO also performed chair of directors (Previtali and Paola 2023).

This part found the issue of business ethics is the concern of firms' moral behaviors in doing business. It found the increased tendency of disclosure business ethic by firms because it confirmed the benefits of conducting business ethics. It also confirmed the outsider board helps improvement of firms' business ethic issues.

2.1.4 Summary of ESG and Issues

In this section, it will conclude the three pillars ESG issues by the rating conceptions and finding by earlier sections. It will also analysis the existing research gap of these issues.

2.1.4.1 Summary of Environmental issues

This section has reviewed four environmental issues. First, climate change means the physical risk of extreme weather events and the transitional risk to the adoptions of low carbon emissions. Second, biodiversity and land use mean the decline of species changed by overusing nature resources. Third, raw material sourcing means the availability of traceability system and quality certifications. Finally, Toxic waste is hazardous air emissions and disposal materials.

2.1.4.2 Summary of Social Issues

The social part includes eleven issues linked to human rights. First, health and safety mean employees' health conditions and injuries from working environments. Human resources developments focus on employees' education and training, while labor management focuses on the labor adjustment cost, such as new hiring, terminations or change of positions. Supply chain labor standards mean the supply chain transparency of the practices and policies. Privacy and data security are the sensitivities of boundary controlling between human beings' interactions and data exchange. Product safety and quality refer to the failure of products in safety and quality control. Responsible investment means the practices of investment in the adoption of ESG principles. Community relations mean the neighborhood relationship between firms and local citizens. Access to finance is the inequality distribution of finance resources, while access to health care issues is the inequality in covering health care systems. Finally, opportunities in nutrition and Health means the inequality of achieving healthy nutrition between different social classes.

2.1.4.3 Summary of Governance Issues

This section has found five governance issues. First, the issue of board means the board members' independence and diversity of age, gender, and experiences. Second, pay stood for the pay gap between high management and normal employees. Ownership and control are the ownership and management accountability separations. Furthermore, Accounting is the compliance to accounting principles and taxation policies. Finally, business Ethic is moral or not on the corporation's business behaviors.

2.1.4.4 Summary Issues, Research Gaps and Construction of ESG

This part will conclude the findings of the issues in three pillars and identify the gap found in the review. In the end, it will also introduce how this section will integrate with research design.

First, existing literature has found the importance of ESG engagement for improving different social issues. For example, ESG engagement can help release finance constraints in access to finance. It can also improve labor efficiency and help reduce customers' concern on privacy and data security. Similar impacts found in human resource management, access to health care and product safety and quality. However, ESG engagement required cost and investment increase from firms' side, which might have firms' motivations. For example, climate change and health care systems require heavy investment in recent technologies and a new model of recycling business in biodiversity and land use needs to be investigated by a certain investment. It was found that firms are willing to invest in ESG activities since it is helpful, but firms are not willing to add cost. For example, corporations' disclosure misleading nutrition information to improve image from customers' side. Therefore, the conflict between increase of high motivations on ESG engagement and cost and investment control strategy, provides another gap for research, which is greenwash tendency in later sections.

Second, although ESG issues are not new, few literatures called for public attention for few specific issues. For example, Firms have not paid sufficient attention to biodiversity and land use, which form the foundation of environment. Similar situations found in health and safety and privacy and data security issues. It thus provides a gap to verify availability information of these issues in this study. Third, diversity of ESG issues globally existed by the reviewed literature. For example, ESG in EU means all level of issues improvement while Chinese invested heavily on clean technologies such as solar and EVs. Furthermore, India's state ownership is different with Chinese state ownership. Religions, which is key in the issue of communities relations, are different in different regions and indicate various conception of communities relations. It thus offers another gap between ESG conceptional diversity and globalization.

Furthermore, existing literature has found a strong link between governance issues with other issues. For example, board and ownership issues have changed firms' behaviors on the management of environmental issues such as climate change and toxic and waste issues. Meanwhile, independent board members are helping firms' business ethical behaviors. Furthermore, governance issues of ownership are not the same in different regions. For example, state ownership in China tends to lead a good ESG performance while it is not the case in India. However, it found the ownership of MNEs' play a no doubt positive influence in ESG area. Therefore, the second point of this research focuses on the role of MNEs and governance in ESG research.

Finally, this section found literature has worked on the relationship between business performance and different issues. However, the results of literature are not the same. For example, the climate change management negatively affected firms' business performance, while a more profitable company might release more toxic and emissions. Existing literature also found the employees' direct benefits lead to ESG performance

because employees take part when they get benefits. The evidence found in health and safety and supply chain labor standards. However, other literature doubles the management motivations of ESG engagement. For example, an incentive ESG pay could be hard to measure when different rating agencies give different results. Therefore, it remained a research gap to find the relationship between firms' business performance and other ESG factors.

In conclusion, existing literatures in each ESG issue have indicated the gap to connect with the topics of greenwash tendency and role of MNCs with GVCs, and firms' ESG performance measurement and business performance. However, the concept review in each ESG issue could give the opportunity to support in the research design and challenge the reliability ESG measurement. On one hand, the research design in measuring ESG issues is relied on the conceptional review in this part. On the other hand, the misaligned understanding on each ESG issue within the content of different regions, economics and observers, has asked the difficulties of the construction of the ESG measurement objects and challenged the reliability of collected data in this study. Therefore, it will further identify the reason for this conceptional misalignment in ESG rating by the following section of accounting measurement objectivity.

2.2 ESG Greenwash and ESG Rating Divergency

This section will first review serval gaps and topics found in the last section, the ESG greenwash tendency, caused by conflict between cost of engagement with ESG activities and cost saving strategy. The information availability caused by the ESG rating divergency will follow in the next, which will help measure the ESG performance and managing ESG greenwash tendency.

2.2.1 ESG Greenwash

Greenwash is the declaration of firm's CSR policies in the reporting lower than the real implementation (Ioannou, Kassinis and Papagiannakis 2023), for example, firms communicated with stakeholders by misleading information for overpromising of the real environment performance and practices (Lyon and Montgomery 2015). Additionally, one of the common greenwashing behaviors is selective disclosure of ESG information, which means offering positive ESG practices but without presenting or removing negative information (Lyon and Maxwell 2011).

Firms greenwashing is the reaction of external pressure when firms are receiving external accusation on sustainability practices (Seele and Gatti 2017). Firms also greenwashed by the impression management with low cost to do it, by which firms give positive impression to external stakeholders with more talking than real costing reactions (Long, Wang and Zhang 2024). However, Greenwash can reduce customer satisfaction and thus negatively change the corporation's performance (Ioannou, Kassinis and Papagiannakis 2023).

2.2.1 Greenwash Motivations

Existing literature has found reasons for the firm's greenwash from prospectives of flexibility of sustainability standard and firms' operational sustainability strategy. First, the flexibility of voluntary private setters may leave potential for greenwashing. The firm may over commit to its stakeholders by supporting the target of achieving strength of the competitive of firms' legitimacy. For example, companies in Australia are on the greenwash activities but initially they prefer to bear the increase of cost to issue voluntary sustainability report to strength the legitimacy (Zharfpeykan 2021). It might need more

regulating on the voluntary sustainability standards, while Kolcava (2023) did not agree to simply point at the voluntary private setters' issue to cause the greenwash, because accusation of greenwash is directly reduce the citizens confidence on environmental protection and it will not follow with higher demanding on government regulating from citizens' side, but it will reduce the citizens' perceived effectiveness on greenwash identification. The increasing of regulating demand is coming from the part of the people who originally preferred to the small government which is more likely to protect environment (Kolcava 2023).

Second, the firm's operational sustainability strategy in achieving short term profitability may lead to greenwash. For example, the hotel industry is moving to be green since the saving of green practices such as reducing one time use tower is profitable, but saving is not reflecting on customer side, which is greenwash (Majeed and Kim 2023). However, different firms have different tendencies in greenwash, which are linked with the firm's characteristics as well as where the industry and region's economic level the firm stayed in. Firms with leader's gender in female are less possibility to do greenwash compared with men-led firms according to data of the 7,870 private firms from twenty-eight countries (Zhang 2023). Ruiz-Blanco, Romero and Fernandez-Feijoo (2022) evaluated the S&P top one hundred companies greenwash level and found that firms in environmentally sensitive industries are less greenwash activities and firms issuing a sustainability report with assurance performed less greenwash as well. Furthermore, the Belt and Road Initiative (BRI) showed that sustainable development in higher income economics found while not in developing countries (Harlan 2021).

In conclusion, impression management, and fulfillment of legacy from external pressures motivate greenwash behaviors. On one hand, existing regulations making the flexibility to disclose ESG information makes firms greenwash activities possible. On the other hand, firms are looking for short-term profitability targets to do this without adding cost.

However, firms' governance structure, such as board gender diversity, are the key factors to influence greenwash.

2.2.3 ESG Rating and Prevention of Greenwash

ESG rating is the ranking service for a selected list of companies by agencies who use public information, such as companies' sustainability report and government reports, to analysis of firms' ESG performance (Elbasha and Avetisyan 2018). These rating agencies are a service for different audiences, including investors, customers, employees and other public actors (Scalet and Kelly 2009). Not liked the focus financial data assessment from credit agencies, ESG rating agencies are more focused on non-financial part assessment, while the foundation of using ranking information is similar way which is to identify who is good or bad performance of financial or non-financial areas (Escrig-Olmedo, Muñoz-Torres and Fernández-Izquierdo 2010).

The rating is helping improve firms' ESG issues management and thus prevent greenwash activities. Because a valid rating is useful to measure firms' ESG performance and distance to public expectations (Dillenburg, Greene and Erekson 2003). It could help verify the sustainability result of what the firm is talking about. He, Du and Yu (2022) found that enhancement of ESG disclosure performance inhibited manager misconduct, such as greenwashing because the external attentions from investors and brokers will put more pressure on manager's self- discipline. It gives motivation for those low-ranking companies to improve sustainability performance (Mattingly 2017). However, it concerns on the validation of ranking data (Sharfman 1996), and the independence of agencies (Daines, David and Larcker 2010)

Concern about the validation of ranking data may hurt managers' motivations to improve ESG. Even more, it might remove managers' attention from rating result. For example, Arvidsson and Dumay (2022) interviewed the firm's managers for responses to the rating of ESG performance by sustainability rating agencies and found that sustainability adoptions did not depend on rating results but depend on the managers' belief and the operational strategy which are not always aligned between different firms.

In summary, ESG rating is a measurable tool to prevent ESG greenwash, by ranking performance of different firms. However, managers did not show a serious attitude to it, which might be due to concern about the rating data validations.

2.2.4 ESG Rating Divergency

ESG rating divergency started from public concerns on the validity and reliability of CSR ranking measurement (Agle and Kelley 2001), in which vertical validation of the measurement by comparing with peer agencies data is the key part to the assessment (Sharfman 1996). Therefore, ESG rating divergency means the failure of vertical validation of different raters' ESG ranking data. Consequently, the same firm may result in different rating points by different rates (Chatterji. et al. 2016, Pang. et al. 2024 and Zhou, Lei and Yu 2023). For example, by selective with same firms list, Berg, Koelbel and Rigobon (2022) found that the correlations of ratings result from six different raters are in various range between 0.38 to 0.71. Mayer and Ducsai (2022) also confirmed that the social and governance dimensions scoring is different amount different raters.

Stakeholders could hardly make the decision if the ESG scores are vertically different, on the other hand, firms receive multiple pressures from different raters to improve ESG which are in confusion of improvement strategy (Zhou, Lei and Yu 2023). Furthermore,

investors are no longer pricing on good ESG performance because the “good performance” becomes not aligned for investors’ view (Berg, Koelbel and Rigobon 2022). For example, Wang. et al. (2024) found that the stock return was negatively correlated with firm’s ESG rating divergence level. Meanwhile, it becomes difficult for company to link compensation of managers to ESG engagement if the ESG performance misaligned (Mao, Wang and Lin 2023). Finally, it might hurt the academic research result if academic empirical result can be found differently in different rating agencies’ data (Berg, Koelbel and Rigobon 2022).

Geng, Chen and Liu (2024) called for increase of transparency and less subjective judgement for ESG rating process from agencies. Because similar credit rating divergence, various ESG rating results are due to those different methods and agencies used various data sources to assess ESG performance (Wang. et al. 2024). From firms’ side, Geng, Chen and Liu (2024) also found firms internal control effectiveness may reduce the rating divergence but pressure from outside media may increase the rating divergence.

In conclusion, this part presented the concept of ESG rating divergency which refers to various rating result firm different raters in one same firm. Raters’ responsibility to overcome this variance are calling urgently.

2.2.5 Raters’ Independence in Rating ESG

Few literatures have criticized the rating agencies’ responsibilities for the divergence of ESG performance results. For example, Geng, Chen and Liu (2024) called for more transparency from agencies for the rating methodologies. Wang. et al. (2024) challenged the independence of agencies, who might offer a good rating for companies due to

commercial benefits. Few studies have searched for the difficulties of having a proper ESG rating.

Conceptional deviations in the understanding of ESG issues remained significantly between different rating agencies (Dorfleitner, Halbritter and Nguyen 2015). Berg, Koelbel and Rigobon (2022) found that disagreement of scope on ESG issues and measurement methodologies variants are main problems from raters. By interviewing six raters' analysts and taking decent work as example, Louche, Delautre and Pimentel (2023) found three challenges to do a proper rating, including nature of ESG data, contextualization of issues and capabilities and independency of ESG rating agencies. Furthermore, Rahman and Post (2012) also confirmed that ESG data availability are the main restrictions to measure ESG performance.

However, current studies reviewed challenges in rating are on third party views (Berg, Koelbel and Rigobon 2022, Louche, Delautre and Pimentel 2023 and Rahman and Post 2012), which is either an assessment of rating methodologies or an interview with agencies' employees. It remained a gap to have a raters' view on the conducting of complete ESG rating.

2.2.6 Independence Issues in Financial Measurement

Measurement divergence also existed in the accounting world. Pereraa, Chand and Mala (2020) found the confirmation bias of accountants by judgements of reporting when applying International financial reporting standards are significant for SMEs in seventy countries. Bressler, Bressler and Bergen (2018) explained the reason for accountants' weak position independence that people prefer to accept the evidence they are collecting. Furthermore, Boone et al. (2024) found the misleading financial reporting is due to

motivations of impression management strategy which help to minimize the bad impression from outside observers.

Few studies have found the issue of accounting independence. For example, the estimation of cost, accounting accruals, applied in management of profit expectations, in which it estimated a higher cost when firms have reached the profit forecast (Seidel, Simon and Stephens 2020). Furthermore, such independence issue found serious when the shareholders have no abandonment choice (Hui and Jorgensen 2018). Boone et al. (2024) also found the abnormally positive accounting tons distorted the financial graph. However, accountants' subjective judgments are not always harmful. For example, Lu, Yang and Zhang (2023) found that conservative estimation from accountants follows with higher investment efficiency.

2.2.7 Linking Accounting Objectivities and ESG Measurement Objectivities.

Not like ESG measurement divergence, measurement independence issues of accounting have existed in the early 1960s, which is the objectivities of accounting measurement (Chambers 1964, Ijiri and Jaedicke 1966 and Wojdak 1970). Ijiri and Jaedicke (1966) defined the reliability of measurement included part of measurers' independence gathering with objectivities of measurement process, which includes three factors of objects, the measurement system, and output of measurement. Wojdak (1970) has extended the concept of measurers' independence as the operational objectivities, which is the application of measurement method within the communication with financial community of different stakeholders including shareholders and regulations. Therefore, the accounting measurement independence issues combined with four objectivities factors of objects, the measurement valuation system, output of measurement and measurers' judgments. The below figure 5 illustrates four factors.

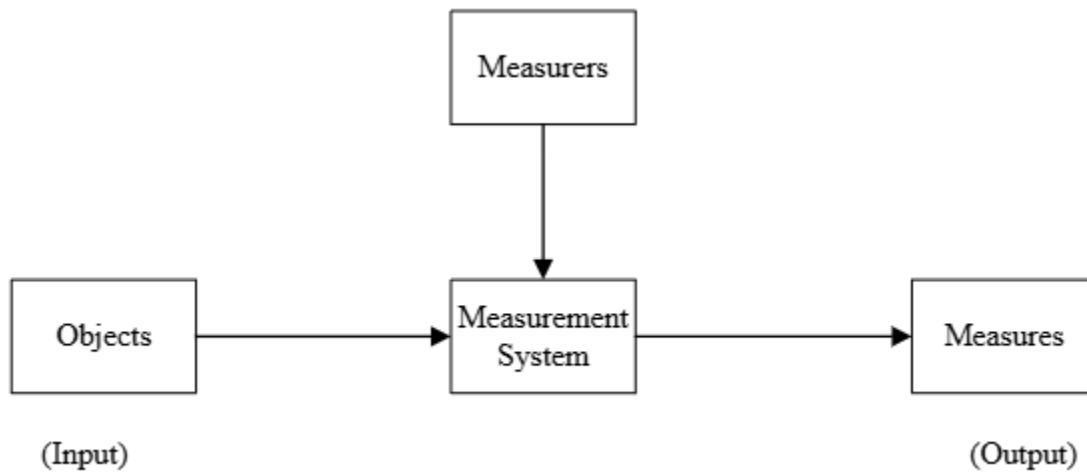


Figure 5: Measurement process four factors (Ijiri and Jaedicke (1966))

Consequently, the measurement processes objectivity includes assessment of four factors. First, it means that the input of objects needs clearly positioned as objective (Ijiri and Jaedicke 1966), for example, accounting clearly and objectively defined cash balance as the monetary assets held by an entity. Second, a measurement system's objectivity is determined by the extent to which the measurers defined and consistently applied the rule and alignment of understanding between measurers (Ashton 1977). Furthermore, the degree of objectivity of output of measure is the deviation of outputs after measurements by different measurement (Parker 1975). Finally, measures' judgments are the misunderstanding of measurers on the measurement system or measure objects (Ponemon 1995).

The rater's independence issues, like the accounting measurement objectivities, could be ESG measurement objectivities. First, it has shown the challenge of the objectivities of ESG issues' objects. For example, (Mayer and Ducsai 2022) has raised that ESG raters have misaligned with the ESG categories. Second, ESG measurement methodologies are weak objectivity, because they are not transparent (Geng, Chen and Liu 2024).

Furthermore, the rating divergence clearly showed the issue of output objectivities (Berg, Koelbel and Rigobon 2022). Finally, measures are putting subjective judgments in ratings. For example, Wang. et al. (2024) found ESG analysts are working difficultly to analysis the firms' intentions in behind of what firms have disclosed.

There have been so few literatures have discussed on the issues of objectivities of ESG measurement. However, a gap in this area was found. First, it has not found a literature has applied four factors framework to assess objectivity of ESG measurement (Ijiri and Jaedicke 1966 and Wojdak 1970). Second, existing works on evaluations of ESG measurement objectivities issues are mainly from a 3rd party view, by investigation with methodologies of different raters (Semenova and Hassel 2015), interviewing with managers from different raters (Louche, Delautre and Pimentel 2023) and analysis of output of measures from different raters (Berg, Koelbel and Rigobon 2022), however, it lack of a view from the rater on the challenges of ESG rating objectivities. Therefore, this study has given the first research question in below.

Research Question 1: What are challenges of four factor's objectivities of ESG rating measurement from a rater's view?

2.2.8 Summary of ESG Greenwash and ESG Rating Divergency

This part has reviewed three concepts of ESG greenwash, ESG rating and ESG rating divergency. ESG greenwash means firms misleading communications of ESG policies and practices. ESG rating is a quantitative tool to prevent ESG greenwash activities by visible measurement of ESG performance. ESG rating divergency makes the rating measurement failure by different results from agencies for one same firm. Therefore, it proposed a research question to identify the challenges from the rater's point of view in conducting an ESG rating.

2.3 Globalization of ESG and Role of GVCs

During the first section of review ESG issues, the section found the value further deep in the role of MNCs, which is distributing international trading and value worldwide. Therefore, this part will introduce two factors of globalization and global value chains.

2.3.1 Globalization and ESG

Globalization is the enhancing interaction flows, including business trade, money transactions, culture, and thinkings, through sharing, communicating, adopting, and resisting of these flows between people globally (McKenzie 2019). It might be a threat to the environment by inequality of production and distribution of goods and services between different regions (Newell 2012). For example, Ahmed, Cary and Le (2021) found that globalization degraded the ecological footprints. Globalization creates social issues by four prospectives of growth in interdependence, increasing open trading policies, spreading of western culture, deterritorialization of local connections (Scholte 2000), Consequently, it might have the potential to stimulate economic growth (Jiang. et al. 2024), but it found an increase of divergence between economic benefits and risk of natural resources consumption by globalization, in which a huge proportion of humanity still lives in poverty (Newell 2012). Therefore, globalization might be linked with ESG issues by either creating issues or deteriorating issues.

However, ESG issues unequally distributed worldwide. For example, the access to nutrition and the issue of health in developed countries means obesity disease caused from high energy food in low-income social class (James and Nelson 1997), however, nutrition issues in developing countries are lack of food and poverty issue (Newell 2012).

Furthermore, access to finance issue in developed economic means supporting for financing resource availability in developing countries (Demirguc-Kunt and Maksimovic 1988), while it might not be the case for developing countries to support other economy about the finance who is lack of those resources. Therefore, ESG is linked with globalization, while it remains diversity of issues around different economics.

This part found that globalization might have created ESG issues or deteriorated ESG issues. However, ESG issues in global remained distinctive characteristics amount different areas. Therefore, the next two sections have selected two important economics of EU and China for investigation of those diversities of ESG concepts, since EU is one leading developed economy, and China is the biggest developing economy in the world.

2.3.2 ESG in EU

The EU has proposed to be the first climate green continent at the target of year 2025 (EU 2019). Europe is the region with the first law to mandatory disclosure of ESG in 2014 (Howitt 2014). The overall attention of ESG in EU is not double as fast and more serious than other regions. For example, Rezaee. et al. (2023) found that firms in EU have higher level of ESG disclosure level than U.S. in long-term period. However, ESG in the EU remained two concerns of overcomplexity of directives and overregulation on firms' side.

Overcomplexity of regulations may come from the difficult alignment between EU members. Kinderman (2020) explained the country liked Italy, CME (Coordinated Market Economics), are slow with local regulations preparation, which is slower to react on EU regulations, while countries liked France has been well prepared and pushed for faster regulations. Consequently, few directives overlap and are complex to operate. For example, Villiers (2022) found that The Corporate Sustainability reporting directive

(CSRD) and Due Diligence Directive (CSDD) overlap and do not align in few parts, which are complex for operation from firm's side.

Due to the complexity of the regulations, it might overregulate firms in EU. For example, Aguado-Corre et al. (2023) also found that the bank setters in Spain provided great different contents of ESG reporting version to align by using of GRI and identification of SDGs. Villiers (2022) also pointed out that two similar directives with few deviations increase the complexity for firms to follow both.

Few literatures have asked for more involvement from the market side to solve these concerns. For example, Stubenrauch and Garske (2023) found the issue of the low effectiveness of the energy directive and recommend additional market-based measurements could help. The case of ETS instrument indicated that to give the trading tool for carbon emission tool is not bad as Trojan horse, because it engaged the more stakeholders who is not supported the policy or who is slowly in action of carbon reduction (Markard and Rosenbloom 2020). Furthermore, Kinderman (2020) argued that the social performance might not be from regulation, instead it might come from market, because firms in Nordic countries with good CSR performance no matter before or after stronger regulations.

In conclusion, the EU gave ESG fast and serious attention by adding several regulations. However, it remained two issues of overcomplexity of regulations and overregulating on firms. The exciting research has called for more investigations on firms' side to solve these issues.

2.3.3 ESG in China

China government joins in the green future as target 2030 carbon peak and 2060 carbon neutralization (Li. 2023). ESG in China focused on environmental issues, such as air pollution and water distress (Bai. et al. 2022, Moore 2019, Xie. et al. 2023 and Zhang. et al. 2023). However, first, ESG in China face the regulation consistency of central and local government. Second, China remained high diversity of ESG between different regions. Furthermore, the government in China has heavily led the ESG, but less research on firms' side ESG activities.

Central government and local government focused differently on ESG that the consistency could not guarantee. For example, Westman and Ping (2022) found ecological civilization has created by the narrative way in central government to build up the legitimacy for certain forms of environmental interventions, which provide the comprehensive thinking to encourage whole state actors to put environmental discourses as national priority. Meanwhile, ecological civilization provides a way to get alignment of interest in small ethnic groups by environmental government without inventions of culture diversity (Zeng 2019). However, it might be harmful for other stakeholders if the local government takes the central order as too high a priority (Westman and Ping 2022). Because local governments need to manage few different stakeholders. For example, the local government in Yantai city coordinated the multiple stakeholders, including central policy, environmental NGOs and provincial level government, to balance the cost and benefits in competing over renewable energy use and biodiversity situation (Sheng. et al. 2023)

ESG development is not the same consequence by different geographic locations and urban and rural areas. Fan. et al. (2022) applied the Inclusive Wealth Index to test the sustainability level of different province and found that overall, China has developed sustainably, while the provinces remaining in main industries on low or semi-skills manufacture are struggling transformed to be sustainable development and resulted as lower increase rate compared with other provinces. This is similar in the impact on labor

markets of the city with implementation of China's carbon emissions trading scheme, in which the demanding side of low skill labors in those areas have decreased by promoting the robot industries (Wang, Wang and Song 2023). Dong. et al. (2023) studied on ten resource-based provinces, which are leading to the use of natural resources of minerals and lumber, and found that the coordination between energy, economic and environment performed better in eastern regions and western is better than central regions. Rural areas are growth of total energy consumption by the increase of coal petroleum caused the further expansion of agricultural carbon emissions while the clean energy instalment convert the emissions to decrease (Li. et al. 2022). The public policy tried to implement one strategy to all cities to reduce the climate change influence in urbanization, which was found in the sponge city development initiative, while Ma and Jiang (2023) found that different cities implemented initiative in separate ways.

Policies makers are lacking understanding behaviors from firm's side. For example, firms export business decreased after the environmental policies of China's 2003 City Air Pollution Prevention and Control Program (CAPPCCP) (Zhang. et al. 2023). Furthermore, the foreign investment firms in China reacting on the stronger environmental regulations are flexibly depending on its position in the market, which means the stronger market position in the pollution industry tends to lead the more investment against string regulations (Hu, Yin and Moon 2022).

In conclusion, ESG in China means more environmental issues. It remained issue on distribution of task between central and local governments. It is difficult to balance ESG policy in China against the diversity of economic and cost element in different regions. It might need further consideration on the firm's side when making ESG policies.

2.3.4 Comparisons of ESG in EU and China

ESG is no doubt aware globally. In last two sections, it has found differences of ESG between China and EU. ESG developed in advance in Europe, where it has raised a complete set of regulations on monitoring different issues. While ESG in China focuses on environmental issues and heavily driven by government.

However, it found ESG issues for two regions with similar concerns. First, both regions are struggling with policing to balance around the diversity of internal regions. The different countries in EU, such as France and Italy, remained different content and speed of preference on preparation towards to ESG. While China needs to balance the one comprehensive policy for various provinces, which remained different economic structure and cost elements levels. Second, both regions asked for more attention on the firm's side. EU tended to be overregulating its firms, while China seems to be lack of attention on firms' side.

Therefore, this study has moved in the area by those similarities and differences in EU and China to work on selection of the research samples, to bridge the gap of firms ESG behaviors within both concept of ESG in EU and China. Therefore, it has been to choose an EU' MNC's Chinese subsidiary and its supplier within China.

2.3.5 Globalization and MNCs

Few people have found the trend of deglobalization which might decelerate those ESG issues. For example, the increasing importance of state sovereignty is found in the global market (Kilic. et al. 2022 and RoChe and Kruk 2024). The role of MNCs leading global trade is critical because it played a key position for the consequences of unbalanced development of ESG issues in globalization. First, MNCs liked to invest in those low-

income countries who have more stable political status and natural resources, which turns to an unbalanced distribution of advanced technology between different regions (Jiang. et al. 2024). Furthermore, MNCs tend to spend more on ESG activities in subsidiaries where the country has stronger competence and upstream suppliers (Jamali 2010 and Miska, Witt and Stahl 2016), because the efficiency of ESG investment in those countries is more than others. However, existing research also found a more positive impact from MNCs ownership investment in different regions (Cheng. et al. 2024, Cordeiro. et al. 2018, Deng 2021 and Sahasranamam, Bindu Aryaand Sud 2020).

However, resistance to globalization has belonged to one part of globalization (McKenzie 2019). Globalization might still be the solution for issues created by deglobalization. For example, a global governance structure has helped regulate the environmental impacts of shrimp production in Thailand, in which shrimp produced locally but consumed by globally (Oosterveer 2006). Therefore, it is worth investigating further the role of MNCs in the next sections.

2.3.6 Role of Global Value Chains and ESG

Global value chains theory (GVCs) (Gereffi, Humphrey and Sturgeon 2005) explained how the global economic activities are distributed by different global value chain governance types, in which the lead firm allocates standard production process to the emerging economies and remain the innovation activities in headquarters (Buciuni and Finotto 2016). Few scholars called up the GVCs in promoting ESG because the lead firm is setting the performance demanding and standards within GVCs that could be the entry and mobility conditions (Gereffi 2014), in which sustainability is one of the entry standards for the suppliers within GVCs. Ismail, Dilshod and Mehmet (2021) reviewed the existing literatures of connections between GVCs and ESG in emerging countries and found that the increasing importance of role of GVCs in environmental sustainability to

drive effective environmental practices by transforming firms' environmental strategies and capabilities in cooperation with the GVC.

However, the role of leading firms in GVCs has debated the influence on ESG. Hamish (2018) investigated example by Walmart-BAP certificates and found that the role of international lead buyers in GVCs is using the gatekeeper power of the transnational sustainability standards to control the powerful suppliers in its network, which are more inclusive, independent, and demanding. Ponte (2020) wondered if the lead firm does not stay for the improvement of environmental results but rather to use the concept of sustainability development to acquire the accumulation of intangible green assets. Moreover, De Marchi and Gereffi (2023) found that the outside party overlooked firms in the role of fighting climate crises, because manager external influences such as policy makers, consumers, and NGO, exist in the practices of the lead firms. Furthermore, it is also evidence that developed countries have transferred the high carbon emissions activities to developing countries since leading firms would further extend competitive resources against others by transferring activities (Huang and Zhang 2023).

It certainly found evidence of the influence from the lead firm to its supplier on sustainability development. Through three potential strategies for lead firms to governance on suppliers' sustainability, including enhancing collaboration and trust, offering support to production areas, and accepting extra production cost, Gai (2023) found that the lead firms in coffee industry have better position as the actor to improve the sustainability situation of its network of suppliers. Huang and Zhang (2023) confirmed with the concept of transnational sustainability standards bringing in the sustainability improvement possibilities. Wang. et al. (2022) recommend the policy to look for participants in GVCs in countries to promote sustainability development, because the empirical studies showed that GVCs participations improve the green growth in long term prospective.

The global buyers within GVCs effectively impacted suppliers' social performance but it remained in the time when suppliers' country is driving the institutional pressures in the same direction (Castaldi. et al. 2023). The suppliers' country interest on sustainability is important in GVCs, while the motivations from different countries are different because the high-income countries benefit more from GVCs in sustainable growth (Wang. et al. 2022).

It can also find the trend of upgrading MNE's subsidiaries in GVCs in emerging countries (Ryan. et al. 2020). Ismail, Dilshod and Mehmet (2021) highlighted a gap of theorization in between GVCs and emerging countries' ESG. De Marchi and Gereffi (2023) recommended to the policy makers not just focus on critical role of lead firms in sustainability influencing but rather to know how the reaction and challenges overcoming between firms and firm to reduce the overall environmental impacts.

Given the review on studies of GVCs on ESG, this part found gaps which are worth to be further searching. Since the global value chain distributes economic benefits and technologies, it is worth this study to investigate if it distributed the value of ESG in the same way.

2.3.7 Adoptions of ESG and AMC Model

Buckley and Liesch (2023) proposed the model of awareness–motivation–capability (AMC) to explain actors' behaviors within GVCs governance against the adoptions of challenge of national regulations. This model aligned with few literatures on corporations' ESG adoptions.

Firms received awareness of the adoption of ESG because focal firms should allocate more resources to reach increasing sustainable demanding from its downstream suppliers (Ingenbleek and Krampe 2023). However, it is not clear if firm's sustainability awareness performed initially from internally for obtaining unit competitive against other players (inside- out) or only correctively acted to meet external pressures. Ferreira-Quilice, Hernández-Maestro. and Gonzalez Duarte. (2023) believed the firms' sustainability development is outside-in because firms say ESG reporting is not what they are doing. On the other words, it is more about disclosure purpose instead of real sustainability improvement for firms.

Motivation to go with ESG might come from better economic performance, but how the benefit and cost are allocated is the issue. Zayed and Yaseen (2021) found that difficulties to adopt ESG in Egyptian industries is due to the higher cost than financial benefits from firm's side. Buckley and Liesch (2023) explained within GVCs governance, buyers tended to support suppliers to eliminate cost or bear the cost directly.

Firms' internal capabilities might decide how far the way towards to good ESG performance. Movahedipour. et al. (2017) found that the firm's internal capability, including company ethics and values, vision and mission, and employee's skills are determined factors on the adoptions of sustainability. Narimissa, Kangarani and Molla (2020) also found that firms internal measurement system to capture suppliers' sustainability profile and rank the sustainable level of the product are the key to successful sustainability implementations.

This part has reviewed the AMC model within GVCs governance in the concept of adoptions in ESG. However, it did not find measurements of ESG performance by AMC

model. Therefore, it provides an opportunity in this study to assess the selected companies ESG performance by AMC model.

2.3.8 Summary of Globalization of ESG and Role of GVCs

In summary, this section has reviewed the concepts of globalization and GVCs and the linkage of them between ESG. It has first found the Globalization might have deteriorated the ESG issues worldwide. Second, it has reviewed ESG in EU and China and found focus on MNCs is urgently in solving ESG regulations. Meanwhile, global governance is an efficient way to manage sustainability issues, referred to as Global Value Chains Governance. Finally, it found a gap to use AMC adoptions model to assess firms' ESG performance.

2.4 ESG Greenwash, ESG rating, GVCs and Business Performance

As reviewed in the last sections on concepts of ESG greenwash, ESG rating and GVCs, this section will further investigate the relationship between them as well as firms' business performance. It will first investigate the relationship between GVCs and two factors of ESG greenwash and ESG adoptions and then it investigates the influences of several factors of GCVs, greenwash and ESG adoptions on suppliers' business performance.

2.4.1 GVCs, ESG Greenwash and ESG Adoptions

As discussed in last section, GVCs governance has been recognized as the distribution of financial related benefits within its network of suppliers (Buckley and Liesch 2023 and Ingenbleek and Krampe 2023), however, few studies have doubt about the intention of lead firms' ESG practices and policies (Gereffi 2014, Hamish 2018 and Ponte 2020), which has explained that the power of lead firm in sustainability development are used to select suppliers and improve bargain power with its suppliers. Consequently, the leading firm has enjoyed the competition advanced with other firms who have no capabilities to use sustainability to negotiate lower procurement costs. While other scholars found the straightforward evidence of the lead firm in improving sustainability together with their upstream and downstream suppliers (Gai 2023, Huang and Zhang 2023 and Wang. et al. 2022). The debate of role of GVCs (Gereffi, Humphrey and Sturgeon 2005) on corporations' ESG practices and policies has motivated this study.

To link the ESG practices and policies with the role of GVCs, it thus found in last sections that firms may take greenwash and ESG adoptions together in ESG activities. Therefore, two factors of ESG greenwash (Ioannou, Kassinis and Papagiannakis 2023 and Seele and Gatti 2017) and it applies ESG adoptions measured by development of ESG rating between different two years to measure the investigation on the gap of GVCs and sustainability. Therefore, the second research question is as follows.

Research Question 2: Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?

2.4.2 ESG Greenwash and ESG Adoptions

Firms' ESG greenwash found widely in ESG world (Lyon and Maxwell 2011 and Lyon and Montgomery 2015), is selectively disclosure ESG information with the

communication with different stakeholders. Firms in greenwash tended to practice less than their ESG disclosure (Long, Wang and Zhang 2024). Whether firms greenwash activities have impacted on its ESG rating development has remained debated. Few scholars believed the greenwash activities are harmful for the motivations of ESG adoptions and thus it should negatively impact the firms' ESG rating (He, Du and Yu 2022, Ioannou, Kassinis and Papagiannakis 2023 and Majeed and Kim 2023). While ESG greenwash, a part of ESG practices, which did not indicate no ESG practices from firms' side, has no direct influence on firms ESG adoptions (Arvidsson and Dumay 2022). It might be right on both sides. On one side, firms with greenwash tendency, trying to save costs on engagement of ESG, might thus try to do real activities as little as possible. On the other hand, greenwash tendency indicates firms' high motivations to proof to external stakeholders about their engagement of ESG. This high motivation did not reflect with actions and efforts. Therefore, it is worth to investigate third research question in the following.

Research Questions 3: Are firms' ESG adoptions impacted by firms' ESG greenwash?

2.4.2 Business Performance, ESG Greenwash, ESG Adoptions and GVCs

Few studies have found the negative impact from ESG greenwash to corporation's business performance. Zhou. et al. (2023) has found firms' environmental greenwash has reduced firms' value. Teti, Etno and Pausini (2024) also found the greenwash tendency has impacted the return of stock. Furthermore, Zhang (2023) highlighted that firms with lower financial performance and constrained financial resources tend to use greenwash behaviors to attract more financing resources. However, Lee and Raschke (2023) found that greenwash did not impact the firm's financial performance. The correlations between corporations' business performance and ESG greenwash are in debate.

Measurement of ESG rating can predict corporation's business performance. For example, Hovatter (2022) found that firms with outperformance of ESG reporting and sustainability investment within the peer industry followed better financial performance. Meanwhile Agoraki. et al. (2023) found the firms with high ESG performance representing the low reputation risk tended to reduce the information asymmetry, receive better financial support, and have better performance during the COVID-19 shock. Furthermore, Ferrer, López-Arceiz and Rio (2020) found the firms with higher ESG resulted in better financial performance forecast accuracy after the Directive 2014/95/EU during the time 2008 to 2017. However, few scholars did not agree with these correlations. Wang, Liao and Zhang (2022) used the ESG rating data from Bloomberg ESG and found the screening by ESG rating on investment profile strategy did not receive a better investment return. Zhang, Zhao and He (2022) found that both high and low ESG rating data can generate good return by analysis of Chinese stock list company value. Furthermore, Cordazzo, Bini and Marzo (2020) did not see the correlation between the ESG scoring and shares price of the firms in Italy.

By positioned on the debate on business performance of corporations, it thus addresses last research question in following:

Research Question 4: Are suppliers' business performances impacted by factors of GVCs governance, ESG adoptions and ESG greenwash?

2.4.5 Summary of ESG Greenwash, ESG rating, GVCs and Business Performance

This section has proposed four research questions by investigating linkages between main factors reviewed in previous sections, including ESG greenwash, ESG rating, GVCs and

corporation business performance. It first asks about the relationship between greenwash and business performance. Second it asked how GVCs has impacted the ESG greenwash. Furthermore, it has been asked to investigate the link between ESG rating and business performance. Finally, it provided the question to investigate the relationship between role of GVCs and ESG rating.

2.5 Summary of Literature Review

This section reviewed existing findings relevant to the study topics of ESG, ESG rating, ESG greenwash, ESG adoptions and role of GVCs governance. It has been existing gaps in this section for proposal of four research questions in this study.

First, it has found the weakness of concept of ESG structure and details ESG issues, which lead to the challenge of the reliability of ESG rating. The ESG structures from different origin bodies are various. PRI provided a sample structure of ESG by separation of climate change, biodiversity, human rights and governance issues. While ESG standard bodies, such GRI, proposed a much more detailed structure than PRI, it includes the economic value as one of additional value and has not asked for the input of governance. ESG rating agencies, who are more commercial and profitable orientations, offered a detailed structure with several governance issues. The study thus provides a review of each issue in the structure of rating agencies. It found gaps between different observers on the same ESG issues. The review of the construction of ESG has implied the value of the research objective. Meanwhile, the design of ESG questionnaires and the empirical findings in later sections will use it.

Second, it focusses on the behaviors of ESG greenwash, which is motivation for development of rating agencies. However, the rating divergence among raters reduced the

reliability of this tool. The gap to identify the reason rating divergence has remained. This part then links the similar issue in the accounting world, the objectivity of measurement. It thus proposes to extend this framework to ESG measurement process to fill existing gaps of the rating divergence. The first research question is highlighted in this part.

Third, it focusses on the concept of globalization and the connections with ESG development. It first reviews the globalization trend of ESG issues by connected and compared ESG development in EU and China, which matched to the group of organizations selected in this study. It reviewed the theory of GVCs governance and found with the debate on the functions of GVCs governance in the development of corporations' sustainability. Meanwhile, the AMC model developed from GVCs governance has extended to the measurement of greenwash. It thus links the role of GVCs and ESG development by separation of ESG greenwash and rating development for the generation of research question 2.

Finally, it further finds the gap between ESG greenwash and firms' ESG adoptions for research three. In the end, it reviews the debate of firms' ESG adoptions referring to expenditure or returnable investment and follows with research question 4.

CHAPTER 3: Research Methodology

3.0 Introduction

Following gaps found in the objectivity of ESG rating measurement and relationship between factors of the role of GVCs, ESG greenwash, ESG adoptions and suppliers' business performance, it stated four research questions below.

1. What are the challenges of four factor's objectivities of ESG rating measurement from a rater's view?
2. Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?
3. Are firms' ESG adoptions impacted by firms' ESG greenwash?
4. Are suppliers' business performances impacted by factors of GVCs governance, ESG adoptions and ESG greenwash?

This section will develop proper research methods and procedures for answering research questions. First, it applies the structure of research onion as the base to develop method. It finds objectivist as the ontological position in this study. While two areas of the research topics will indicate both interpretivism and positivism as the epistemological positions in this study. It will introduce the research strategy by survey and interview for collection of quantitative and qualitative data. It chooses the research choice as the mixed method, and research techniques as the content analysis and regression analysis.

Second, this section will introduce the implementation of pilot study before the main study. It is first positioned by the framework of pilot study procedure by Ismail, Kinchin and Edwards (2018), with the steps of determining, assessment, revisit, and reflections. It thus reflects on epistemological positions, back-translation, missing data, normality of sample, reliability of data, improvement on interview skills and participants remaining in main study.

Third, this section explains how it will collect and construct the relevant data. It will introduce the construction of strength of GVCs governance between upstream and downstream suppliers. It will present the method of AMC data collection by semi-structure and relevant treatments and the variables of ESG quantitative data and the set-up of questionnaires.

Fourth, it introduces the conduction of data collections in the main study. It lists the diversified research organizations and participants together with the limitations on the ethical position on the dual role conflicts in this study. It then introduces the details procedures of the data collections both questionnaires and AMC semi-structure interview. The impact statement is as follows.

Finally, it will present the data analysis plan for three parts data of AMC rating, ESG rating and GVCS governance strength. It then follows the determination of greenwash. In the end, it concludes three analysis tools of content analysis, statistics t-test and OLS regression analysis.

3.1 Research Method

This section following the research onion of figure 6 (Saunders, Lewis and Thornhill 2018), will explain ontological and epistemological positions of the research, the procedure of the selection of research methodology and the relevant reasons.

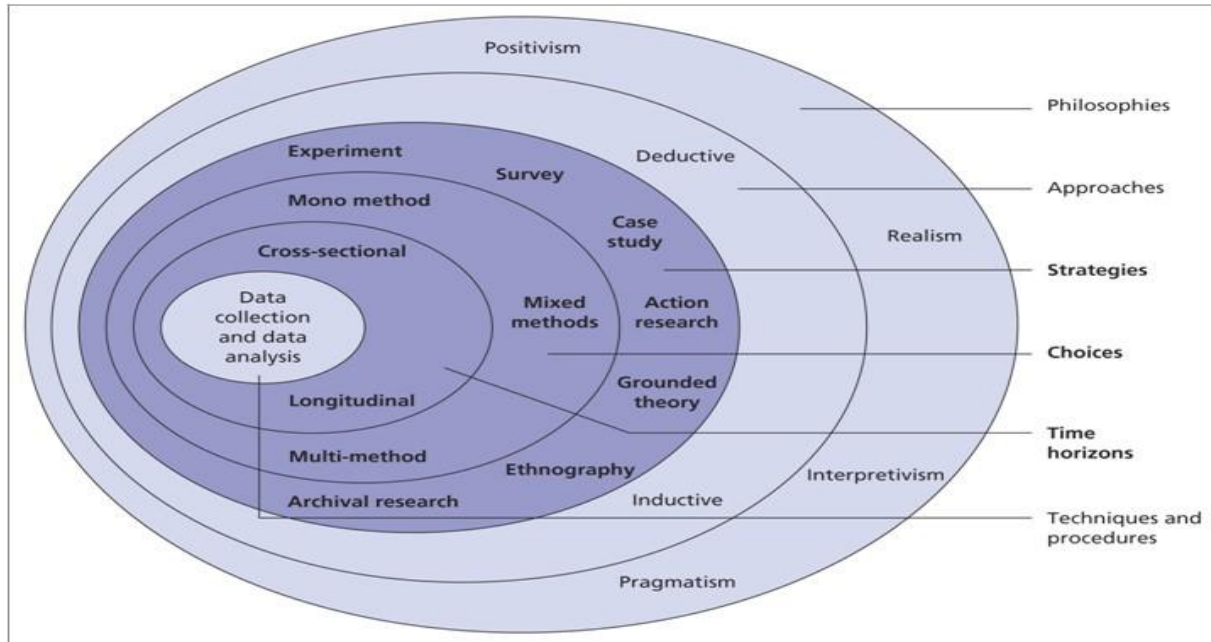


Figure 6: Research Onion (Saunders, Lewis and Thornhill 2018)

3.1.1 Ontological Positions

The ontological position of this study is objectivism, which is going to review existing concept of ESG greenwash, Rating, adoptions, GVCs and business performance by developing external understanding on organizations with consistently real processes and structures (Bryman and Bell 2011). First, the researcher stands objective distance with the key concept in this study. ESG greenwash, Rating, adoptions, GVCs and business performance, are not new objectives, which have been involved in different studies by

scholars (Chatterji. et al. 2016, Gereffi, Humphrey and Sturgeon 2005, Ioannou, Kassinis and Papagiannakis 2023, Majeed and Kim 2023, Seele and Gatti 2017 and Scalet and Kelly 2009). It did not intend to revise or modify the concept of those terms in this study. Second, research questions are objective. The challenges of rating in first question also are involved by scholars (Chatterji. et al. 2016, Pang. et al. 2024 and Zhou, Lei and Yu 2023). The difficulties of ESG rating are thus an existing concept. The other three questions of asking for the relationship of research factors and the influences on business performance look at extending findings on debates of exiting literatures.

3.1.2 Research Approach and Epistemological Positions

Research objectives are not in the same epistemological positions. First, the challenges of the objectivity of ESG rating measurement process are to understand the process of collecting and analysis difficulty, which needs more interpretation works to build up this concept. It is an inductive procedure, which has been conducted by few existing literatures. For example, Semenova and Hassel (2015) have evaluated ESG rating difficulty with interpretation of exiting methodologies of by different six agencies. Similar epistemological positions in Louche, Delautre and Pimentel (2023), who analysis the content of interviews from different agencies managers to evaluate the challenge of rating for social issues.

However, the other three objectives, investigating relationship of ESG factors of greenwash, rating, business performance and GVCs, which are investigating evidence to prove the validation of research relationships, should refer to an evidence base test way (Bryman and Bell 2011) and as positivism epistemological position. Few literatures have stand positivism positions on deduction of Greenwash and business performance (Teti, Etro and Pausini 2024 and Zhou. et al. 2023). Similar positions as relationship between ESG rating and business performance found (Hovatter 2022 Agoraki. et al. 2023).

Furthermore, the foundation of this research, ESG rating, is both deductive and inductive ways. First, it referred to Berg, Koelbel and Rigobon (2022), by collecting quantitative data from suppliers in each issue to do the assessment of ESG, which is a deductive way. Second, it refers to Buckley and Liesch (2023); by assessing awareness, motivations and capabilities of firms' ESG adoptions, it has used qualitative interview data in an inductive way. Since concerns on ESG rating validation are not new, two sources of data in rating can improve the vertical validation of the data (Agle and Kelley 2001).

Therefore, this study has included both epistemological positions of interpretivism and positivism. Because different objectives worked at various positions. On one hand, challenges and difficulties of rating are interpretivism, on the other hand, investigations of research relationships between factors are positivism. Furthermore, two methods in ESG rating, including quantitative data assessment and interpretation of interview data also included both interpretivism and positivism positions.

3.3 Research Strategy

This part chooses the survey designed with two questionnaires and one semi-structure interview as the research strategy in this research, which has aligned with both interpretivism and positivism positions of this study. It designed two questionnaires to collect quantitative data of ESG issues and governance strength of suppliers within GVCs governances. It designs the semi-structure interview by feedback from suppliers regarding the data of suppliers' AMC adoptions of ESG.

3.4 Research Choice

The mixed method, including treatment of quantitative and qualitative data, is in the selection of this study aligned with the research strategy. It might have argued about the selections of mixed methods in the study, which might need to manage the conflict options between positivism and interpretivism (Bryman and Bell 2011). However, few reasons have asked for a mixed method to evaluate ESG in this study.

First, this study will collect mixed data (Bryman and Bell 2011), which help gain the vertical validity of the ESG data (Agle and Kelley 2001). Existing ESG rating data are quantitative in few studies (Berg, Koelbel and Rigobon 2022, Chatterji. et al. 2016, Zhou, Lei and Yu 2023 and Mayer and Ducai 2022), which has regarded as the advantage of measurement by data in ESG rating areas (Scalet and Kelly 2009). However, the ESG rating agencies need to interpret few qualitative data in corporations' ESG policies and practices, in which a process to interpretate intention in behind needs (Louche, Delautre and Pimentel 2023). Meanwhile, The AMC interview is collecting awareness, motivations, and capabilities, are qualitative data (Buckley and Liesch 2023). Secondly, a quantitative method of data correlation analysis (Bryman and Bell 2011), requested in research objectives of investigations on ESG factors' and GVCs relationships. The challenges and difficulty of conducting ESG rating relied on content analysis of the Rating procedures, which is as a qualitative method.

It chose as cross-sectional as time horizon in this study. First, ESG data keeps on updating at every moment (Huw 2022 and Sun 2022), the selected corporations might update the strategy and practices of ESG adoptions from time to time. If the study did not follow cross-sectional time horizon, it would be hard to follow with big amount of updating data and not meaningful for reaching objectives of this study. Second, the concept of ESG measurement and business performance in existing studies are cross-sectional concepts, such year-end assessment of business performance or ESG rating data

by year. However, this data remained a limitation of the data of governance strength. Since the business world is dynamic, the relationship between firms will not be the exact same over the lengthy period. It means the governance strength between suppliers and the lead firm is dynamic. Therefore, due to the chosen brief period of the time horizon in this study as between 2021 to 2023, it assumed governance strength between suppliers and lead firm are stable in this period.

3.5 Research Techniques

It applies to two main research techniques. First is the qualitative technique of content analysis. Second is the quantitative technique of the correlation analysis by OLS regression between different research factors ESG. The first content and analysis technique will review the collections of the data and investigate the challenges of the nature of ESG data in conducting ESG rating procedures and. It will further use them in the construction of challenges of ESG rating objectivity. Second correlation analysis will conduct the factors relationship, such as GVCs and Greenwash, GVCs and Rating, Rating and Business Performance, and Greenwash and Business Performance.

3.6 Pilot Study Introduction

Pilot study, also regarded as feasibility study (Van Teijlingen and Hundley 2001), is in purpose to save resources and test feasibility of the designed research by a minimum trail run with the involvement of limited participants or other resources (Schreiber 2008).

It motivated the researcher to do pilot study not only due to the increase in the likelihood of success (Van Teijlingen and Hundley 2001), but also for few other reasons. First, it

will help improve the quality of the data and efficiency for data collections in the main study (Hazzi and Maldaon 2015). Because this study will need to collect few quantitative data which will impact the research analysis if the data quality is not effective and re-collections of data will consume more resources and reduce the motivations of participants. Second, although few studies did not conduct the pilot study for qualitative research due to reason of saving for funding (Ismail, Kinchin and Edwards 2018), this study has found the significant benefits to have pilot study in the qualitative data collection part (Schreiber 2008), which can receive the feedback from interviewees if the questions are clear and reaching the objective of data collections.

Therefore, this pilot study will introduce the procedures, participants, and data collections first. Each step of the procedures, including determining, assessment, adjustment, reflections, and revisiting will follow.

3.6.1 Pilot Study Procedures, Participants and Data Collections

This study has included both qualitative and quantitative data. It thus follows the pilot study procedures recommend by Ismail, Kinchin and Edwards (2018) in bellowing figure 7. This study has planned to include twenty-one organizations, and it recruited four participants including two participants for questionnaires and two participants for interviews, from which three participants from industrial sector and one participant working in IT service industry. It completed the pilot study of data collections between 2024.04 - 2024.05.



Figure 7: Pilot study procedure (Ismail, Kinchin and Edwards 2018)

3.6.2 Determining

The determining procedure has included two parts by separating four participants equally into two groups. One group is taking interview for AMC. Another group participates in the questionnaires of ESG assessment and Governance strength assessment.

First, it has conducted separately for the interview with two participants through ethical procedures, following a clear process. They voluntarily joined and received with participant information sheets in advance. Only after signing the consent agreement sheet, it proceeds with the interview. As two selected participants were working at the same workplace as the researcher, the interviewee preferred to take it at an independent room within the workplace. It applied the interview record device after the agreement from the interviewee and given full explanation of the ethical use of the data.

Second, the ethical procedure for the other two questionnaires remained the same as the other group of two participants. Eighty-seven questions, prepared for collections of the assessments of organizational ESG, business performance and governance strength, will follow in the next section including reflection of the pilot study. It is determined by paperwork to collect feedback from a question list and ask participants to answer questions independently.

3.6.3 Assessment

The assessment, (Ismail, Kinchin and Edwards 2018), will discuss the evaluations and feasibility of two parts by two groups of four participants.

3.6.3.1 Assessment of AMC interview

It has evaluated the conduction of semi-structure interviews by feedback and interactions with two participants. It has indicated a successful feasibility to collect data of AMC according to collected data stream. However, it found few areas for improvement in the main study.

First, Separations of questions by three pillars of E, S and G are not helpful, but separation of each issue can help collect more data, Originally, it lists questions separately by different pillars, which did not help recover more issues. The response is simple if the question did not reach each issue. Even more, the interviewee is likely to mix different issues between three pillars, for example, when the interviewee discussed the efforts on environmental issues, they tend to also discuss health and safety. It will reflect a way to motivate interviewees to generate additional data.

Second, participants do not want to talk about few issues and do not explain whether due to the willing or knowledges issues. On the other hand, it linked to participants' sensitivity on talking about ESG issues. The research found that two participants treated the electrical version of the data carefully by few adjustments with existing recording content in the end, which has turned back few new opinions.

3.6.3.2 Assessment of ESG Quantitative Data and Governance Strength Data Collection

It has assessed ESG data and Governance Strength data together because the data was from one of the same groups of two participants. It received data from two participants showing successful feasibility and evaluations. Each participant did not give feedback with difficulty completing the survey, and the feedback time was within around one hour, which is reasonable for the completions. However, it needs to review serval areas. First, few ESG data is not applicable or missing for the participant. For example, the IT sector participant has feedback that the land use and wastewater are not applicable for data input. Meanwhile, another participant did not complete one of the questions and asked for a column to input unwilling option. Finally, both participants are question about the research's independence with the conflict of academic research and a business management role.

3.6.4 Revisit

It has made the revisit process after the necessary adjustments of questionnaires and semi-structure interview question list. The researcher did not take another time of pilot study due to resource availability limitation. However, conducting a Q&A process with

the necessary adjustment for each trial participant. It thus confirmed the improvement of revised questionnaires and question list.

3.6.5 Reflections

This section will provide reflections in pilot study for improvement of the main study.

3.6.5.1 Reflection of Epistemological Positions

ESG rating, which is a quantitative methodology in measurement of firms ESG performance, stood a positive position but it needs to revisit with interpretivism method. Because the pilot study found a vertical validation (Sharfman 1996) of ESG is important. First, the pilot study can find the greenwash tendency of the participant, for example, one feedback about the significance of the carbon reduction management has been highlighted and the knowledge of neutralization, while the participant could not provide what kind of the plan or what kind actual action has been taken. Second, the mixed method provides opportunities for thus study to assess another factor of ESG greenwash, which will be in the measurement of the deviation between quantitative ESG rating and qualitative AMC rating,

3.6.5.2 Back-translation

Hazzi and Maldaon (2015) has highlighted the necessity of back-translation procedure in bilingual language. Since this study has conducted in bilingual language, it has found the reading difficulty on the contents from participants. For example, it can prevent the

presence of missing values for non-applicable or not available cases by this procedure. Therefore, this section has decided on a back-translation procedure in the main research.

3.6.5.3 Missing Data

Serval reasons caused the missing data in the pilot study. First, the characteristics of ESG conception are various, which include different issues and need assess by high volume of data, eighty-seven variables in this study. Second, the participant may not like to discourse the information (Louche, Delautre and Pimentel 2023), which is selective disclosure ESG information, referred to ESG greenwash. Thirdly, the participant may face capabilities issues, without knowing the specific issue due to knowledge or without preparation of data.

Additionally, few issues might not be applicable for few specific sectors, for example, environmental issues for the service sector. Finally, the research organization might not have stored the data from daily operation.

However, it reflected that missing data could bring benefits for the study (Hazzi and Maldaon 2015). First, it may give opportunities for assessment of participant attention for specific issues. Second, it has included the treatment of missing data in a part of this study, which refers to the availability of information in ESG rating (Rahman and Post 2012).

3.6.5.4 Sample Size and Normality

It could not calculate the normality of data collected by only four participants due to resources limitations. However, the ESG rating quantitative data between 2021 to 2023, providing two sets of ESG performance in 2022 and 2023, which will be around forty data, will reach the normality request of statistics volume as 30 (Hazzi and Maldaon 2015). However, it is still a limited number of samples, due to resource limitations (Rothgeb 2008).

3.6.5.5 Data Reliability

Reliability of ESG data is a key concern in relevant studies (Rahman and Post 2012). The pilot study has helped the researcher to prevent unreliable data by improving interviewing skills and improving confidence for participants to improve the transparency of data with less concerns on confidential issues. However, the unreliable ESG data disclosure found by existing studies, which is as greenwash tendency. It thus includes as one of the key factors in this study.

3.6.5.6 Interviewing Skills Improvement

Improvement of interview skills are key factors in qualitative study (Hazzi and Maldaon 2015), because it helps improve the data reliability and availability. The researcher recognized that the weak interview skills resulted from an uncontrollable time schedule or an uncompleted interview. The participant might feel a lack of confidence and less passion for the project. The researcher will thus learn from good examples and practice more conversions.

3.6.5.7 Same Participant for Pilot Study or Not

It is better not to have same group people both in pilot study and main study, because same participant might feel no interest and negatively impact on the feedback (Hazzi and Maldaon 2015). However, due to limitation of resources, removing participants from pilot study will reduce the availability of data. Meanwhile, it cannot change two participants from the hierarchy firm, who manage ESG management. It thus asks the same pilot study participants to join in the main study. The researcher also believes the good relationship between the researcher and participants in pilot study can prevent the negative impact on data collections in the main study.

3.6.6 Pilot Study Conclusion

The pilot study in this study has been implemented by the framework of procedures of determining, assessing, revisiting, and reflecting before the main study. It reflected the mixed epistemological positions of interpretivism and positivism. While it found the challenges of back-translation and missing data management. It further confirmed the normality of the sample and reflects the reliability of the collected data. In the end, it addresses the importance of the improvement of interview skills.

3.7 Research Survey

This part will introduce the designed research survey for this study. First, it will introduce the GVCs governance strength survey and the way to calculate the data. Second, it will explain the questionnaire designed for collections of each ESG issue and the method to assess firms' ESG performance. Finally, it will provide the introduction of the semi-structure outline and the treatment method of assessing ESG performance and ESG greenwash by the collected qualitative data.

3.7.1 GVCs Governance Strength Data

GVCs theory illustrated the distribution of technology and economic by globalization, in which the global governance model is the key factor for this distribution (Gereffi, Humphrey and Sturgeon 2005). Gereffi, Humphrey and Sturgeon (2005) explained five global governance models of market, modular, relational, captive and hierarchy for the value distribution according to the governance strength from three perspectives of complexity of transactions, ability to codify transactions and capabilities in the supply-base in table 7.

Table 7: GVCs governance type (Gereffi, Humphrey and Sturgeon 2005)

Governance type	Complexity of transactions	Ability to codify transactions	Capabilities in the supply-base
Market	Low	High	High
Modular	① ↓ High ② ↑	High ④ ↓	High
Relational	↓ High	③ ↑ Low	⑤ ↑ High ⑥ ↓
Captive	High	High	Low
Hierarchy	High	Low	Low

Ryan. et al. (2020) measure the global governance by how close working relationship between lead firms and suppliers. Cao. et al. (2023) further distinguish firms governance type by focusing on evaluation of cooperations in three sides, including market cost and information sharing and strategic cooperation. Therefore, this study has referred to the evaluation method of governance as Cao. et al. (2023) by the assessment of governance strength in GVCs in three parts of cost cooperation, information sharing cooperation and business strategy cooperation.

It measured cost cooperations between suppliers by how long the seller can stay in a weak position by giving benefits to buyer when the market inflates. For example, when the market price of materials is increasing, the longer time the seller can stay without selling price increase indicates a higher GVCs governance strength. Information sharing cooperation, for example, sharing operational supply situations, financial data and market share information, is by questionnaires with various levels of openness for participants to rate. The more open the seller in sharing information, the higher governance strength. Third section of business strategy cooperating is by the will of the seller and buyer to work together to develop capacity, quality and treasury management.

However, questionnaires not only have collected the perception of governance strength from sellers but also from buyers. Two main reasons follow. First, two sides perception of strength data can help improve the validity and reliability of the data. Because the view from one side might have limited by its restriction of networks. For example, the seller feels a higher cooperation in cost with buyer by comparing with different buyers within the seller's network. While the buyer might not assess as high as seller, because the buyer is comparing the cooperation within peer suppliers in its network. Second, two side evaluations can mitigate the risk of dynamic power of governance strength. Because the market is dynamic, the relationship of governance type is also dynamic within different periods. For example, one seller might change the strategy to a market relationship with the lead firm, however the buyer has not yet observed this change. Therefore, it used two versions of questionnaires, one for upstream suppliers in appendix A, another for downstream suppliers in appendix B, to assess governance strength from both views of buyers and sellers.

3.7.2 ESG Issues Quantitative Data

This study has reviewed ESG rating issues, referred to MSCI, in the literature section review by listing twenty-four issues separately. The review of issues has helped construct variables for each issue. However, it has not included issues below in this study due to comparable reasons, listed in table 8.

Table 8: Exclusion of ESG issues

Excluded ESG Issues	Exclusion Reasons
Responsible Investment	Small firms lack ESG investment policy and communities
Controversial Sourcing	Selective suppliers are not in controversial production
Access to Finance	Only one supplier is in bank sector, others are not available
Access to Health Care	No suppliers are in health care system
Opportunities in Nutrition and Health	Except four suppliers are in the food industry, other suppliers are in industrial sectors.

Therefore, this study applied different variables in following table 9 to design ESG questionnaires. Appendix D has provided questionnaires to collect relevant data from suppliers.

Table 9: ESG rating variables

ESG Issues	Formular	Variables	Department
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Climate Change	Employees EV/HEV Car Total Vehicle	Employees owned EV/HEV	Administration
Climate Change	Company EV/HEV Car Total Vehicle	Company owned EV/HEV	Administration
Climate Change	Company Instalment solar panel in size Land size	Company Instalment solar panel in size	Administration
Climate Change	Employee Instalment solar panel in size total employee	Employee Instalment solar panel in size	Administration
Climate Change	Company coal consumption Total energy consumption	Company coal consumption	Administration
Climate Change	Company gas consumption Total energy consumption	Company gas consumption	Administration
Climate Change	Company electricity consumption Total energy consumption	Company electricity consumption	Administration
Climate Change	Company biofuel and other renewables assumptions total energy consumption	Company biofuel and other renewables assumptions	Administration

Biodiversity and Land Use	Well water consumption Total water consumptions	Well water consumptions	Administration
Biodiversity and Land Use	Tap water consumption Total water consumptions	Tap water consumptions	Administration
Biodiversity and Land Use	Production and Total land size	Production land size	Administration
Biodiversity and Land Use	Revenue Total land size	Total land size	Administration
Biodiversity and Land Use	Spare land %	Spare land size	Administration
Biodiversity and Land Use	Land Environmental Assessment frequency	Land Environmental Assessment frequency	Administration
Biodiversity and Land Use	Land Environmental Assessment cost	Land Environmental Assessment cost	Finance
Raw Material Sourcing	Current year minus quality certificate renew year	Quality certificates renew year	Administration
Raw Material Sourcing	Quality Team Headcount/Revenue	Quality Team Headcount	HR
Raw Material Sourcing	Top 10 T1 Suppliers with quality certificate	Top 10 T1 Suppliers with quality certificate	Procurement
Raw Material Sourcing	Traceability record system	Availability of traceability record system	Administration

Raw Material Sourcing	Top 10 T1 Suppliers with traceability commitment %	Top 10 T1 Suppliers with traceability commitment %	Procurement
Toxic Emissions and Waste	Waste water license valid year minus current year	Waste water license valid year	Administration
Toxic Emissions and Waste	Waste water volume/revenue	Waste water volume	Administration
Toxic Emissions and Waste	Solid Waste volume/revenue	Solid Waste volume	Administration
Toxic Emissions and Waste	Investment of wastewater	Investment of wastewater	Finance
Toxic Emissions and Waste	Company coal consumption Total energy consumption	Company coal consumption	Administration
Toxic Emissions and Waste	Company gas consumption Total energy consumption	Company gas consumption	Administration
Toxic Emissions and Waste	Current year minus last environmental assessment	Last environmental assessment year	Administration
Toxic Emissions and Waste	Water consumptions	Total water consumptions	Administration
Health and Safety	Safety manager in company tenure	Safety manager in company tenure	HR

Health and Safety	Long term illness headcount	Long term illness headcount	Administration
Health and Safety	Extra medical insurance	Existing of extra medical insurance	HR
Health and Safety	Extra medical insurance coverage of employees %	Extra medical insurance coverage of employees %	HR
Health and Safety	CEO incentive linked to safety performance	CEO incentive linked to safety performance	HR
Health and Safety	CEO Safety bonus total bonus	CEO Safety bonus total bonus	HR
Health and Safety	Safety manager incentive linked to safety performance	Safety manager incentive linked to safety performance	HR
Health and Safety	Safety manager Safety bonus total bonus	Safety manager safety bonus total bonus	HR
Health and Safety	Current year minus Last occupational and health current assessment year	Last occupational and health current assessment year	Administration

Human Capital Development	Employee Satisfaction Survey Frequency in last three years	Employee Satisfaction Survey Frequency in last three years	HR
Human Capital Development	Employees with shares/ total employees (excluding sales)	Employees with shares (excluding sales)	HR
Human Capital Development	Employees with variable bonus/ total employees (excluding sales)	Employees with variable bonus (excluding sales)	HR
Human Capital Development	Annual training cost Total employees	Annual training cost	Finance
Human Capital Development	Last three years of training cost	Last three years of training cost	Finance
Human Capital Development	Turnover per employee	Turnover per employee	Finance
Labor Management	Employee shares incentives total salary	Employee shares incentives	HR
Labor Management	Annual Employee benefit cost	Employee benefit cost	Finance
Labor Management	Employee Satisfaction Survey Frequency	Employee Satisfaction Survey Frequency	HR
Labor Management	Employee Satisfaction Survey	Employee Satisfaction Survey	HR

	Frequency in last three years	Frequency in last three years	
Labor Management	Employees ongoing part-time degree Total employees	Employees ongoing part-time degree	HR
Labor Management	Employees age trend	Employees average age	HR
Labor Management	Output of product per employee	Production Volume	Administration
Supply Chain Labor Standards	Average salary for operators	Average salary for operators	HR
Supply Chain Labor Standards	Annual Overtime payment	Annual overtime payment	HR
Supply Chain Labor Standards	New labor court cases	New labor court cases	Administration
Supply Chain Labor Standards	Annual Top 10 suppliers audit frequency	Annual Top 10 suppliers audit frequency	Procurement
Product Safety and Quality	Availability of traceability record system	Availability of traceability record system	Procurement
Product Safety and Quality	Top10 supplier Traceability record system availability	Top10 supplier Traceability record system availability	Procurement
Product Safety and Quality	Annual customers complain	Annual customers complain	Sales
Product Safety and Quality	Training cost for quality department	Training cost for quality department	Finance

Product Safety and Quality	Accumulated investment in Lab	Accumulated investment in Lab	Finance
Product Safety and Quality	Expenses in Lab	Expenses in Lab	Finance
Product Safety and Quality	Valid quality certificate	Valid quality certificate	Finance
Community Relations	Employees from local community residents	Employees from local community residents	HR
Community Relations	Annual environmental assessment cost	Annual environmental assessment cost	Finance
Community Relations	Donations to local community	Donations to local community	Finance
Community Relations	Managers from local communities in total managers%	Managers from local communities in total managers%	HR
Community Relations	Plant land sizes	Plant land sizes	Administration
Community Relations	Plant land sizes/local community land sizes	Local community land sizes	Administration

Privacy and Data Security	PCs purchase within 3 years Total PCs	PCs purchase within years	IT
Privacy and Data Security	Total PCs/Revenue	Total PCs	IT
Privacy and Data Security	Annual ICT Expenses Revenue	Annual ICT Expenses	Finance
Privacy and Data Security	Annual ICT Investment	Annual ICT Investment	Finance
Board	Management members who combined as shareholder role(10%above) total management members	Employees with 10% or above of shares	HR
Board	Firms' form (listed/not listed/Foreign invest)	Basic info.	Administration
Board	Average age of management board	Senior managers ages distribution	HR
Board	Average tenure	Senior managers tenure in existing company	HR
Board	Female percentage of management	Female senior managers	HR
Board	Firms' form (listed/not	Basic info.	Administration

	listed/Foreign invest)		
Board	Firms' form (listed/not listed/Foreign invest	Basic info.	Administration
Board	Firms' form (listed/not listed/Foreign invest	Basic info.	Administration
Board	Short term debt/Revenue	Short term debt (with one year maturity)	Finance
Board	Short term debt/Revenue change ratio	Short term debt (with one year maturity)	Finance
Pay	CEO dividend*8/ (CEO annual Salary*5)	CEO's Annual Dividend Received	HR
Pay	CEO pay/total salary of senior management	CEO's Annual Salary received	HR
Pay	Incentives shares %	Total Salary of Senior management team	HR
Ownership and Control	Majority shareholder 0-10% 10-30%, 30%-75%, 75%-100%	Majority Shareholder shares %	Administration
Ownership and Control	One share one vote	One share means one vote right	Administration

Ownership and Control	Firms' form (listed/not listed/Foreign invest	Firms' type	Administration
Accounting	If single role of accounting senior management role existed	Does senior manager only responsible for finance	Administration
Accounting	Accounting headcount/Total headcount	Accounting department headcount (excluding senior manager)	HR
Accounting	Accounting department salary/headcount	Accounting department salary	HR
Accounting	Audit fee/Revenue value and change rate	Annual audit fee	Finance
Accounting	Audit fee/Revenue value	Audit fee/Revenue value	Finance
Business Ethics	Average Age of management	Manager level and above average age	HR
Business Ethics	Average Age of employee	Total employee average age	HR
Business Ethics	Female percentage of management	Female employees in Manager level and above	HR

Business Ethics	Female percentage of employees	Female employees in all employees	HR
Business Ethics	Average Degree of management	Manager level and above education degree distribution	HR
Business Ethics	Average Degree of employee	all employees' degree distribution	HR
Basic information		Company annual revenue	Finance
Basic information		Company yearend employees	HR
Basic information		Company annual net results	Finance
Basic information		Firms' type	Administration
Basic information		Annual Salary paid	HR

3.7.3 ESG Adoptions AMC Qualitative Data

The semi-structured interview follows a structure based on the AMC framework (Buckley and Liesch 2023) in appendix C, which aims to assess firms' awareness, motivations, and capabilities concerning ESG adoption. It will follow questions during the interview by noting with different issues which the interviewee may not mention.

The treatment of data section will introduce how the AMC data is rating. However, this study implements two steps in reducing the subjectivity in collecting and coding of the data. First, AMC interviews conducted two sides' validation of work. On one side, the researcher is collecting maximized data by showing different ESG issues during the interview. On other side, participants will validate that the interview questions accurately capture intended concepts by potentially confirming or refining specific wordings. Second, the analysis uses a single, consistent coding procedure. Each collecting data will undergo an initial coding phase focusing on different ESG issues. The data within one issue will be than separated by awareness, motivations, and capabilities. The third code will be than justification on positive or negative AMC of the content.

3.8 Research Organizations and Participants in Main Study

This study planned to involve twenty-one organizations, include one EU MNCs' Chinese subsidiary, referred as hierarchy firm, and its twenty upstream and downstream suppliers in China. Because the resource is more available in MNCs' Subsidiary, the research has invited five persons to finish different part of the work, however, one of the participants did not find proper time to join it. Two of the twenty suppliers did not response to the invitation to the project, No. 24 participants agreed to the invitation at the beginning and finished the questionnaire, while he/she quit in the last step of interview.

Therefore, acceptance as 84%, by total as twenty-one participants of twenty-five invitation, helps finish total eighteen research organizations' ESG quantitative data and ESG adoptions AMC interview, which referred to table 10. Following the coding of the number of participants, the coding between P004 to P025 in table 11 has been used for the research organization, in which P004 has concluded as name of the same organization for P001 to P005 because P004 has provided the quantitative data of ESG.

Table 10: Acceptance status of participants

Participant No.	Position	Method	Status
1	Plant Manager	Interview	Did not accept the interview
2	HSE Manager	Interview	Pilot Study Participant
3	HR Manager	Interview	Pilot Study Participant
4	Finance Manager	Questionnaires	Accepted and completed
5	Procurement Manager	Questionnaires	Accepted and completed
6	Vice General Manager	Interview & Questionnaires	Pilot Study Participant
7	General Manager	Interview & Questionnaires	Accepted and completed
8	Senior Key Account Manager	Interview & Questionnaires	Accepted and completed
9	General Manager	Interview & Questionnaires	Accepted and completed
10	Business Partner	Interview & Questionnaires	Accepted and completed
11	Vice General Manager	Interview & Questionnaires	Pilot Study Participant
12	Senior Key Account Manager	Interview & Questionnaires	Accepted and completed
13	General Manager	Interview & Questionnaires	Accepted and completed
14	General Manager	Interview & Questionnaires	Accepted and completed

15	Senior Key Account Manager	Interview & Questionnaires	Accepted and completed
16	General Manager	Interview & Questionnaires	Accepted and completed
17	Vice General Manager	Interview & Questionnaires	Accepted and completed
18	Senior Procurement Manager	Interview & Questionnaires	Accepted and completed
19	Senior Key Account Manager	Interview & Questionnaires	Accepted and completed
20	Senior Key Account Manager	Interview & Questionnaires	No response
21	Senior Key Account Manager	Interview & Questionnaires	Accepted and completed
22	Senior Key Account Manager	Interview & Questionnaires	Accepted and completed
23	Senior Key Account Manager	Interview & Questionnaires	No response
24	Senior Key Account Manager	Interview & Questionnaires	Complete Questionnaire, but quit for interview
25	Senior Key Account Manager	Interview & Questionnaires	Accepted and completed

Table 11: Research organization's sector and location of province

Participant No.	Research Organization No.	Sector	Location of Province in China
1	P004	Manufacture	Heilongjiang

2			
3			
4			
5			
6	P006	Manufacture	Hebei
7	P007	Manufacture	Shandong
8	P008	Service	Shanghai
9	P009	Manufacture	Hebei
10	P010	Service	Shanghai
11	P011	Service	Heilongjiang
12	P012	Service	Guangdong
13	P013	Service	Beijing
14	P014	Manufacture	Guangdong
15	P015	Service	Shanghai
16	P016	Manufacture	Liaoning
17	P017	Service	Shanghai
18	P018	Manufacture	Liaoning
19	P019	Manufacture	Jilin
20	P020	Manufacture	Liaoning
21	P021	Manufacture	Shanghai
22	P022	Manufacture	Liaoning
23	P023	Manufacture	Anhui
24	P024	Manufacture	Shanghai
25	P025	Service	Tianjin

According to the introduction of participants in this part, the surveys collections can help provide sufficient data and samples for analysis against different research questions. First, nineteen organizations including one hierarchy firm and eighteen suppliers, have given nineteen sets of GVCs strength data. The correlation analysis between GVCs and ESG activities of greenwash and adoptions can position on these nineteen sets relationships. Second, nineteen firms can provide nineteen sets of analysis between ESG greenwash and ESG adoptions. Finally, this study compares the business performances of nineteen companies against their greenwash and ESG adoptions to assess them. However, the sample size is small, which limits the ability to generalize these results across different supply chain networks. First, the sample represented in a limited the network from one specific MNCs from Europe operating in China. The result might not be sufficient to support other countries. Meanwhile, one supply chain network cannot provide possibility to validity the result with other networks in China. Finally, the sample collection, including only three-year periods of data, could not provide a long view of the analysis.

3.9 Challenges of Participations in Main Study

The researcher has found two challenges of engagement of participation in the main study. First, the participant is feeling pressure to join the project because of the direct pressure from the asking for accountability and responsibility of ESG issues, which is one of the objectives of the project. The three unacceptable invitations were all from the manufacturing sector. The researcher may assume that the invited organization may face few environmental issues, which turned to the result that the accepted participants are at better ESG performance than unaccepted participants While the service sector is all accepted, it might be less pressure from service sectors. This offers both one disadvantage and an advantage of this study. The advantage is that the reliability of data can confirm after sincere consideration of the pressures faced. For example, one of the unacceptable invitations is unaccepted in the middle of the process when the participant has finished the questionnaire. This may have proved the reliability of participants' decisions.

However, the disadvantage of this pressure is that the participant is under the selection of the direct pressure. It may have excluded the sample who did not like the ESG issues and only included the participants in the high tendency of favor in ESG issues. The researcher has made efforts in releasing the pressure from participant by option to withdraw the participation at a certain time. Further ethical considerations will present in the impact statement. The second challenge is maintaining sustainable energy for participants in the project. The questionnaire in pilot study found reasonable time at one hour. However, it has underestimated the authorized time to reach those data. For example, one of the participants from the bank sector took long time to get approval internally to complete the data since the data has covered few departments' data, a part of which, such as labor or employees' benefits, are sensitive and strictly controlled. Furthermore, due to the wide range of locations from different participants, a part of the interviews took by phone call, which lost few emotional signals and impacted on the participants' energy as well. The researcher has minimized the risk by good relationship with participants in this part.

3.10 Research Procedure and Data Collection in Main Study

This part includes the data collection procedures of two parts of semi-structure interview and two questionnaires assessing corporations' ESG performance, business performance, and governance strength. The data collections in the main study were executed between 2024.05-2024.07.

3.10.1 Data Collection of Two Questionnaires

Except for the research organization "P004", only one single person for collection of both questionnaires and interview joined from the other research organizations. "P004" research organization is different due to high data access availability and helpful for data

accuracy. The research has prepared specific project information sheets and content forms for each participant, in which the research organization's ethical rules will have introduced, and free termination option of the participants follows from the beginning. The research sent both digital and paperwork of the questionnaires to the participant, while most participants prefer to work digital version which are easy to verify. Therefore, double confirmation of digital data is always conducted with each participant. It creates a specific share folder with a unique and valid password to load all digital documents for each participant. After the confirmation of the content in loaded documents from participants, each participant will receive the valid password and access address.

3.10.2 Data Collection of the AMC Semi-Structure Interview

The procedure for interviews is like that used in questionnaire data collection; both require participants to sign consent forms and get notices about ethical rules. The interview always starts with ethical consideration by informing about the independent role of the research and a free possibility to leave with the project. The researcher treats the recorders as collections of data while all participants prefer not to store voice documents and make few amendments on the word documents. In the end, the research will upload digital documents in the same way as treatment for two questionnaires.

3.11 Impact Considerations

This part will introduce the ethical procedure in this study, by three parts of informing, protecting and benefits to respondents (Rothgeb 2008)

3.11.1 Informing Respondents

As lessons learned from pilot study that all participants treated highly on confidential of participation. Therefore, it implemented two steps to improve confidence in the confidentiality of participation. First, the research gave more formal introduction of ethical procedures to participants three times, including invitation process, data collection process, and completion of data collection. Secondly, good interview skills improvement enhances the flexible feelings from participants during the interview.

3.11.2 Protecting Respondents

Protecting participants can further improve participants' confidence. As found by pilot study, the participant tends to leave out with the handwriting and voice recording. This study has agreed with participants by storing digital documents only and all documents will stay with both procedures of collection and back-confirmation.

3.11.3 Benefits to Respondents

Participants have frequently asked about the conflict role of academic and business management during the pilot study. This study repeatedly raises the dual role conflict issue to the participant at the beginning. The participants will note that this research has non-funding source and did not offer benefits to participants and the employer of the researcher, who will be not able to reach data and not benefits or penalties from other parties. Furthermore, the researcher also provides a letter from employer to participant to strength this ethical position.

3.12 Data Analysis

The part will introduce data analysis procedure against the collected data. First, it will introduce how to ground qualitative data and interpret to a quantitative ESG assessment. Second, it will introduce the way of calculating ESG performance by first questionnaire's data and the treatment of output of governance strength. Thirdly, it will introduce how greenwash is determined. Finally, it will introduce the analysis tool for reaching three goals.

3.12.1 Treatment of AMC Qualitative Data

The researcher will ground the content analysis (Saunders, Lewis and Thornhill 2018) of the qualitative data by each issue with rating in bellowing principle in table 12 and calculate the ESG rating for firms by weighted issues scoring in each pillar.

Table 12: Treatment principles of suppliers' AMC quality data

Data validation	Principle	Rating
Data inclusion as positive awareness	Knowing the issue	1
Data inclusion as negative awareness	Do not know the issue	-1
Data inclusion as positive motivations	Want to do something about the issue or care about the impact of the issue	2
Data inclusion as negative motivations	Do not want to do something or do not care about the impact of the issue	-2
Data inclusion as positive capabilities	Actions have made or clear action plan to do with supporting points on the issue	3

Data inclusion as negative capabilities	Actions have made or clear action plan to do with harmful points on the issue	-3
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3.12.2 ESG Questionnaire Treatment

MSCI (2022) stated ESG assessment is rating the deviation between management planning and management executions. However, this study could not get management planning data, therefore, this study replaces “planning” as performance of current year minus one year. The performance of each variable is assessed by the formula:

$$V_i = \frac{V_{i,cy} - V_{i,cy-1}}{V_{i,cy}}$$

Where:

- $V_{i,cy}$ is the performance of one of the ESG variable i in rating current year.
- $V_{i,cy-1}$ is the performance of one of the ESG variable i in rating of one year before the current year.

The performance of each variable will then be conducted by rating process compared with all companies' same variable data by distribution between the maximum and minimum value from 0.5 to 7. The formula is below.

$$ESGVS_{i,m} = \frac{Round \left(\frac{V_{i,m} \times 14}{Max V_i - Min V_i}, 0 \right)}{2}$$

Where:

- $ESGVS_{i,m}$ is the rating score of variables i for company m.
- $V_{i,m}$ is the variable i performance for company m.
- $Max V_i$ is the maximum value of variable i performance amount all selected companies.
- $Min V_i$ is the minimum value of variable i performance amount all selected companies.

Each ESG issue's rating score will be then weighed by its variables score and followed by the formulas.

$$ESGIS_{n,m} = \text{Weighted } (ESGVS_{n,m})$$

Where:

- $ESGIS_{n,m}$ is the rating score of ESG issue n for company m.
- $\text{Weighted } (ESGVS_{n,m})$ is the weighted average of variable scores which have belonged to ESG issue n.

Each pillar of ESG will be weighted calculation of pillar group of issue's scores. The overall ESG performance will be weighed average by the value of three pillars in following formular.

$$ESGS_m = \frac{ES_m + SS_m + GS_m}{3}$$

Where:

- $ESGS_m$ is the ESG score for the firm m in the specific year.
- ES_m is the environmental pillar score for the firm m in the specific year.
- SS_m is the social pillar score for the firm m in the specific year.
- GS_m is the governance pillar score for the firm m in the specific year.

3.12.3 Governance Strength Assessment

Each research organization will receive two side assessments of governance strength as both upstream supplier and down supplier views. “P004” organization is determined by max strength as value of “5” because it recognizes GVCs governance as the hierarchy governance type by the lead firm’s direct investment in the foreign country (Gereffi, Humphrey and Sturgeon 2005). The final calculations of governance strength, represented by bellowing formulation. In case, if one side supplier or both are not willing to rate one specific question, the calculation will respect one valid supplier’s rating or removed the specific question in the calculation part.

$$GovS_m = \frac{GovS_{a,m} + GovS_{b,m} + GovS_{c,m}}{3}$$

Where:

- $GovS_m$ is the GVCs governance strength for the company m.
- $GovS_{a,m}$ is governance strength weighted score in section a, for the company m.
- $GovS_{b,m}$ is governance strength weighted score in section b, for the company m.
- $GovS_{c,m}$ is governance strength weighted score in section c, for the company m.

3.12.4 Determination of Greenwash

Sharfman (1996) refers to greenwash by deviation between diverse sources of ESG data. This study decides the greenwash as the difference between assessment of ESG rating and AMC rating in following formula.

$$ESGG_m = \frac{ER_m - AR_m}{AR_m}$$

Where:

- $ESGG_m$ is the company m' s ESG greenwash tendency.
- ER_m is the company m' s ESG rating result.
- AR_m is the company m' s AMC rating result.

3.12.4 Analysis Tools

The analysis tool of content analysis applied in this study for two parts. First, the construction of objectivity of ESG measurement input will apply the content analysis of literature review. The section conducted in the last section is an available resource for content analysis. Second, the AMC rating will need content analysis tool to determine awareness, motivations and capabilities from the qualitative data collected by the interview.

The t-test analysis tool applied to find the significant difference of the samples. For example, it will be used to analysis the various outputs resulting as significantly different

or not by different treatment of missing data method in the section of objectivities evaluation part. Another statistical analysis tool is the OLS regression analysis. Because regression analysis can help find whether proposed factors are significantly correlated.

3.13 Summary

This part introduces the development of methods in this study. First, it introduces the implementation of research onion for the research methods. The objectivist is the ontological position, while both interpretivism and positivism are epistemological positions in this study. Consequently, the research choice of a mixed method based on the research techniques of content analysis and regression analysis, chooses together with the research strategy by combination of survey and interview.

This section also presents the pilot study positioned of the framework of steps of determining, assessing, revisiting, and reflections. It is further strength the positions of epistemological. While it found the challenges of back-translation and missing data management. It confirmed the normality of the sample and the weakness of data reliability reflected. Furthermore, it highlights the importances for the researcher to improve the interview skills in the main study.

The introduction of data collection is presented after pilot study. The construction of GVCs governance strength is presented together with the AMC data collections. The variables of ESG rating data are provided with the setup pf questionnaires.

Furthermore, it presents the procedures of data collection in the main study. It introduces the diversity of the research organization and participants. While it further introduces the

weakness of dual role conflict position of researcher in this study together with relevant measures to strength this issue. The details of the process of data collection for two questionnaires and semi-structure interviews introduced. The detailed impact statement is as follows.

Finally, it presents the data treatment plan for various sources of data in this study. It describes the AMC rating and GVCs governance strength and the process of calculation of firms greenwash. It introduces the content analysis, statistics t-test and OLS regressions as the data analysis tools in the end.

CHAPTER 4: Findings and Analysis

4.0 Introduction

This part includes three main bodies. The first part is the analysis of four objectivity factors in ESG rating measurement. Second, it will present the collected and treated data and confirm the normality of the data. Third, it will investigate the relationship between GVCs and two factors of ESG greenwash and ESG adoptions. It will follow the analysis of correlation between ESG greenwash and ESG adoptions. Finally, it will investigate the influence of other factors of GVCs, ESG greenwash and ESG adoptions, on suppliers' business performance.

4.1 Challenges of Objectivities of Four Factors in ESG Rating

This study applied four factors' objectivities framework in the evaluation of measurement objectivities, proposed by (Ijiri and Jaedicke 1966 and Wojdak 1970) to analysis the challenges of ESG Rating, which included four factors of inputs, measurement system, outputs, and measurers. This part will conduct analysis following these four factors.

4.1.1 Challenges of ESG Input Factor Objectivities

Input factor objectivities considered the measurement of input object (Ijiri and Jaedicke 1966), which is the concept of ESG in this study. This part will first discuss the general concept of ESG. Second, it will assess the construction of each ESG issues according to

content analysis of literature review sections, listed by the structure for ESG issues from MSCI.

4.1.1.1 General Concept of ESG

The general concept of ESG constructed as environmental, social and governance pillars has aligned in existing literature. However, due to three different origins bodies of ESG concept, including Responsible Principles, ESG rating agencies and ESG disclosure standard bodies, this study has found differences of ESG issues constructed by three parties referring to table 2 in section of literature review.

First, ESG disclosure bodies lack governance in its disclosure standards but are by thirty separate detail issues. Second, ESG investment principles parties include only four issues of climate change, biodiversity loss, human rights, and governance, which is lack of breakdown details. Finally, ESG Rating agencies are providing most details issues, such as MSCI with separation of thirty-two items, while different raters remain different structure of issues (Dorfleitner, Halbritter and Nguyen 2015). In conclusion, it found the aligned general concept of ESG, while construction of ESG issues remained few deviations between different origin bodies and within the same origin body of rating agencies.

4.1.1.2 Construction of Each Environmental Issue

Table 13 assesses the four objects of ESG environmental issues, assessed by various opinions from different literature by positioning different observers. It has shown the unclear objectives of each environmental issue for development of ESG measurement

methodologies. For example, the methodology of measurement of raw material sourcing issue by calculation of quality certifications volume are difficult, because the principle of “the more certifications the better performance “(Bashir. et al. 2022, Fonseca. et al. 2022 and Gyekye. et al. 2024), is against the over certification's concepts (Arana-Landin. et al. 2024 and Hahn 2013).

Table 13: Various input of environment issues by different observers

ESG issues	Objects Deviations	Opinion One Side Observers	Opinion Another Side Observers
Climate change	Different social groups' attentions	Firms focus on physical risk or transitional risk depending on business scope. (Chen. et al. 2023, Dong. et al. 2022 and Li. et al. 2022)	Public focus on physical climate change risk (Ardia. et al. 2023)
	Actions in different regions	China is focus on transformation of EVs and take a lead in EVs compared with other areas (Holslag 2022)	EU firms have engaged in an important level of carbon emissions mitigating strategy compared with other regions (Hsueh 2019)
Biodiversity and land use	Linkages with other issues	It linked with local communities' issues, climate change and pollutions issues (IPBES 2022)	Firms tend to discuss biodiversity issue separately (Coolsaet. et al. 2020).
	Biodiversity issue inequality distribution	Nature resources of marine in south and north regions are not equal (Zhang. et al. 2024).	Benefits of protection of land use are not equally distributed (Sharma. et al. 2023)

Raw material sourcing	Availability of certifications and over certifications	The greater availability of quality certificates shows better raw material sources (Bashir. et al. 2022, Fonseca. et al. 2022 and Gyekye. et al. 2024).	Firms are over certificated since different quality systems stood for different dimensions, which is harmful for capital arrangement and could not help building up mission of sustainability of raw material sourcing (Arana-Landin. et al. 2024 and Hahn 2013)
Toxic emissions and waste	toxic emissions and wastes inequality distribution	Toxic emissions are not the same health risk for different social economic groups (Sexton. et al., 1993).	Toxic issues are not the same distributed in different regions since the nature resources distributed unequally (Luo. et al. 2019)

4.1.1.3 Construction of Each Social Issue

Since duplication of concepts between responsible investment issue and ESG, and limited literatures of community relations, it has not been found with various opinions on these two issues. Table 14 listed other ten social issues with different statements. It has been clear challenges for measurement of different opinions by one same concept. Most frequently mentioned deviations are the inequality of distribution of issue represent different meanings of issue in various regions, such as different understanding of nutrition and health, controversial souring, and access to finance amount developed and developing areas.

Table 14: Various input of social issues by different observers

ESG issues	Objects Deviations	Opinion One Side Observers	Opinion Another Side Observers
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Health and safety	Unbalance of internal and external intentions	External attentions from public are lack on safety disclosure variations (Olsen, Awuah-Offei and Bumblauskas 2021)	Internal attentions employees are looking carefully on owned benefits as health condition (Caskey and Ozel 2017 and Guo and Wang 2023)
Human capital development	Impact of gender	Females are important in adoptions of sustainability (Ali.et al. 2021)	Females could not leave with high physical pressure work conditions and show a higher tendency of quit the job in such conditions (Pan. et al. 2021)
Labor management	Conflict of cost control and labor investment	Controlling direct labor adjustment cost is important (Hamermesh 1995 and Merz and Yashiv 2007)	Investment in labor can motivate employees to protect firms benefits (Danthine and Donaldson 2 and Schochet, Benlemlih and Jaballah 2022)
Supply chain labor standards	Internal and external factors	Internal factors of inside motivations are the key drivers for supply chain transparency (Gardner. et al. 2019).	The complexity of external network of firms decides the firms supply chain transparency (Feng, Zheng and Shen 2024)
Privacy and data security	Availability of policies	Polices availabilities are key drivers in issue of privacy and data security (Baumer, Earp and Poindexter 4 and Fusilier and Hoyer 1980)	Increase of policies shown to consumers will create more defensive behaviors (Ruwan, Mario and Shahriar 2021)
Product safety and quality	Conflict of cost and consumers' welfare	Public expect to extend product safety and quality to extra welfare of environment, economy, distribution, health, democracy, and beyond (Rory 2023)	Taking care extra consumers' welfare will increase cost and reduce insurance on quality (Berens, Van Riel and Van Rekom 2018 and Sumitro and Luc 2017)

Controversial Sourcing	Awareness of controversial products in different regions	Western world referred the controversial which is harmful for the society, such as alcohol (Fam, Waller and Yang 8)	Females could not leave with high physical pressure work conditions and show a higher tendency of quit the job in such conditions (Pan. et al. 2021)
Access to Finance	Inequality of access to finance distribution by regions	Financial institutions in developing countries have less capabilities to deal with access to finance (Demirguc-Kunt and Maksimovic 1988)	Developed countries remained more powerful financial institutions to deal with access to finance (Demirguc-Kunt and Maksimovic 1988)
Access to healthcare	Complexity of healthcare supply	Individuals' healthcare demand is unit (Shea et al., 2022)	Important level of complexity for supply of healthcare faced (Shea et al., 2022)
Opportunities in nutrition and health	Various meanings of nutrition issues by different regions	Developing areas' nutrition is lack of energy because of poverty (Phuong. et al. 2022).	Developed countries' nutrition is over supply unhealth and high energy food caused obesity issues (James and Nelson 1997).

4.1.1.4 Construction of Each Governance Issue

Assessment of governance issues has included five issues, except business ethics, other four issues found few objects deviations in following table 15. Like environmental and social parts, those deviations created few difficulties in working out a consistent measurement method. For example, the method in evaluation of board performance should choose one side opinion of more outsider board members (Cucari, De Falco and Orlando 2018 and Zaid. et al. 2020) or more insider board members (Elena and Nicolas 2019).

Table 15: Various input of governance issues by different observers

ESG issues	Objects Deviations	Opinion One Side Observers	Opinion Another Side Observers
Board	Outsider and insider board members	Outsider board members are more independent and thus help risk control and long-term interest of firms (Cucari, De Falco and Orlando 2018 and Zaid. et al. 2020)	Insider board members are more important because they are more accountable for the business results (Elena and Nicolas 2019)
Pay	Validation of pay gap	High pay of CEOs is questioned if they are worth for this gap, or they are closed to the board to get high pay (Chang, Sudipto and Hilary 2010 and Faleye, Reis and Venkateswaran 2013)	CEOs' needs motivations by a certain pay gap and incentives to do extra for ESG (Homroy, Mavruk and Nguyen 2023 and Zhang. et al. 2023)
Ownership and control	Separation of ownership	No ultimate controlling ownership structure renders more flexibility for managers to be accountable for firms' long-term value (Cordeiro, Profumo and Tutore 2021) and Duygu, Ece and Yasemin 2021)	Family-owned ownership structure played as the ultimate owner in assisting development of ESG (Dong. et al. 2024 and Yeon. et al. 2021)
	Various meanings of ownership in different regions	Stated ownership in China helps engage with ESG (Ahmed. et al. 2024)	Stated ownership in India decreased firms ESG performance (Cordeiro. et al. 2018)
Accounting	Spending of Audit cost	Engagement of service with audit firms has improved firms' ESG performance (Bright and Tamara 2023)	Lower cost of audit costs shows a better management of firms' ESG (Song, Wu and Ma 2023)

4.1.1.5 Summary of Challenges of ESG Input Factor Objectivities

This part has assessed challenges of recognition of input factor in ESG measurement. First, although Environmental, Social and Governance as three pillars have aligned in general concept in existing studies, objectivities of input factor for structure of ESG are found few deviations around three different origin bodies of responsible principles, rating agencies and disclosure standards. ESG rating agencies have provided the most detailed breakdown of thirty-two issues, while responsible principles are simplified with four issues and disclosure bodies lack governance issues. Second, more deviations were assessed within each ESG issue. It found that the construction of one ESG issues must consider multiple different recognition, in which the rater needs to determine in one side and give up another side.

4.1.2 Challenges of ESG Measurement System Factor Objectivities

The measurement system's objectivities referred to the visibility of the details principle of the measurement system for the alignment of measurers' understanding (Ashton 1977). Since the limited resource of public methodologies from different rating agencies, this study conducted the content analysis of literature review by two parts of transparency and misalignments of methodologies in following section.

4.1.2.1 Lack of Transparency of Methodologies

Few scholars have called for the transparency of ESG rating methodologies (Pang. et al. 2024, Wang. et al. 2024 and Zhou, Lei and Yu 2023). However, two main reasons from the raters' side are account for the intransparency of methodologies. First, ESG raters are

not willing to disclose methodology to the public. Because related to business confidential, Louche, Delautre and Pimentel (2023) found that rating's managers cannot discuss further deeply with the methodology of ratings. Second, high market competition resulted in resistance to public rating methodologies. Since rating agencies are a profitable organization, rating methodologies, treated as key part of business innovation to compete with others, raters cannot show them to others. Therefore, both internal motivations and external market pressure have resulted in the lack of transparency of rating methods to the public.

4.1.2.2 Lack of Alignment of Methodologies

Existing studies have found the misalignment of rating method between different raters according to limited public information. First, the measurement objects in the method are various. As mentioned in the section of assessment of input objectivities, few studies found the construction of input variables are different. It has found similar deviation construction of general concept of ESG. Asset4 provides one additional pillar as economic pillar (Dorfleitner. et al. 2015), which is aligned with ESG disclosure standard bodies, while other agencies have not included an economic pillar. Meanwhile, other issues, such as shareholder engagement, recognized as social issues and governance issues by different agencies (Chatterji et al. 2015 and Dorfleitner. et al. 2015). Second, the data collection arrangements are different between raters and within the same agencies between different periods. For example, MSCI's measurement indicators are changed from time to time between 60 to 80 indicators, while ASSETS4 included 850 data point for calculations (Dorfleitner. et al. 2015). Furthermore, the weighting system, aggregations of performance indicators to issue, issues to pillar and pillars to overall performance are all different (Berg, Koelbel and Rigobon 2022, Louche, Delautre and Pimentel 2023 and Mayer and Ducsai 2018).

It has been a few scholars asking for reasons for those misalignments (Eccles and Strohle 2018). However, the first reason, which has been explained by the last part, is that the business competition motivation of rating agencies is tended to measure differently and proved to have a better ability of measurement compared with other competitors. Second, each rating agency is founded with different visions of measurement ESG. Lars and Hassel (2015) have classified two kinds of visions, one is value-driven (MSCI), and another is value-based (ASSETS4). Value-driven agencies measured the practice of ESG against the risk of exposure, while value-based firms measured how much value of ESG activities has been created for the long-term value. Therefore, the mixture of business external pressure and internal visions leads to the misalignment of measurement methodologies between different raters.

4.1.2.3 Summary Challenges of ESG Measurement System Factor Objectivities

Inconclusions, the measurement system objectivity is lack of consensus due to lack of transparency and misalignment of measurement methodologies. First, the measurement system lack of transparency is due to internal business confidential requirement and external competition pressure. The misalignment of the measurement system is due to dynamic understanding of ESG input and nature of business. The nature of business is two parts of motivations of differentiation on products and services and different business visions relied on different methods of ESG value output measurement or ESG value against risk measurement.

4.1.3 Challenges of ESG Raters Factor Objectivities

Few scholars have challenged the independence of raters, which is as measures' bias in measurement (Ijiri and Jaedicke 1966 and Ponemon 1995). Measures subjective

judgements during the measurement process might create bias on the result of calculations. This study has thus chance to not only find the problem of the rater's independence but also investigate the reasons behind it. It will introduce three parts of challenges of ESG Raters' bias, ESG data quality and ESG missing data treatment.

4.1.3.1 Challenges of Raters' Bias

Measurers' bias (Ponemon 1995), referred to as raters' bias in this study, has been a positive advantage of ESG raters in measurement of social performance at the beginning. Because compared with measuring by own reports, a third party's evaluation from outside of the target firm is more objective and reliable (Sharfman 1996). However, rating divergence is straightforward evidence of rating bias in same firm. It has been explained by exiting work of three reasons of origin of raters, rater effect and dynamic demand of clients.

First, raters' bias starts from the first of investing value by raters. Because the major of those agencies' aims, offering investment recommendations for social investors, is view of financial orientation, which is tended to measure social issues linked to financial outcome and avoid the measurement without linkage to financial result (Louche, Delautre and Pimentel 2023). Secondly, the rater's effect could not be avoided. It means when raters judged on one indicator for one specific company as reliable performance, the next indicator of this company will be rated as good as well by the favorable effect from formal one to the rater (Berg, Koelbel and Rigobon 2022). Finally, the raters' judgement process is influenced by dynamic demand from clients. For example, if clients asked for more deeply integrated data of labor management, the judgement process will need to improve data collections and add in more or reduce few subjective judgements (Louche, Delautre and Pimentel 2023).

4.1.3.2 Challenges of ESG Data Quality

External ESG data quality is another key factor for the creation of bias of judgement on ESG measurement. The Assessment of ESG data quality has included three parts of nature of ESG data, firms' capabilities of preparation ESG data and firm's motivations to disclosure ESG data.

The nature of ESG data is a high availability of mass data sources and a low availability of few companies and specific areas and a mixture of qualitative and quantitative data. First, ESG data are collected from multiple resources (Chatterji et al. 2015), such as company registration profiles, sustainability reports, media, interview, surveys and other public resources (Mayer and Ducsaï 2022 and Semenova and Hassel 2015). The measure's judgement of selection or exclusion of data is creating bias. The more availability of ESG disclosure of one company, the rating divergency are more serious (Liu 2022). Secondly, raters are complaining about the lack of ESG data. For example, Sahin et al. (2022) found ESG measurements are rated with data gaps and low quality ESG data. Finally, due to diverse sources of ESG data, the characteristics of ESG data are mixture of qualitative data and quantitative data. As a measurement process is to quantify performance, which needs to transform qualitative data, measurers' transformation of data are difficult (Louche, Delautre and Pimentel 2023) and creating bias.

Firms' capabilities of preparation of data impacted the quality of ESG data. Companies' size and profitability situation can ensure How many available resources are feasible for firms to prepare data (Louche, Delautre and Pimentel 2023). Meanwhile, the regulation of the countries and industry sector of the firms resulted with different urgency of companies for ESG data preparation (Mayer and Ducsaï 2022).

Firms' motivations to disclose ESG data also impact on the availability of data. Raters are wondering the behind of what firm's saying, because firms are not always honest and tended to selectively disclosure information (Louche, Delautre and Pimentel 2023). This found in the section of firms greenwash tendency (Lyon and Maxwell 2011). It has been a big challenge for raters because ESG measurement is developed by the concept of objective measurement method while the core of measurement is influenced heavily by subjective selection activities.

4.1.3.2 Challenges of Missing ESG Data Treatment

The present study has rating ESG by a fixed questionnaire, which has avoided the issue of high availability of mass data sources. However, the challenge of firms' capabilities and motivations of preparation of data, which has resulted in missing of data, will be discussed in this part.

Two treatment methods have been applied in existing rating services. The first measurement is to measure the lowest grade for the missing data indicator (Louche, Delautre and Pimentel 2023), because raters are not possible to rate as superior performance with data (Berg, Koelbel and Rigobon 2022). This is aligned with the assumptions of greenwash tendency, that rating agencies assumed focal firms are hiding bad social performance. However, two questions remained in this treatment. First, are firms with missing data all due to greenwash? Few firms just lack the ability to prepare the data, which might be due to size, profitable situation and regulation demands. Second. Are all missing data firms' level of greenwash equally bad? If the deficient performance of firms is measurable, it should not be equal for different firms.

Second way to treatment is that rating agencies excluded issues in the measurement, which has resulted in the missing indicator in the pillar (Sahin et al. 2022). This treatment includes greenwash treatment. Because it includes data what firms preferred to show and excludes the data what firms want to hide.

Therefore, no matter what this study chooses the method of treatment for missing data, ESG measurers could not avoid the subjective judgments of the measurement process.

4.1.3.3 Summary of Challenges of ESG Raters Factor Objectivities

The challenge of raters' bias on the measurer's factor objectivities is concluded from positions of raters and nature of data. First, raters' financial orientation bias, halo bias and considering client's demands leads to the challenges of objectivity. Second, the nature of ESG data also leads to the bias on converting mass sources of ESG data and the bias on lack of data due to firms' capabilities of preparation ESG data and firm's motivations to disclosure ESG data. This part also explained the difficult position for the rater to give a firm rating with situation of lack of data, which is unknown by lack of data capabilities or lack of willingness to share data.

4.1.4 Challenges of ESG Output Factor Objectivities

The output factor (Ijiri and Jaedicke 1966 and Ponemon 1995), is the final key part of evaluation of measurement Objectivity. Current challenges on ESG rating measurement objectivities, as rating divergence (Pang. et al. 2024, Wang. et al. 2024 and Zhou, Lei and Yu 2023), have discussed the assessment of the output divergence between different raters. However, limited studies have discussed the challenge of ESG output factor from a

rater's point of view. As mentioned in the last part, the expected objective measurement of ESG rating in fact is measured by several subjective decisions. This part will apply the example of decision on treatment of missing data in this study to illustrate where difficulties are and how are consequences of this application.

4.1.4.1 The Fact of Missing Data by Each ESG Pillar

As shown in figure 8, this study has invited 18 organizations to participant ESG questionnaire with collection of 81 direct ESG variables for 3 years, as totally 4374 expected collections of data, 1836 occupied by social pillar, 1296 data of environmental pillar and governance pillar as 1242 data. However, the average of missing data for total is 1414 as 26% occupied total data. If pay attention on the breakdown of each pillar, governance pillar resulted as fewer missing data and percentage compared with other two pillars.

Furthermore, figure 9 showed the breakdown of miss data percentage by breakdown to two sectors of ten organizations in manufacturing and eight organizations in service sector. The service sector has shown missing of more than half of the data in environmental pillar. While the manufacturing sector showed a similar level of missing data in each pillar and the service sector only performed better as a governance pillar than manufacture sector.

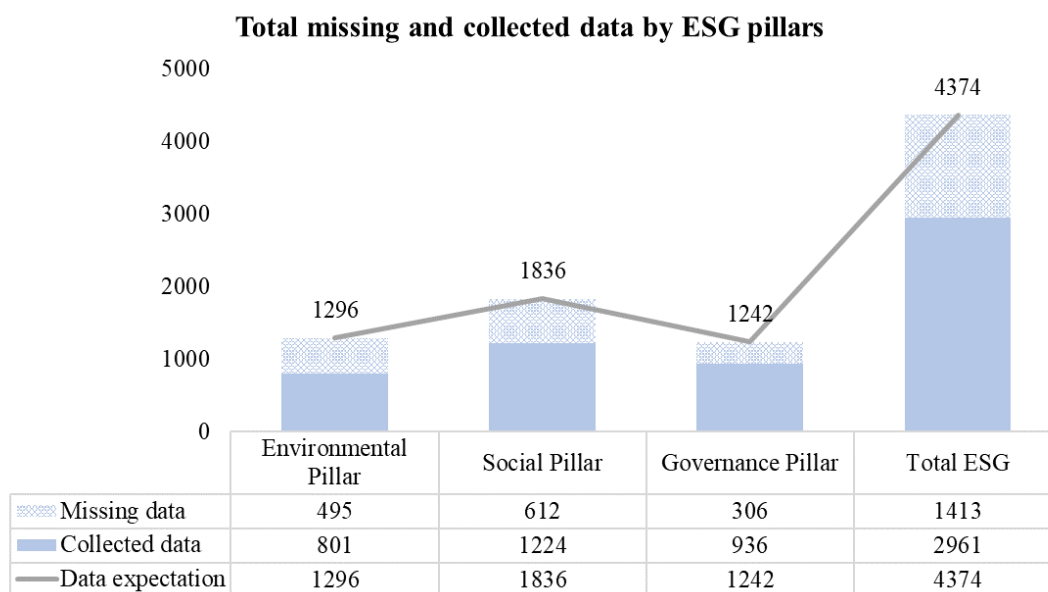


Figure 8: Total missing and collected data by ESG pillars

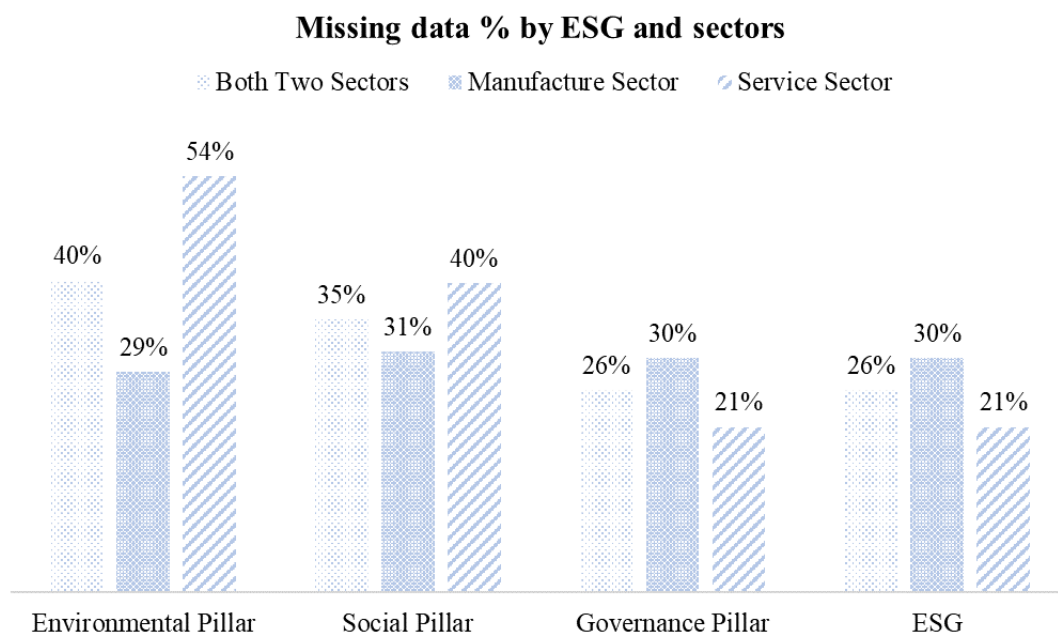


Figure 9: Missing data percentages by ESG pillars and business sector

By the above two figures, the fact of missing data in each pillar found. However, different industry sectors have shown their own characteristics differently compared with other sectors.

4.1.4.2 The Fact of Missing Data by Issues

Bellowing figure 10 below provides the breakdown of missing data by each issue for all collecting samples. Two issues have resulted in more than 50% of missing data. The issue of toxic emissions and waste has resulted in 55% of missing data in environmental pillars. Product safety and quality issues lack 51% in social pillar.

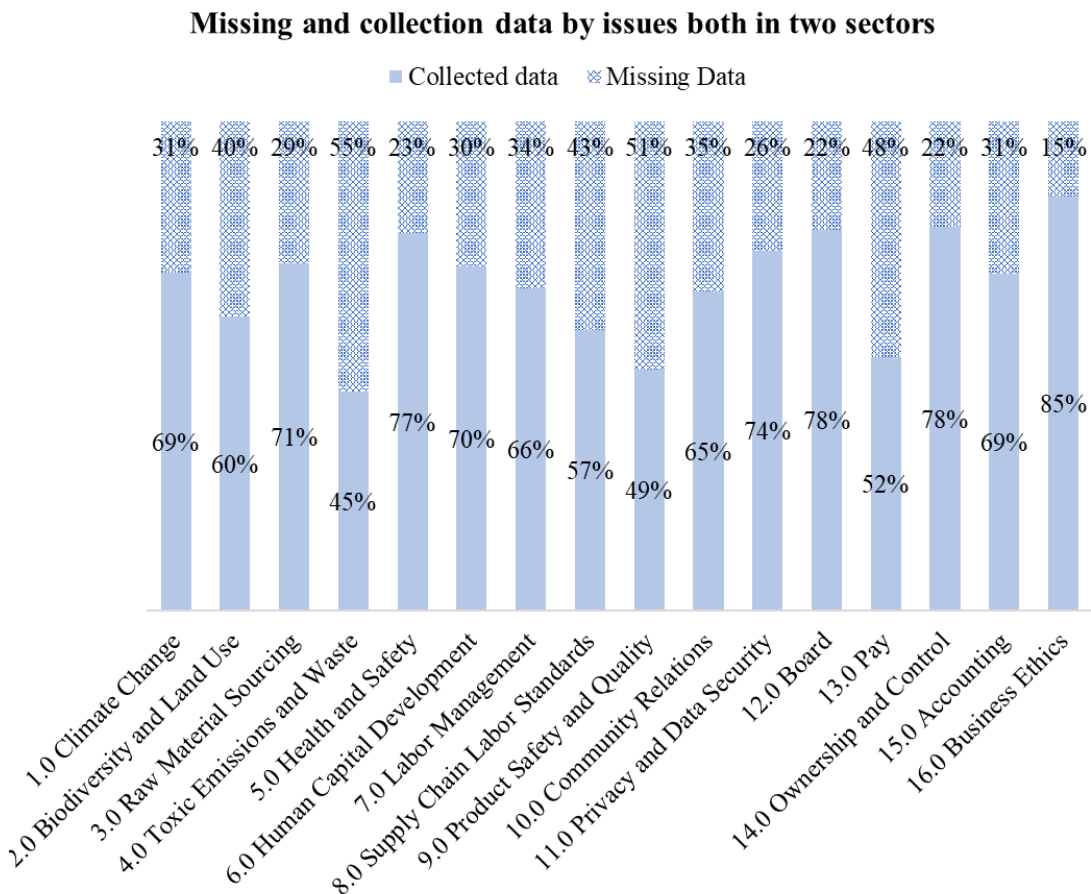


Figure 10 Missing and collection of data by issues in two business sectors

However, the manufacturing sector showed in figure 11 a better performance with data collection. It has found only the issue of pay is more than half of missing data as 54%, which is aligned with the findings in the last part of total evaluation of missing in ESG and sectors.

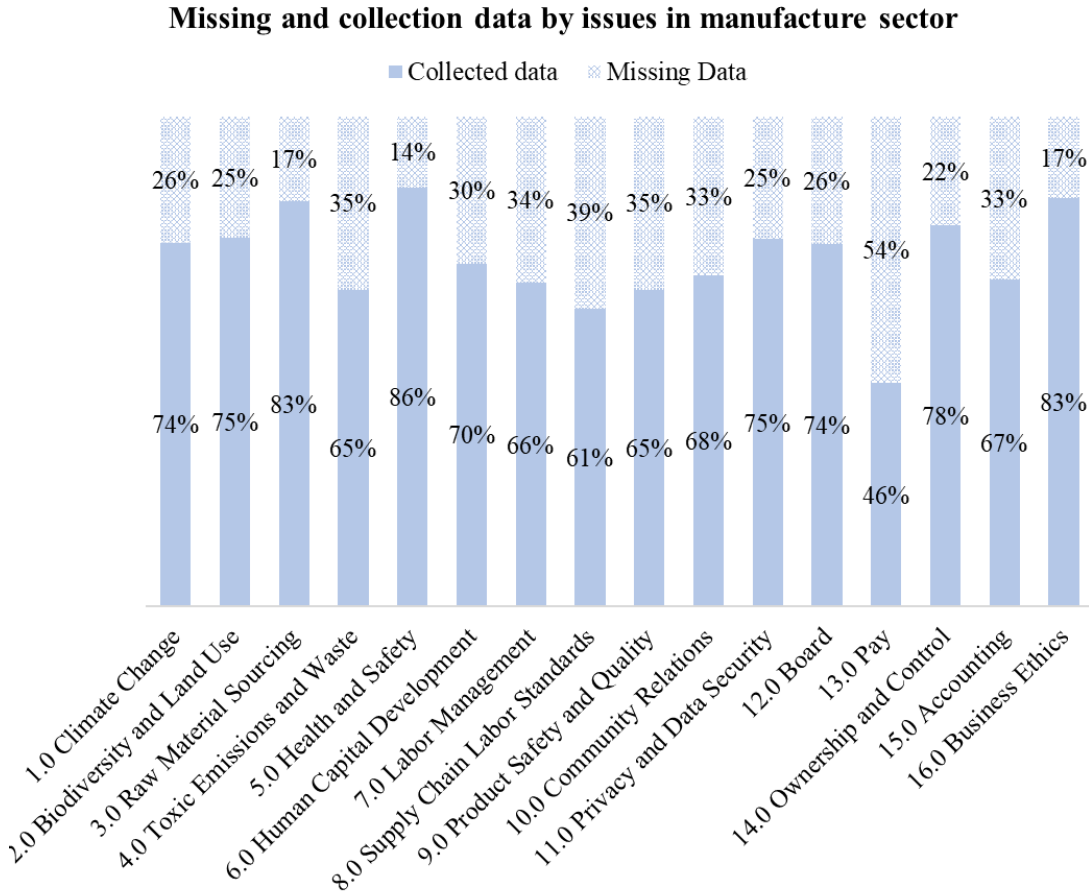


Figure 11: Missing and collection of data by issues in manufacture sector

The service sector has shown worse data of collections than the manufacturing sector in figure 12. Two environmental issues of Biodiversity and Land Use and Toxic Emissions and Waste are collected with less than half available data. Meanwhile 70% of missing data in product safety and quality are the highest percentage of missing amount issues.

While the service sector collected better data for the availability of issue of pay than manufacture sector.

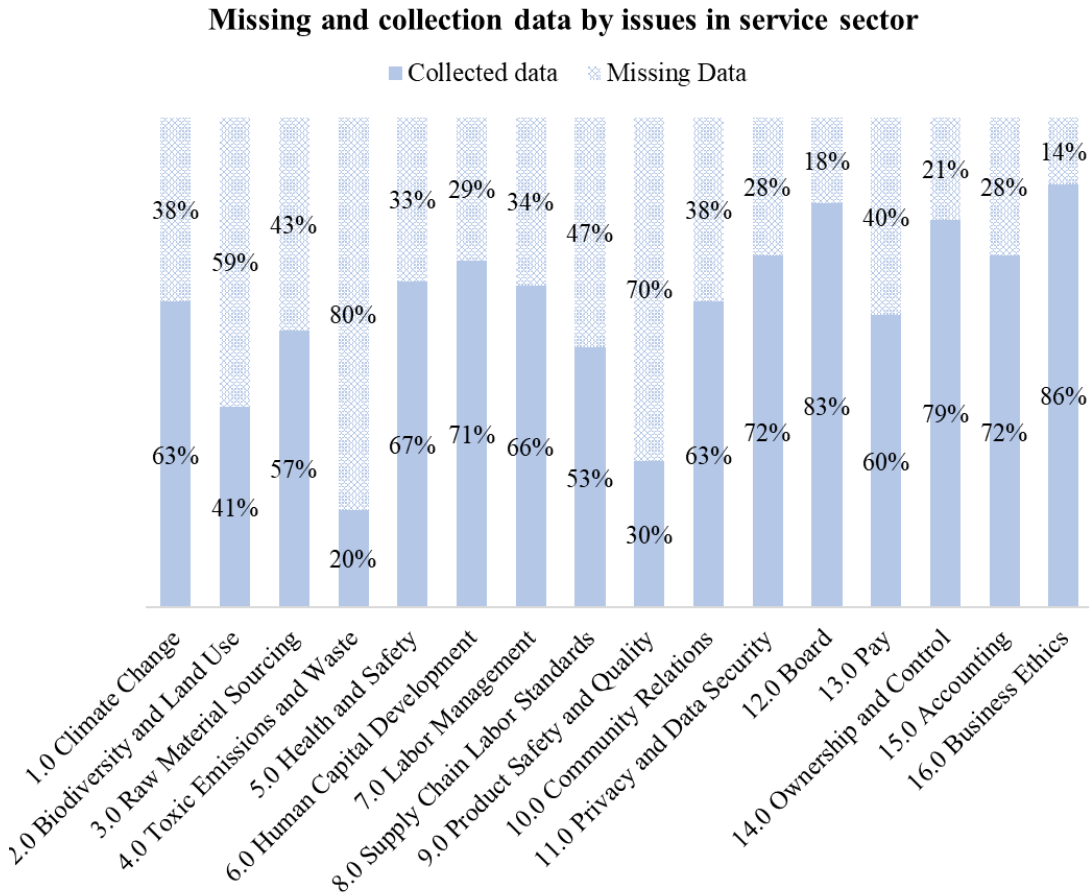


Figure 12: Missing and collection of data by issues in service sector

In conclusion, this part found the fact of missing data in each issue of ESG. Similar findings in the last section have been found that samples of different sectors have shown their own characteristics of missing data. Therefore, it is worth investigating which issues are significantly missing from data.

4.1.4.3 Normality of Missing Data by Issues

Before testing the significance of issue in missing data, bellowing figure 13, 14 and 15 have confirmed the normality of the missing data by total sample and separation of manufacture and service sectors samples, in which both value of Kurtosis and Skewness are within -10 to 10 and -3 to 3.

Total Allocation of Missing Data in both sectors	
Mean	0.334
Standard Error	0.028
Median	0.310
Mode	#N/A
Standard Deviation	0.113
Sample Variance	0.013
Kurtosis	-0.487
Skewness	0.483
Range	0.399
Minimum	0.153
Maximum	0.552
Sum	5.342
Count	16.000

Figure 13: Normality of missing data by issues in two business sectors

Missing Data in Manufacture Sector	
Mean	0.291
Standard Error	0.025
Median	0.280
Mode	0.353
Standard Deviation	0.100
Sample Variance	0.010
Kurtosis	1.534
Skewness	0.817
Range	0.400
Minimum	0.144
Maximum	0.544
Sum	4.663
Count	16.000

Figure 14: Normality of missing data by issues in manufacturing business sector

Missing data in service sector	
Mean	0.387
Standard Error	0.045
Median	0.358
Mode	0.375
Standard Deviation	0.182
Sample Variance	0.033
Kurtosis	0.658
Skewness	0.957
Range	0.665
Minimum	0.135
Maximum	0.800
Sum	6.192
Count	16.000

Figure 15: Normality of missing data by issues in service business sector

4.1.4.4 Significant Missing Data Issues

In this part, t-Test (Bryman and Bell 2011), is applied to investigate which issue is the significant missing data compared with total sample. Three parts of total samples, manufacture samples and service samples are separately discussed.

The missing data of tested specific issue is represented by μ_1 , while the mean of total sample is represented by μ_2 . The H_0 indicates the test specific issue is significantly equal or less of missing data percentage compared with total data by bellowing formula.

$$\mu_0 \leq \mu_1$$

While H_1 is represented by the significantly over missing data of specific issue than total sample and formula by following:

$$\mu_0 > \mu_1$$

Consequently, Table 16, 17 and 18 are summaries of results of the test.

In the bellowing total sample test, it has found that issues of toxic emissions and waste, product safety and quality, pay, supply chain labor standard, biodiversity and land use are significantly (1%) missing data compared with other issues. In the test of manufacture sample, it thus found that the significant missing data issues are pay, supply chain labor standard, toxic emissions and waste, product safety and quality and labor management. In the test of service sample, it found that the significant missing data issues are toxic emissions and waste, product safety and quality, biodiversity and land use and supply chain labor standard.

Table 16: T-test of missing data by ESG issues total samples

T-test of Missing data by ESG issues total samples (μ_1)	H₀	H₁	Missi ng data %	Mea n of total sam ple (μ_0)	Stand ard deviati on of total sample	T- test resu lt	P- Valu e	Reject ed H₀ or Not
4.0 Toxic Emissions and Waste	$\mu_0 \leq \mu_1$	$\mu_0 > \mu_1$	55.2 %	33%	11%	7.70 24	0.00 00	Reject ed
9.0 Product Safety and Quality			50.7 %			6.13 18	0.00 00	Reject ed
13.0 Pay			48.1 %			5.21 56	0.00 01	Reject ed

8.0 Supply Chain Labor Standards		42.6 %			3.25 23	0.00 27	Reject ed
2.0 Biodiversity and Land Use		39.9 %			2.31 74	0.01 75	Reject ed
10.0 Community Relations		34.7 %			0.47 10	0.32 22	Could not reject
7.0 Labor Management		34.1 %			0.24 19	0.40 61	Could not reject
15.0 Accounting		31.0 %			- 0.83 79	0.79 24	Could not reject
1.0 Climate Change		31.0 %			- 0.86 13	0.79 87	Could not reject
6.0 Human Capital Development		29.6 %			- 1.32 87	0.89 81	Could not reject
3.0 Raw Material Sourcing		28.9 %			- 1.59 05	0.93 37	Could not reject
11.0 Privacy and Data Security		26.4 %			- 2.47 40	0.98 71	Could not reject
5.0 Health and Safety		22.8 %			- 3.72 83	0.99 90	Could not reject
12.0 Board		22.2 %			- 3.94 64	0.99 94	Could not reject
14.0 Ownership and Control		21.6 %			- 4.16 46	0.99 96	Could not reject
16.0 Business Ethics		15.3 %			- 6.40 05	1.00 00	Could not reject

Table 17: T-test of missing data by ESG issues manufacture samples

T-test of Missing data by ESG issues manufacture samples (μ_1)	H_0	H_1	Missing data %	Mean of total sample (μ_0)	Standard deviation of total sample	T-test result	P-Value	Rejected H_0 or Not
13.0 Pay	$\mu_0 \leq \mu_1$	$\mu_0 > \mu_1$	54.4 %	29%	10%	10.1639	0.0000	Rejected
8.0 Supply Chain Labor Standards			39.2 %			4.0271	0.0005	Rejected
4.0 Toxic Emissions and Waste			35.3 %			2.4874	0.0126	Rejected
9.0 Product Safety and Quality			35.3 %			2.4874	0.0126	Rejected
7.0 Labor Management			34.0 %			1.9518	0.0349	Rejected
15.0 Accounting			33.3 %			1.6840	0.0564	Could not reject
10.0 Community Relations			32.5 %			1.3493	0.0986	Could not reject
6.0 Human Capital Development			30.0 %			0.3451	0.3674	Could not reject
12.0 Board			26.0 %			-1.2616	0.8868	Could not reject
1.0 Climate Change			25.7 %			-1.3764	0.9055	Could not reject
11.0 Privacy and Data Security			25.0 %			-1.6633	0.9415	Could not reject
2.0 Biodiversity and Land Use			24.8 %			-1.7589	0.9505	Could not reject

14.0 Ownership and Control			22.2 %			- 2.7791	0.9930	Could not reject
3.0 Raw Material Sourcing			17.3 %			- 4.7428	0.9999	Could not reject
16.0 Business Ethics			16.7 %			- 5.0106	0.9999	Could not reject
5.0 Health and Safety			14.4 %			- 5.9032	1.0000	Could not reject

Table 18: T-test of missing data by ESG issues service samples

T-test of Missing data by ESG issues service samples (μ_1)	H ₀	H ₁	Missing data %	Mean of total sample (μ_0)	Standard deviation of total sample	T-test result	P-Value	Rejected H ₀ or Not	Mean of total sample (μ_0)	Standard deviation of total sample
4.0 Toxic Emissions and Waste	$\mu_0 \leq \mu_1$	$\mu_0 > \mu_1$	80.0 %	39 %	18%	9.0904	0.0000	Rejected	39 %	0.18
9.0 Product Safety and Quality			70.0 %			6.8893	0.0000	Rejected	39 %	0.18
2.0 Biodiversity and Land Use			58.9 %			4.4524	0.0002	Rejected	39 %	0.18
8.0 Supply Chain Labor Standards			46.9 %			1.7993	0.0461	Rejected	39 %	0.18
3.0 Raw Material Sourcing			43.3 %			1.0198	0.1620	Could not reject	39 %	0.18
13.0 Pay			40.3 %			0.3472	0.3666	Could not	39 %	0.18

							rejec t		
1.0 Climate Change		37.5 %			- 0.2 642	0.6 024	Coul d not rejec t	39 %	0.18
10.0 Community Relations		37.5 %			- 0.2 642	0.6 024	Coul d not rejec t	39 %	0.18
7.0 Labor Management		34.2 %			- 0.9 979	0.8 329	Coul d not rejec t	39 %	0.18
5.0 Health and Safety		33.3 %			- 1.1 813	0.8 721	Coul d not rejec t	39 %	0.18
6.0 Human Capital Development		29.2 %			- 2.0 985	0.9 734	Coul d not rejec t	39 %	0.18
11.0 Privacy and Data Security		28.1 %			- 2.3 277	0.9 828	Coul d not rejec t	39 %	0.18
15.0 Accounting		28.1 %			- 2.3 277	0.9 828	Coul d not rejec t	39 %	0.18
14.0 Ownership and Control		20.8 %			- 3.9 327	0.9 993	Coul d not rejec t	39 %	0.18
12.0 Board		17.5 %			- 4.6 664	0.9 998	Coul d not rejec t	39 %	0.18
16.0 Business Ethics		13.5 %			- 5.5 377	1.0 000	Coul d not rejec t	39 %	0.18

In conclusion, this part has found that issues of toxic emissions and waste, product safety and quality and supply chain labor standard are all significant with status of missing data after three assessments.

4.1.4.5 Discussions of Data Preparation Capabilities and Selective Disclosure

As mentioned in section 4.1.3.2, several questions are raised on the consideration of data preparation capabilities weakness or selective disclosure of data from firms' side. Those questions are valid in this study.

First, collected samples cannot be objectively distinguished by greenwash tendency or preparation capabilities. For example, missing data of toxic emissions and waste data are likely to be greenwashed by manufacturing sectors, because those organizations might be afraid to disclose the output of waste and emissions. While the service sector might pay less attention to preparing the data because the toxic emissions or waste should be in limited amount. However, product safety and quality and supply chain labor standards are difficult to judge by different sectors on capabilities issue or greenwash tendency. In the end, the judgement of these two examples is subjective without straightforward evidence.

Second, the way to treat missing data as lowest grade could not distinguish which firm is worser than others. It might result as the more disclosure of data, the better rating result to be achieved (Rahman and Post 2012). While the way to exclude missing data into the calculation will help firms greenwash activities. It means less disclosure of data, which might be the better rating. Therefore, it is worth investigating the deviation between these two treatments on evaluations of output factor in the next part.

4.1.4.6 ESG Rating Outputs by Treatment of Lowest Grading for Missing Data

Figure 16 below calculates the overall ESG score by each research organization and the missing data percentage. The ESG score is treated as dependent variables ESGSI, missing data percentage is treated as independent variables M. The correlation regression is made by bellowing formulation and resulted by scattergram in figure 17:

$$ESGSI_m = a * M_m + e$$

Where:

- $ESGSI_m$ is the ESG score for company m assessed by the method of lowest grading for missing data.
- M_m is the missing data percentage of the company m.

The regression shown in figure 18 has found a negative coefficient as “-3.1105” and is tested as significant. It thus shows that in the treatment way of lowest grading, firms ESG score are lower if the missing data is higher.

Participant	Year	Rating
P004	2022	2.48
P006		3.78
P007		2.80
P008		1.71
P009		1.81
P010		1.17
P011		2.50
P012		2.49
P013		3.52
P014		3.31

P015		2.57
P016		1.81
P017		2.81
P018		3.00
P019		1.37
P021		2.68
P022		1.08
P025		0.94
P004	2023	2.71
P006		3.99
P007		2.96
P008		1.79
P009		1.62
P010		1.36
P011		1.67
P012		2.56
P013		3.40
P014		3.04
P015		3.41
P016		1.90
P017		1.81
P018		4.03
P019		2.07
P021		2.73
P022		1.25
P025		1.35

Figure 16: ESG ratings by lowest grading method of research organization in two years

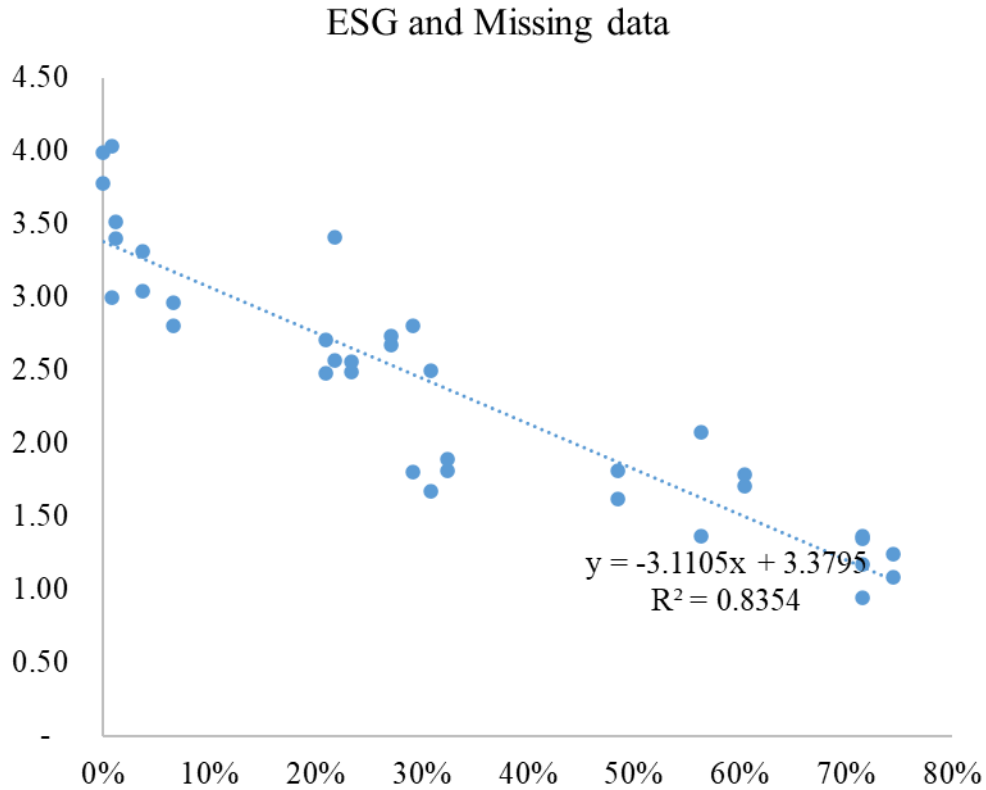


Figure 17: Scattergram of research organizations' ESG rating and missing data in lowest grading method

<i>Regression Statistics</i>	
Multiple R	0.9140
R Square	0.8354
Adjusted R Square	0.8306
Standard Error	0.3566
Observations	36.0000

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	21.94464163	21.94464163	172.5558278	7.06674E-15
Residual	34	4.323921278	0.127174155		
Total	35	26.26856291			

Figure 18: Regression analysis of suppliers' ESG rating and missing data in lowest grading method

4.1.4.6 ESG Rating Outputs by Treatment of Exclusion of Missing Data

Each participating organization's ESG rating is calculated in figure 19. As similar with last part, a correlation regression is built up by dependent variables ESGSII and, independent variables M of missing data percentage in following formulation and the scattergram in figure 20.

$$ESGSII_m = a * M_m + e$$

Where:

- $ESGSII_m$ is the ESG score for company m assessed by the method of exclusion grading for missing data.
- M_i is the missing data percentage of the company m.

The LOS regression results in figure 20 did not show a correlation between missing data and ESG rating by treatment of exclusion of ESG missing data, because the Square R value as only 0.16

Participants	Year	Rating
P004	2022	3.36
P006		4.35
P007		3.20
P008		3.69
P009		3.08
P010		2.45
P011		3.35
P012		3.26

P013		3.77
P014		3.79
P015		3.48
P016		3.24
P017		3.45
P018		3.24
P019		2.83
P021		3.80
P022		3.59
P025		1.79
P004	2023	3.41
P006		4.39
P007		3.30
P008		2.70
P009		3.32
P010		3.14
P011		2.51
P012		3.33
P013		3.66
P014		3.40
P015		4.79
P016		3.48
P017		2.83
P018		4.28
P019		3.97
P021		3.63
P022		4.14
P025		3.37

Figure 19: ESG ratings by exclusion grading method of research organization in two years

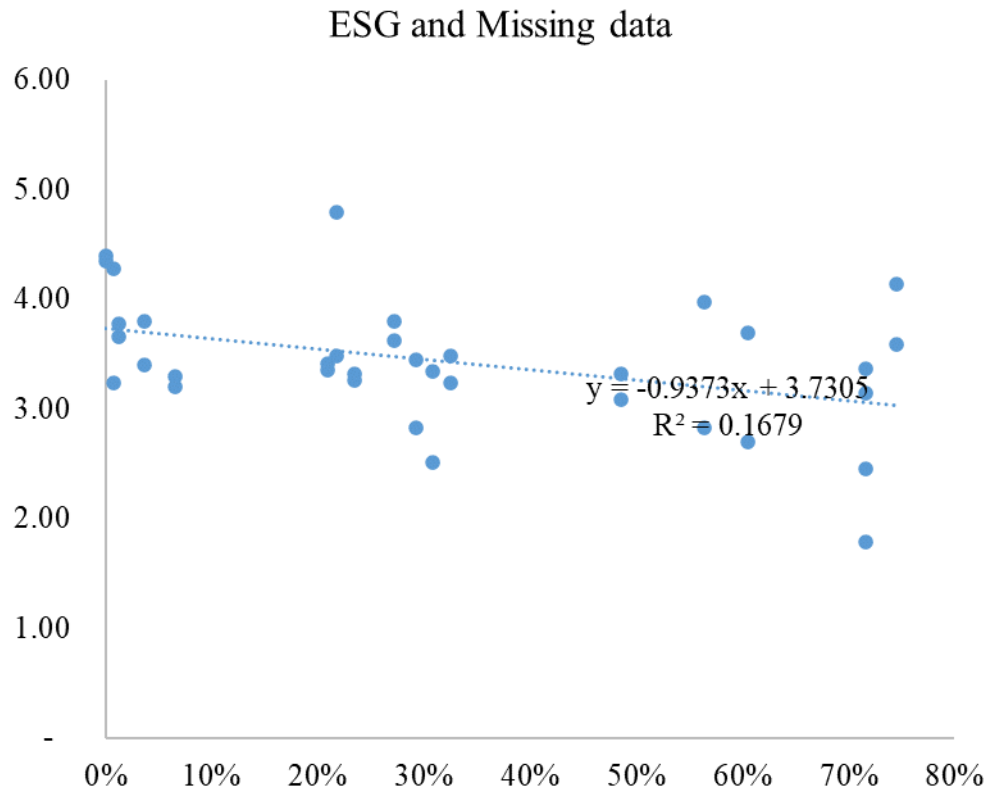


Figure 20: Scattergram of research organizations' ESG rating and missing data in exclusion grading method

<i>Regression Statistics</i>	
Multiple R	0.409800061
R Square	0.16793609
Adjusted R Square	0.143463622
Standard Error	0.538842175
Observations	36

<i>ANOVA</i>					
	df	SS	MS	F	Significance F
Regression	1	1.992459171	1.992459171	6.862245783	0.01306022
Residual	34	9.871930261	0.29035089		
Total	35	11.86438943			

Figure 21: Regression analysis of suppliers' ESG rating and missing data in exclusion grading method

4.1.4.7 ESG Rating Outputs by Two Treatment ways of Missing Data

This part will investigate whether ESG rating outputs from two different treatment methods of missing data can generate two different results. It thus took the T-test for two ESG rating results with thirty-six observations from eighteen organizations for two years of 2022 and 2023. It last found that the mean value of lowest value of treatment ESG rating is significantly lower than another way, which is improved by more than one point in the result of mean in figure 21. Whether this improvement is correlated with missing data rate is worth testing in the next part.

<i>t-Test: Two-Sample Assuming Unequal Variances</i>	<i>Rating by lowest value treatment</i>	<i>Rating by exclusion treatment</i>
Mean	2.374658289	3.427675816
Variance	0.750530369	0.338982555
Observations	36	36
Hypothesized Mean Difference	0	
df	61	
t Stat	-6.052999763	
P(T<=t) one-tail	4.75946E-08	
t Critical one-tail	1.670219484	
P(T<=t) two-tail	9.51892E-08	
t Critical two-tail	1.999623585	

Figure 22: Comparison of ESG rating by two methods of lowest grading and exclusion grading methods

4.1.4.8 ESG Rating Difference and Missing Data

As found in the last section, the ESG rating might have been improved between two treatment ways by the variables of missing data rate. Therefore, dependent variable is

created by the variance between two ESG treatment results and as followed by formulation:

$$\Delta ESGS_m = (ESGSI_m - ESGSII_m)$$

Therefore, figure 23 of scattergram is presented and formulated.

$$\Delta ESGS_m = a * M_m + e$$

OLS regressions are tested in figure 24. Two figures have confirmed a 1% significant positive correlation of ESG improvement of missing data by Square of 0.7591. This has indicated that if the ESG measurement excluded the missing data in the evaluation, the more missing data of firm showed, the more ESG rating result is improved by the greenwash tendency.

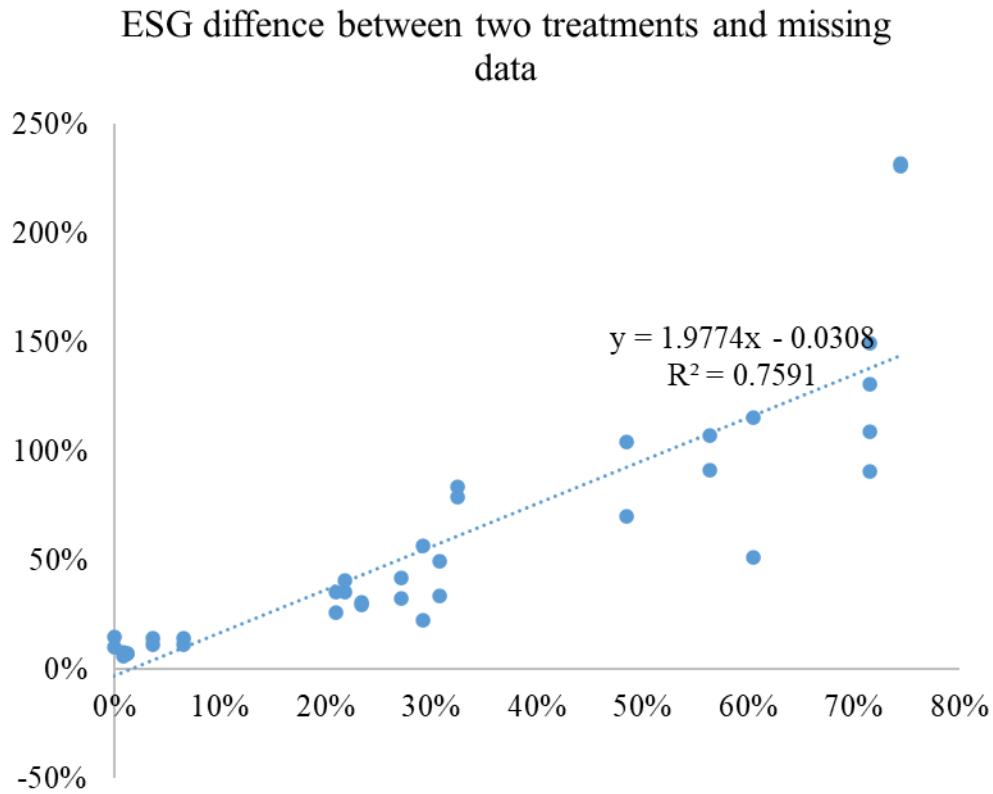


Figure 23: Scattergram of missing data and ESG rating deviations between two methods

<i>Regression Statistics</i>	
Multiple R	0.871289062
R Square	0.75914463
Adjusted R Square	0.752060648
Standard Error	0.287676636
Observations	36

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	8.868624941	8.868624941	107.1635536	4.77476E-12
Residual	34	2.813766788	0.082757847		
Total	35	11.68239173			

Figure 24: regression analysis of missing data and ESG rating deviations between two methods

4.1.4.9 Summary of Challenges of ESG Output Factor Objectivities

In conclusion, by using the data in this study to rate 18 research organizations' ESG performance with year 2022 and 2023, this section has explained the common fact of missing data in measurement of ESG performance and how missing data influence the objectivity of output factor of ESG rating measurement.

This section has found that missing data in each ESG pillar is confirmed, while two industry sectors have shown distinct characteristics in missing data in each ESG pillar. By applying the T-test of missing data in each specific issue, it found that issues of toxic emissions and waste, product safety and quality and supply chain labor standard are all significant with status of missing data after three assessments of total samples, manufacture samples and service samples.

It also applied OLS regressions to analysis the consequences of ESG rating by implementing two methods of treatment on missing data of lowest grading and exclusion of grading. First, it found that the lowest grading created a negative correlation between the research organization's ESG rating and percentage of missing data. Secondly, the exclusion grading method has increased ESG rating by one point for samples compared with samples by the lowest grading way. Finally, it found that the research organization with more ESG data missing, the more improvement of ESG rating result by switching from method of lowest grading to exclusion grading.

4.1.5 Summary of Challenges of Objectivities of Four Factors in ESG Rating

This section, positioned on the recognition of the four factors objectivities of ESG rating measurement (Ijiri and Jaedicke 1966 and Wojdak 1970), by applied both methods of content analysis of literatures and quantitative methods of t-test and OLS regression analysis (Bryman and Bell 2011), found challenges of identifying and unifying the ESG input, measurement system, measurer's bias and ESG output.

First, the input of ESG issues' structure is not aligned due to virus setting up from three main origin bodies of PRI, GRI and rating agencies. Various positions from external observers, like different regulators, industries, citizens from different economics and scholars have created different recognitions of each ESG issue. Second, measurement system is lack of transparency due to business confidential and external competition pressure and lack of alignment by dynamic understanding of ESG input and various agencies' business visions. Third, measurers' bias is critical during the measurement, including owned origin bias of financial orientation bias, hello bias and considering client's demands, and bias origin by nature of ESG data of mass sources of data and lack of qualified data due to firms' capability of data preparation or willingness to share data. Finally, this study applied the collected data and explained two findings of the impact from missing data on the impact of various output. It found that the more missing data of an organization found, the less rating will be received in the lowest grading method. While it found those higher missing data organizations' rating will be improved more than others if the exclusion method is applied.

4.2 ESG Rating, ESG adoptions, AMC Rating, ESG Greenwash, Governance Strength and Business Performance Data Treatment and Normality of Data

This part will introduce the collection of data for several factors of ESG rating, AMC rating, ESG Greenwash, Governance Strength and the test of data normality will be followed in each section.

4.2.1 ESG Rating and ESG Adoptions

ESG rating objectivities stayed challenges as found in last section. Therefore, this study's ESG rating may have been challenged by the construction of ESG issues which might be different with other commercial agencies. While this study has tried to improve the objectivity of the ESG rating process in few ways. First, the measurement system is fixed in the whole evaluation process. Second, only one researcher plays as the measurer. Furthermore, the measurer's objective position is confirmed with no benefits or conflicts with the research organizations within this study.

However, as mentioned, the major challenge for this study is to treat missing data which resulted by significantly different rating result by two ways of treatment in exclusion and in lowest value. Because the missing data is the event of combination of firms' data preparation weakness and hiding of data tendency. Therefore, this study assumed the ESG rating should be combined by these two kinds of rating treatments. Since this study cannot distinguish two measurements, it thus equally included two treatments in the ESG Rating and formulated as follows.

$$ESGS_m = ESGSI_m * 50\% + ESGSII_i 50\%$$

Each of the issues will be calculated in the same way. If the issue is missing by the exclusion treatment, the data will refer to issue rating of another treatment.

Bellowing has followed the normality of the ESG scores data, including rating for two years data of eighteen research organizations, totaling thirty-six samples. Normality of the data is confirmed in figure 25.

Mean	2.90
Standard Error	0.11
Median	2.93
Mode	#N/A
Standard Deviation	0.66
Sample Variance	0.43
Kurtosis	0.02
Skewness	0.12
Range	2.82
Minimum	1.37
Maximum	4.19
Sum	104.44
Count	36.00

Figure 25: Normality of ESG ratings

ESG adoption means the variance of a firm's ESG rating between the year 2022 and 2023 and represented by the bellowing formula.

$$ESGA_m = \frac{ESGS_{m,2023} - ESGS_{m,2022}}{ESGS_{m,2022}}$$

Where:

$ESGA_m$ is the ESG adoption of the company m.

$ESGS_{m,2023}$ is the ESG score of the company m in year 2023.

$ESGS_{m,2022}$ is the ESG score of the company m in year 2022.

According to the above ESG rating data, the ESG development data are developed with eighteen samples, and the normality of data is confirmed in figure 26.

Mean	0.09
Standard Error	0.06
Median	0.04
Mode	#N/A
Standard Deviation	0.25
Sample Variance	0.06
Kurtosis	1.03
Skewness	0.87
Range	1.01
Minimum	-0.28
Maximum	0.73
Sum	1.62
Count	18.00

Figure 26: Normality of ESG adoptions

4.2.2 AMC Rating

The content analysis method is applied to develop points of awareness, motivations, and capabilities from each firm's interview data. However, like ESG rating, the missing data, which means that the interviewee is not willing to talk about the specific issue can also be found, is found also within the data. However, not liked the implementation of a combined of "lowest value" and "exclusion of evaluation" method in ESG rating, the missing of qualitative data in specific issue is applied by one "lowest value" method. Because the missing data here, which indicate either lack of interest or lack of knowledge, can both mean the negative attitude of the participant.

Therefore, the sum of points for each issue are developed by the same ranking as ESG rating, as value from 0.5 to 7. Each firm is rated by AMC aligned with the same construction of ESG rating, including a general ESG value and three values of each pillar. The pay, ownership and control are not included here, which must be aligned with the construction of ESG rating. The AMC ESG rating data, as eighteen observations are confirmed with the normality in figure 27.

Mean	2.06
Standard Error	0.15
Median	2.07
Mode	#N/A
Standard Deviation	0.63
Sample Variance	0.39
Kurtosis	-0.51
Skewness	0.31
Range	2.22
Minimum	1.16
Maximum	3.38
Sum	37.04
Count	18.00

Figure 27: Normality of AMC rating

4.2.3 ESG Greenwash

ESG greenwash is the deviation of firms' ESG disclosure and firm's ESG practices (Ioannou, Kassinis and Papagiannakis 2023). Since this study have conducted two methods of ESG rating, including one of quantitative data referred as “what firms are doing “, and one of qualitative data referred as “what firms are talking,” this study can generate the ESG greenwash data by the difference between these two rating. Therefore, ESG Greenwash (ESGG) in this study is generated by the variance value in percentage between ESG Rating in 2023 and AMC Rating by following formular:

$$ESGG_m = \frac{ESGS_m - AR_m}{AR_m}$$

Where:

- $ESGG_m$ is the ESG greenwash tendency for the company m.
- $ESGS_m$ is the ESG score for the company m in the year 2023.
- AR_m is the AMC rating for the company m.

The total samples are calculated as eighteen observations, and the confirmation of data normality is presented in figure 28.

Mean	0.59
Standard Error	0.16
Median	0.44
Mode	#N/A
Standard Deviation	0.68
Sample Variance	0.46
Kurtosis	3.94
Skewness	1.82
Range	2.83
Minimum	-0.22
Maximum	2.61
Sum	10.57
Count	18.00

Figure 28: Normality of ESG greenwash

4.2.4 Governance Strength

Governance strength shows the strength between suppliers within GVCs (Gereffi, Humphrey and Sturgeon 2005). The strength has been evaluated by three parts of market price, operation, and investment. Weighted average of three parts value is calculated as result by eighteen samples for each research organization. The following figure 28 has confirmed the normality of the collected data.

Mean	3.81
Standard Error	0.13
Median	3.92
Mode	#N/A
Standard Deviation	0.55
Sample Variance	0.30
Kurtosis	3.91
Skewness	-1.66
Range	2.33
Minimum	2.20
Maximum	4.53
Sum	64.81
Count	17.00

Figure 29: Normality of GVCs governance strength

4.2.5 Business Performance

The business performance included three parts of market share growth, net profit growth and profitability to revenue growth. The weighted average of three parts is applied to calculated business performance by following formula.

$$BP_m = \frac{MSG_m + NPG_m + PG_m}{3}$$

Where:

- BP_m is the business performance of the company m.
- MSG_m is the market share growth of the company m.
- NPG_m is the net profit growth of the company m.
- PG_m is the profitability growth of the company m.

The normality of the business performance data is thus presented in figure 30.

Mean	-0.19
Standard Error	0.16
Median	-0.01
Mode	#N/A
Standard Deviation	0.67
Sample Variance	0.45
Kurtosis	3.48
Skewness	-1.93
Range	2.56
Minimum	-1.94
Maximum	0.61
Sum	-3.43
Count	18.00

Figure 30: Normality of suppliers' business performance

4.2 Summary ESG Rating, ESG Adoptions AMC Rating, ESG Greenwash, Governance Strength Data Treatment and Normality of Data

This section has provided the data treatment method of factors of ESG rating, AMC rating, ESG adoptions, ESG greenwash and governance strength. Furthermore, the normality of data of factors of ESG adoptions, ESG greenwash, governance strength and business performance are confirmed for next step regression analysis.

4.3 GVCs, Greenwash, ESG Rating and Business Performance

This section will provide empirical results to investigate several correlations between several factors. First, it will apply theory of Global value chains governance (Gereffi, Humphrey and Sturgeon 5), measured as the governance strength, and investigate the relationship between GVCs and ESG greenwash. Second, it will further assess the correlation between factors of GVCs and ESG adoptions. Third, the relationship between ESG adoptions and ESG greenwash will be evaluated. Finally, whether firms' business performance is impacted by several factors of GVCs, ESG adoptions, ESG greenwash will be addressed.

4.3.1 GVCs and Greenwash

This section includes two assessments. First, it will evaluate the greenwash tendency of the hierarchy firms among the total samples. Second, it will investigate the correlation between governance strength and firm greenwash.

4.3.1.1 Hierarchy Firm's Greenwash

Bellowing ESG greenwash for each organization, three pillars are provided. Organization “P004”, the lead firm’s direct investment, is assumed to receive most influence from the lead firm’s ESG adoptions. Therefore, the T-test, (Bryman and Bell 2011) is applied to assess the value of greenwash of “P004” by bellowing hypothesizes.

H_0 : the ESG greenwash of “P004”, represented by μ_1 , are equal or greater than mean of total sample, represented by μ_0 .

$$\mu_0 \geq \mu_1$$

H_1 : due to the high global value chain governance strength, the ESG greenwash of the hierarchy firm, “P004”, are less than ESG greenwash of total sample.

$$\mu_0 < \mu_1$$

As the ESG greenwash of P004 is calculated as 0.13, the T-test is applied and the result by P value as 0.00504. Therefore, the H_0 is rejected in 1% significance. This has shown that H_1 is accepted. Furthermore, this study extended to test of greenwash in three pillars and p value are tested in table 19.

Table 19: t-test of ESG greenwash of the hierarchy firm

T-Test of ESG greenwash in three pillars	Greenwash value of "P004"	T-value	P-value
ESG total	0.130	2.894	0.005
Environmental Pillar	-0.045	3.262	0.002
Social Pillar	0.	-0.589	0.718
Governance Pillar	0.124	1.234	0.117

Therefore, this part has found the total ESG greenwash, and environmental pillar greenwash of the hierarchy firm is significantly lower than total sample, which did not show similar evidence in social and governance pillar. This has added findings of positive impacts of GVCs in sustainability development (Gai 2023, Huang and Zhang 2023 and Wang. et al. 2022). While the insignificant relationship result in social and governance pillar might be explained by the priority focus of environment issues more than social and governance issues in the context of ESG in China (Bai. et al. 2022, Moore 2019, Xie. et al. 2023 and Zhang. et al. 2023).

4.3.1.2 Correlations between GVCs and Greenwash before Treatment of Missing Data

According to the evidence found in last section that highest governance strength has result a significant low value of greenwash, this part will investigate whether GVCs impacts are valid for total samples. The OLS regression is applied to build scattergram figure 31 and regression analysis in figure 32.

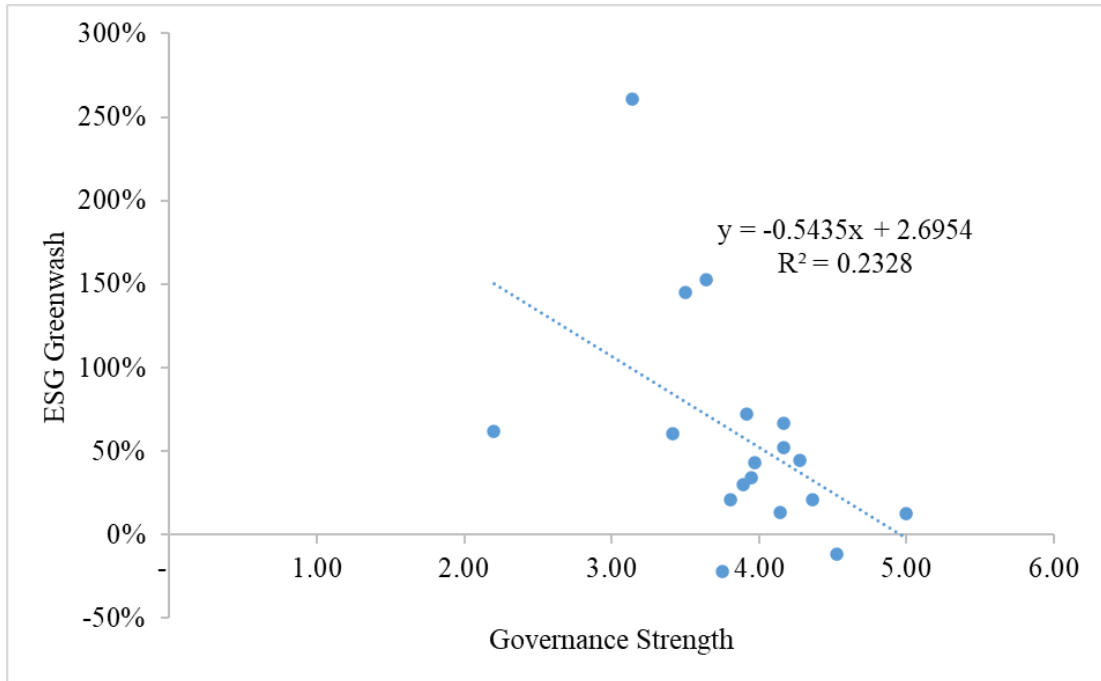


Figure 31: Scattergram of factors of GVCs governance and ESG greenwash before treatment of missing data

<i>Regression Statistics</i>	
Multiple R	0.4824
R Square	0.2328
Adjusted R Square	0.1848
Standard Error	0.6104
Observations	18.0000

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	1.8082	1.8082	4.8539	0.0426
Residual	16	5.9604	0.3725		
Total	17	7.7687			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	2.6954	0.9676	2.7857	0.0132	0.6442	4.7466
X Variable 1	-0.5435	0.2467	-2.2032	0.0426	-1.0665	-0.0205

Figure 32: Regression analysis of factors of GVCs governance and ESG greenwash before treatment of missing data

The negative coefficient value of -0.54 has confirmed a negative relationship between firms' governance strength and greenwash. However, the low R^2 as 0.23 also indicates a low correlation relationship between two factors. The low correlation relationship might be explained by two facts. First, GVCs governance are more valid for hierarchy firms in ESG adoptions, while it has less impact to suppliers within other types of GVCs governance. Second, second 4.1, which showed concerns on the objectivities of ESG rating, has indicated four factors challenging the reliability of the ESG rating, especially on the influence of missing data. Therefore, it will have further treatment on the missing data by evaluating two factors in the next part.

4.3.1.3 Removing Organizations with Significant Missing Data

Data availability is the key factor to measure ESG rating (Rahman and Post (2012)). However, firms might lack the capabilities of preparing ESG data and lack willingness to show negative data to rating agencies. Therefore, this part will remove this factor in the analysis of the relationship between GVCs and Greenwash. Figure 33 showed the missing data percentage of each research organization and the results of t-test against the total samples value. It found that the values of missing data percentage for research organizations of P022, P010, P025, P008, P019 and P009 are 1% significantly higher than total sample. Consequently, those research organizations are treated as an exclusion in analysis of two factors of GVCs and Greenwash in the next part and the total sample

are reduced from 18 to 12 research organizations. Meanwhile, the same treatment will be consistently applied in the analysis of other factors in other sections.

Research Organization	Missing Data Percentage	t-test	p-value	include or not
P022	74%	6.9288	0.0000	Removed
P010	72%	6.4556	0.0000	Removed
P025	72%	6.4556	0.0000	Removed
P008	60%	4.6304	0.0001	Removed
P019	56%	3.9545	0.0005	Removed
P009	49%	2.6701	0.0081	Removed
P016	33%	0.0338	0.4867	Included
P011	31%	-0.2366	0.5921	Included
P017	29%	-0.5070	0.6907	Included
P021	27%	-0.8450	0.7951	Included
P012	23%	-1.4534	0.9178	Included
P015	22%	-1.7237	0.9486	Included
P004	21%	-1.8589	0.9598	Included
P007	7%	-4.2249	0.9997	Included
P014	4%	-4.6980	0.9999	Included
P013	1%	-5.1036	1.0000	Included
P018	1%	-5.1712	1.0000	Included
P006	0%	-5.3064	1.0000	Included

Figure 33: Suppliers' missing data status

In conclusion, this part has removed six organizations with significantly missing data status.

4.3.1.4 Correlations between GVCs and Greenwash after Treatment of Missing Data

Twelve research organizations are included in the analysis in this section after treating missing data. The OLS regression is applied and shown by scattergram and analysis in figure 34 and figure 35. The negative coefficient value of -1.4 and high R^2 value of 0.79 have confirmed the high negative correlation between factors of GVCs and Greenwash after missing data treatment in 1% significance.

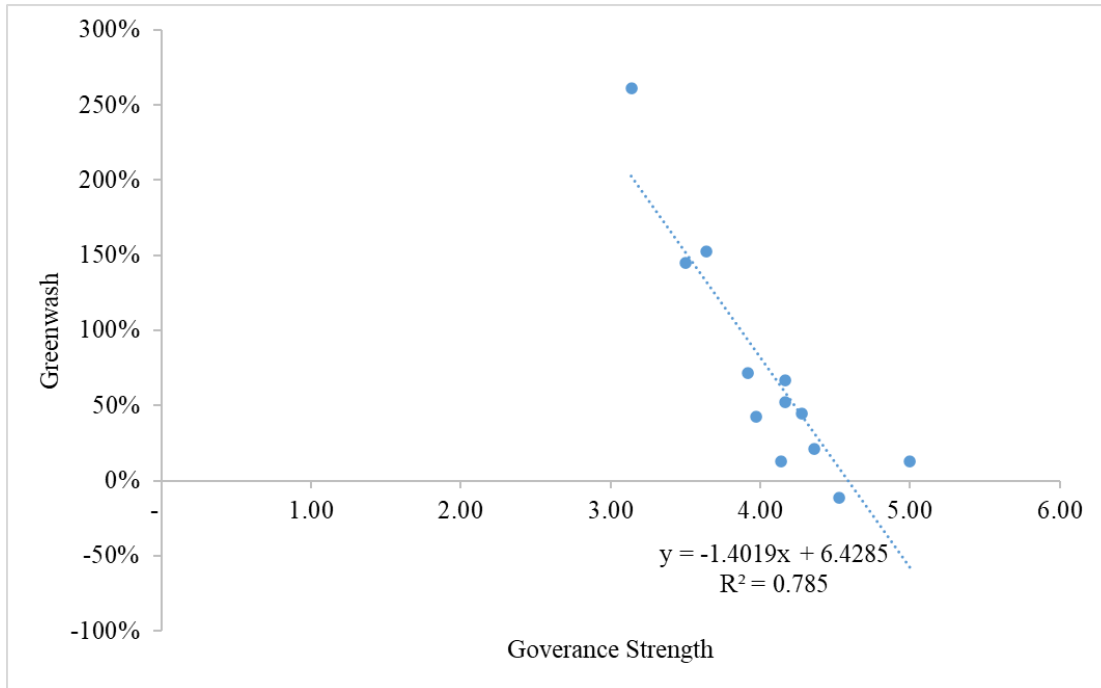


Figure 34: Scattergram of factors of GVCs governance and ESG greenwash after treatment of missing data

<i>Regression Statistics</i>	
Multiple R	0.8860
R Square	0.7850
Adjusted R Square	0.7635
Standard Error	0.3767
Observations	12.0000

ANOVA

	df	SS	MS	F	Significance F
Regression	1	5.1817	5.1817	36.5175	0.0001
Residual	10	1.4190	0.1419		
Total	11	6.6007			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	6.4285	0.9498	6.7683	0.0000	4.3122	8.5447
X Variable 1	-1.4019	0.2320	-6.0430	0.0001	-1.9188	-0.8850

Figure 35: Regression analysis of factors of GVCs governance and ESG greenwash after treatment of missing data

Furthermore, this part also extends to assess the coloration of greenwash by each pillar with GVCs and table 20 has concluded the result. It has further confirmed the negative correlation between GVCs, and each pillar greenwash. However, R^2 of Environmental pillar as 0.81, showed a higher correlation than social and governance, which are represented by R^2 as 0.40 and 0.48.

Table 20: Regression analysis of factors of GVCs and ESG greenwash after treatment of missing data

		R Square	ANOVA - Significance F
GVCs and ESG Greenwash	Coefficients		
Total ESG Greenwash	-1.4019	0.7850	0.0001
Environmental Pillar	-2.3217	0.8134	0.0001
Social Pillar	-0.9240	0.4013	0.0001
Governance Pillar	-1.9004	0.4768	0.0129

4.3.1.5 Summary of GVCs and Greenwash and Answers to Research Question 2

This part offers answers for the first half of research question 2 below.

Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?

In conclusion, it has confirmed that the MNCs' GVCs governance has positive impact on the restraining of ESG greenwash, standing for two findings. First, the significant low value of ESG greenwash found in the hierarchy firm, who has assumed it to be impacted by highest governance strength. However, when splitting the impact on greenwash by each pillar, it could not find a low value of greenwash from hierarchy firm in pillar of social and governance. Furthermore, by removing those six significant missing data research organizations, this part found the negative correlation between governance strength and greenwash value and confirmed that the MNCs' global governance has restrained suppliers' ESG greenwash activities.

4.3.2 GVCs and ESG Adoptions

This part will identify the relationship between GVCs and ESG adoptions by two evaluations. First, it will assess the ESG adoptions of hierarchy firms compared with mean of total sample, represented by the variance in percentage of ESG rating between year 2023 and 2022. Second, it will evaluate the correlation analysis between GVCs and firms ESG adoptions. Similar treatment of missing data samples will be applied as well.

4.3.2.1 Hierarchy firm's ESG Rating Development

The Hierarchy firms' ESG Rating development, the ESG rating change in percentage between 2022 and 2023, has been applied to compare with the total eighteen sample's value by total ESG and separately each pillar in below table 21. First, unexpectedly, except for the development of environmental pillar ratings, hierarchy firm's other two pillars and total ESG developments are all lower than the means of total sample. Secondly, it found that environmental pillar rating is tested as greater development in 10% significance than total samples.

Table 21: Hierarchy firm's ESG rating development

Hierarchy firm's rating development	H ₀	H ₁	ESG rating development	Mean of total sample (μ_0)	Standard deviation of total sample	T-test result	P-Value	Rejected H ₀ or Not
total ESG rating development (μ_1)	$\mu_0 \leq \mu_1$	$\mu_0 > \mu_1$	5%	9%	0.25	-0.5743	0.7133	Could not reject
Environmental pillar rating development (μ_1)	$\mu_0 \leq \mu_1$	$\mu_0 > \mu_1$	43%	21%	0.49	1.4895	0.0773	Rejected
Social pillar rating development (μ_1)	$\mu_0 \leq \mu_1$	$\mu_0 > \mu_1$	-23%	3%	0.26	-3.4582	0.9985	Could not reject

Governance pillar rating development (μ_1)	$\mu_0 \leq \mu_1$	$\mu_0 > \mu_1$	1%	11%	0.37	- 1.007 5	0.836 1	Could not reject
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4.3.2.2 Correlations between GVCs and ESG Rating Before Treatment of Missing Data

This part has applied OLS regression analysis for two factors of GVCs and ESG rating within eighteen samples. Similar findings indicated in factors of GVCs and ESG greenwash, this part could not find the correlation between two factors before treatment of missing. Figure 36, represented the scattergram of the factor of GVCs and total ESG development, could not find the liner trend and table 22 all showed respectively low value of R^2 .

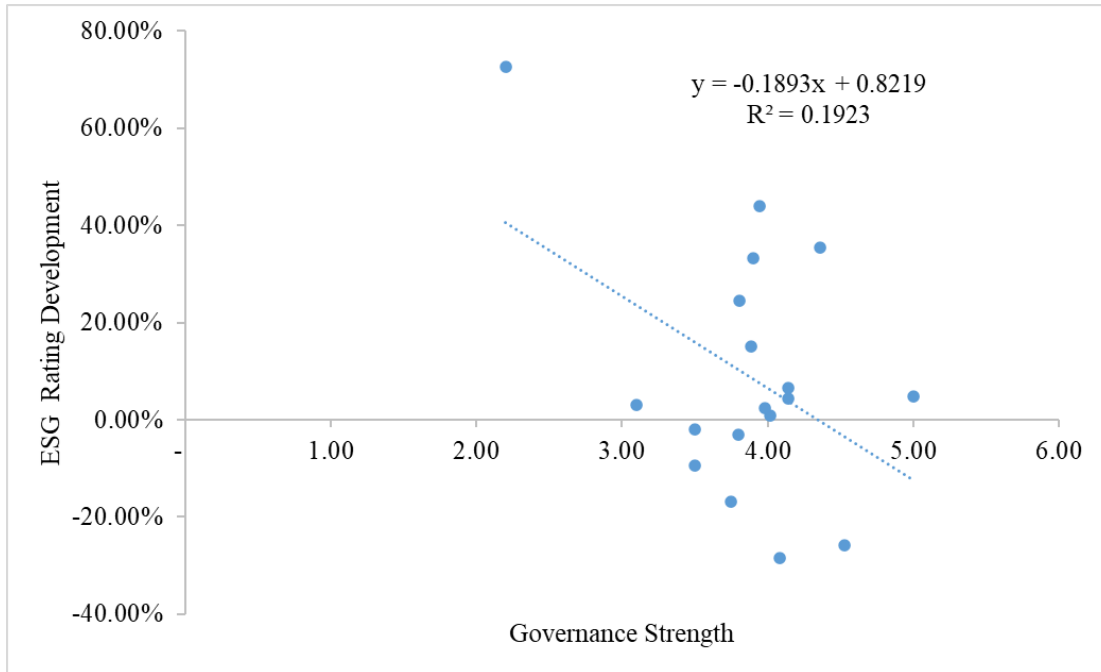


Figure 36: Scattergram of factors of GVCs governance and ESG adoptions before treatment of missing data

Table 22: Regression analysis of factors of GVCs and ESG rating development before treatment of missing data

GVC and ESG rating development regression analysis	Coefficients	R Square	ANOVA - Significance F
Total ESG Development	-0.1893	0.1923	0.0687
Environmental Pillar	-0.0738	0.0078	0.7270
Social Pillar	-0.0456	0.0106	0.6848
Governance Pillar	-0.2608	0.0106	0.0923

4.3.2.3 Correlations between GVCs and ESG Rating After Treatment of Missing Data

This part has removed the significant missing data organizations within the sample, respectively by twelve samples in the investigation. Table 23 provided the OLS regression test by two factors including each ESG pillar. First, the correlation between the development of total ESG, social pillar and governance pillar are not correlated with GVCs are not correlated with development of total ESG, social pillar and governance pillar, because the R^2 value are found as low value. Secondly, GVCs is positively correlated with the development environment pillar rating, represented by 0.61 value of R^2 and 1% significance.

Table 23: Regression analysis of factors of GVCs and ESG rating development after treatment of missing data

GVC and ESG rating development regression analysis	Coefficients	R Square	ANOVA - Significance F
Total ESG Development	0.0260	0.0051	0.8165
Environmental Pillar	0.4885	0.6127	0.0016
Social Pillar	- 0.2381	0.1635	0.1706
Governance Pillar	- 0.1485	0.0497	0.4641

4.3.2.4 Summary of GVCs and ESG Rating and Answers to Research Question 2

This part offers answers to the second half of research question 2 below.

Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?

In conclusion, this part found the significantly greatest ESG adoptions of the hierarchy firm in the environmental pillar compared with total sample while not in total ESG adoptions and pillar of social and governance. Second, after removed missing data sample, only in environmental pillar adoptions are found significantly correlated with governance strength. This showed that GVCs governance has positive impact on suppliers' environmental adoptions, while no evidence found in the adoptions of total ESG or social and governance pillars.

4.3.3 Correlations Between Greenwash and ESG ado and Answers to Research Question 3

Few studies have raised attention on the negative impact of greenwash on ESG adoptions (He, Du and Yu 2022, Ioannou, Kassinis and Papagiannakis 2023 and Majeed and Kim 2023). Therefore, this study applied OLS regression analysis on factors of greenwash and ESG rating and summarized data in table 24. It has shown extremely low values of R^2 both in the samples with and without treatment of missing data.

Table 24: Regression analysis of two factors of ESG greenwash and ESG rating development

ESG greenwash and ESG rating development regression analysis	Coefficients	R Square	ANOVA - Significance F
Before treatment of missing data	-0.1620	0.0	0.3725
After treatment of missing data	-0.0069	0.0008	0.9312

Therefore, this part tried to investigate the relationship between ESG greenwash and ESG adoptions in research question 3.

Are firms' ESG adoptions impacted by firms' ESG greenwash?

In conclusion, this part found similar results as Arvidsson and Dumay (2022) that it could not find the evidence of the correlation between ESG adoptions and ESG greenwash.

4.3.4 Correlations between business performance and GVCs, ESG Rating, Greenwash and Answers to Research Question 5

This study has conducted the OLS regression between business performance and research factors of GVCs, ESG rating and greenwash by Table 25 and Table 26, representing samples before and after missing data treatment, in which business performance is referred as dependent variables while each of other factors are evaluated as independent variables. As relevant low R^2 in each factor's correlation regression, this study is thus not able to provide evidence on whether factors of GVCs, ESG rating and greenwash can impact the business performance.

Table 25: Suppliers' business performance with all factors before missing data treatment

Business performance with all factors before missing data treatment	Coefficients	R Square	ANOVA - Significance F
BP and GVCs	0.1926 ⁻	0.0298	0.4933
BP and ESG Greenwash	0.2663	0.0724	0.2804
BP and Greenwash - E	0.1297	0.0535	0.3557
BP and Greenwash - S	0.3432	0.1244	0.1510
BP and Greenwash - G	0.0346	0.0034	0.8193
BP and ESG Rating Development	0.2663	0.0724	0.2804
BP and Rating - E	0.3814 ⁻	0.0779	0.2619
BP and Rating - S	0.4	0.0061	0.7584
BP and Rating - G	0.4095 ⁻	0.0526	0.3599

Table 26: Suppliers' business performance with all factors after missing data treatment

Business performance with all factors after missing data treatment	Coefficients	R Square	ANOVA - Significance F
BP and GVCs	0.3889 ⁻	0.1005	0.3153
BP and ESG Greenwash	0.2224	0.0823	0.3660
BP and Greenwash - E	0.1632	0.1172	0.2759

BP and Greenwash - S	0.2029	0.0582	0.4
BP and Greenwash - G	0.0623	0.0195	0.6649
BP and ESG Rating Development	0.5408	-	0.5933
BP and Rating - E	1.1303	-	0.0947
BP and Rating - S	0.0230	-	0.9730
BP and Rating - G	0.1294	0.0049	0.8280

This part is aimed at answering the research question 4 below.

Are suppliers' business performances impacted by factors of GVCs governance, ESG adoptions and ESG greenwash?

Unexpectedly, this part has not found evidence of the correlation with different factors of GVCs, ESG adoptions and ESG greenwash.

4.3.5 Summary of GVCs, Greenwash, ESG Rating and Business Performance

Several t-tests and OLS regression analysis are applied in this section to answer research questions between 2-4. The conclusion is followed by each question.

Research question 2:

Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?

Few evidence found of the impact of the lead firm's GVCs governance on both suppliers' ESG greenwash and ESG adoptions activities. First, firms ESG greenwash and the Greenwash value in each pillar are found to be negatively correlated with the governance strength of suppliers. This can explain that GVCs governance has helped restrain the greenwash activities for suppliers. Second, GVCs found only to influence positively on suppliers' ESG adoptions in environmental pillar. Third, both assessments found evidence validation only when the miss data organizations should be removed in the correlation analysis.

Research Question 3:

Are firms' ESG adoptions impacted by firms' ESG greenwash?

It found that suppliers' ESG greenwash are not correlated with ESG adoptions in this study.

Research Question 4:

Are suppliers' business performances impacted by factors of GVCs governance, ESG adoptions and ESG greenwash?

Unexpectedly, this part has found no evidence of the correlation between suppliers' business performance and different factors of GVCs, ESG adoptions and ESG greenwash.

4.4 Summary of Finding and Analysis.

This part includes three main sections. In the first section, findings to answer research question 1 are presented. The second section confirmed the normality of collected and treated data for preparation of further t-test and regression test in third part. The third section has given the answers to research questions 2 to 4. The following conclusion has followed the order of research question.

Following findings are presented in answering the first research question by positioning on the recognition of the four factors objectivities of ESG rating measurement (Ijiri and Jaedicke 1966 and Wojdak 1970). First, the objectivity of input object is challenging. Construction of ESG structure by breakdown of issues could not be found with same consensus by different origin bodies of PRI, GRI and rating agencies. Meanwhile, different influence observers from different regulators, economics and scholars constructed ESG issues differently. Secondly, ESG measurement methodologies amount different raters are lack of transparency due to business confidentiality and high competition pressure and lack of the alignment by dynamic understanding of ESG input and different agencies' business visions. Third, measurers' bias, including owned origin bias and bias by difficult interpretation of ESG data create further disagreement during the measurement process. Finally, this study also presented that different interpretation of ESG missing data could create various output of measurement.

After confirmation of data normality, further regression analysis is applied to investigate answers for research question 2 to 4. First, this study has provided empirical evidence for the role of GVCs governance from the lead firm on the development of supplier's sustainability. The lead firm's GVCs governance has led the suppliers greenwash restrained by the influence of GVCs governance strength. Meanwhile, unlike greenwash factors being influenced by GVCs in all three pillars, have resulted in the suppliers' ESG adoptions in environmental pillar only. Second, this study could not find evidence for the correlations between firms' ESG greenwash and ESG adoptions. Third, it also found the business performance is not impacted by a range of factors of GVCs, ESG adoptions and ESG greenwash.

CHAPTER 5: Discussion, Contribution and Recommendation

5.1 Introduction

This part first concludes the research motivations, objectives and questions. Second, it provides two theoretical frameworks and two developed models in the research contribution. The recommendations for practices and policies are as follows. The research limitation and directions of future research are then provided.

5.2 Restatement of Research Questions

This study is aimed to investigate the relationship between suppliers greenwash, ESG adoptions and business performance within the GVCs governance and integrating with measurement objectivity theory to improve the robustness of the result by the case study of European multinational company operating in China and its upstream and downstream suppliers.

1. What are the challenges of four factor's objectivities of ESG rating measurement from a rater's view?
2. Are suppliers' ESG greenwash and ESG adoptions impacted by GVCs governance from the lead firm?
3. Are firms' ESG adoptions impacted by firms' ESG greenwash?
4. Are suppliers' business performances impacted by factors of GVCs governance, ESG adoptions and ESG greenwash?

This study is motivated by existing gaps found by the conduction of literature reviews in relevant topics. Since the ESG rating measurement in this study is determined to measure the factors of ESG greenwash and ESG adoptions, the first gap is the debate of ESG rating divergence. Few scholars have highlighted the carefulness on using the ESG rating data (Agle and Kelley 2001, Chatterji. et al. 2016 and Geng, Chen and Liu 2024), because the validation and reliability of data are challenged by the rating divergence from different agencies (Pang. et al. 2024, Sharfman 1996, Wang. et al. 2024 and Zhou, Lei and Yu 2023). By positioned on the theory of measurement objectivities evaluation by proposed by (Ijiri and Jaedicke 1966 and Wojdak 1970) and motivated by the urgency of identification of rating divergence reasons (Berg, Koelbel and Rigobon 2022), the first research question is addressed accordingly. The second gap is the debate between the role of GVCs governance and suppliers' sustainability development. Few scholars are questioning the role of GVCs from the MNCs in developing sustainability, because few lead firms have used sustainability as an entry gate to select supplier for more earnings and profits (Gereffi 2014, Hamish 2018 and Ponte 2020). While other scholars found the MNCs have been pressured by few stakeholders and motivated to improve ESG together with their upstream and downstream suppliers (Gai 2023, Huang and Zhang 2023 and Wang. et al. 2022). This gap will be facilitated by research question 2. The third research question has been addressed on the debate on the truthiness of firms ESG adoptions (Lyon and Maxwell 2011 and Lyon and Montgomery 2015), which is as firms greenwash tendency (Ioannou, Kassinis and Papagiannakis 2023 and Seele and Gatti 2017). Few scholars have found firms ESG adoptions are negatively impacted by the ESG greenwash (He, Du and Yu 2022, Ioannou, Kassinis and Papagiannakis 2023 and Majeed and Kim 2023), while other scholars do not see the relevant between them (Arvidsson and Dumay 2022). The research question will be able to fill this gap. Finally, the fourth debate on the regardless of ESG adoption activities as single cost or a good payback investment (Agoraki. et al. 2023, Ferrer, López-Arceiz and Rio 2020, He, Jing and Chen 2023, Hovatter 2022, and Wang, Liao and Zhang 2022), has been the gap for research question 4.

5.3 The Objectivity of ESG Rating Measurement

Ijiri and Jaedicke (1966) and Wojdak (1970) proposed the four factors of objectivities of measurement process in accounting world, extended to ESG rating measurement in this study. The core factors in figure 37 are represented by four factors of measurement input objects, measurer, measurement system and output of the measurement. Ijiri and Jaedicke (1966) explained that the objectivity of the measurement process represented by the consensus found in these four factors by external observers. It thus applied the framework in the study to investigate the challenges of the objectivities of the ESG rating and the reasons for rating divergence. First, it will find the measurement input objects by the process of construction of general ESG concept and concepts of ESG issues. The measure bias will be illustrated by the impact on measurement process. The factors of measurement methods will be investigated with areas of misalignment between different raters. The output factor will be explained by the empirical result of the impact from missing data treatment on various outputs.

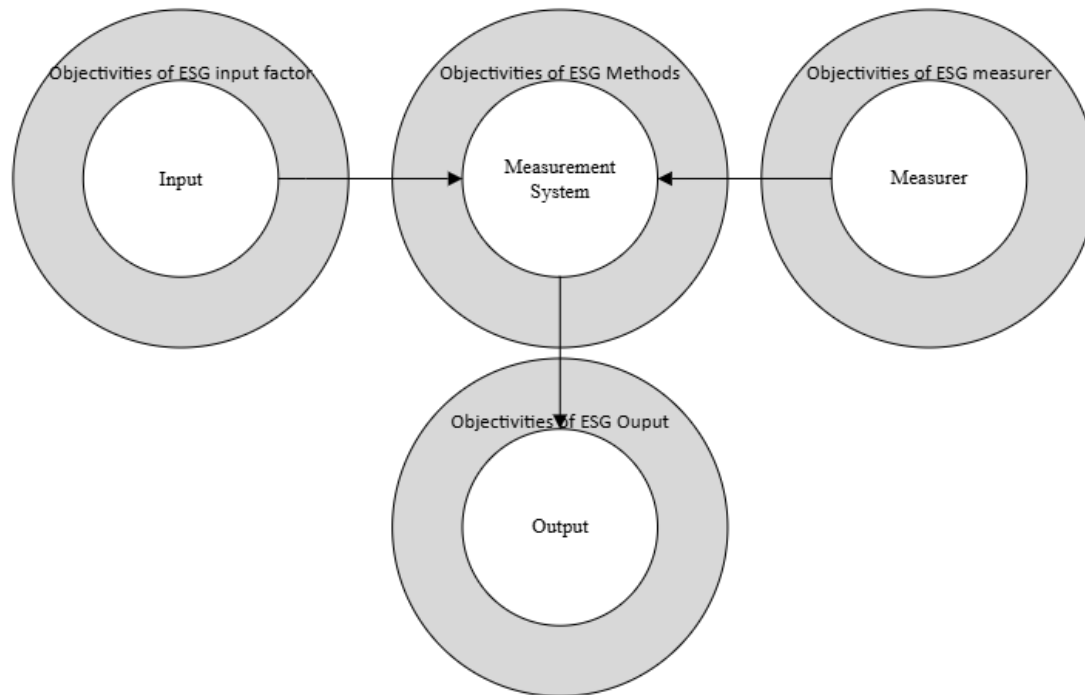


Figure 37: Four factors of the objectivity of measurement process (Ijiri and Jaedicke 1966 and Wojdak 1970)

5.4 GVCs, ESG Greenwash, ESG Adoptions and Business Performance

GVCs governance (Gereffi, Humphrey and Sturgeon 2005), explained how the lead firm has collaborated with suppliers by different governance types. The lead firm, MNCs from European Union economic is selected together with its hierarchy firm in China and its Chinese upstream and downstream suppliers. The recent adoptions activities of ESG, governed from the regulation's standard in EU to regulations in China, including ESG greenwash and ESG adoptions measured by ESG rating variance between years, are another two factors why the sample is selected.

The road map framework in figure 38 offered by first the picture of supplier's business operating reflected as GVCs governance. It followed by the plan to collect the

questionnaires of ESG data and AMC rating data (Buckley and Liesch 2023) the generation of measurement of ESG adoptions and ESG greenwash. After construction of three factors of GVCs, ESG adoptions and ESG greenwash, research question 2 and 3 will investigate relationships between these three factors. By collections of suppliers' business performance, research question 4 will explore the impact of different factors on suppliers' business performance.

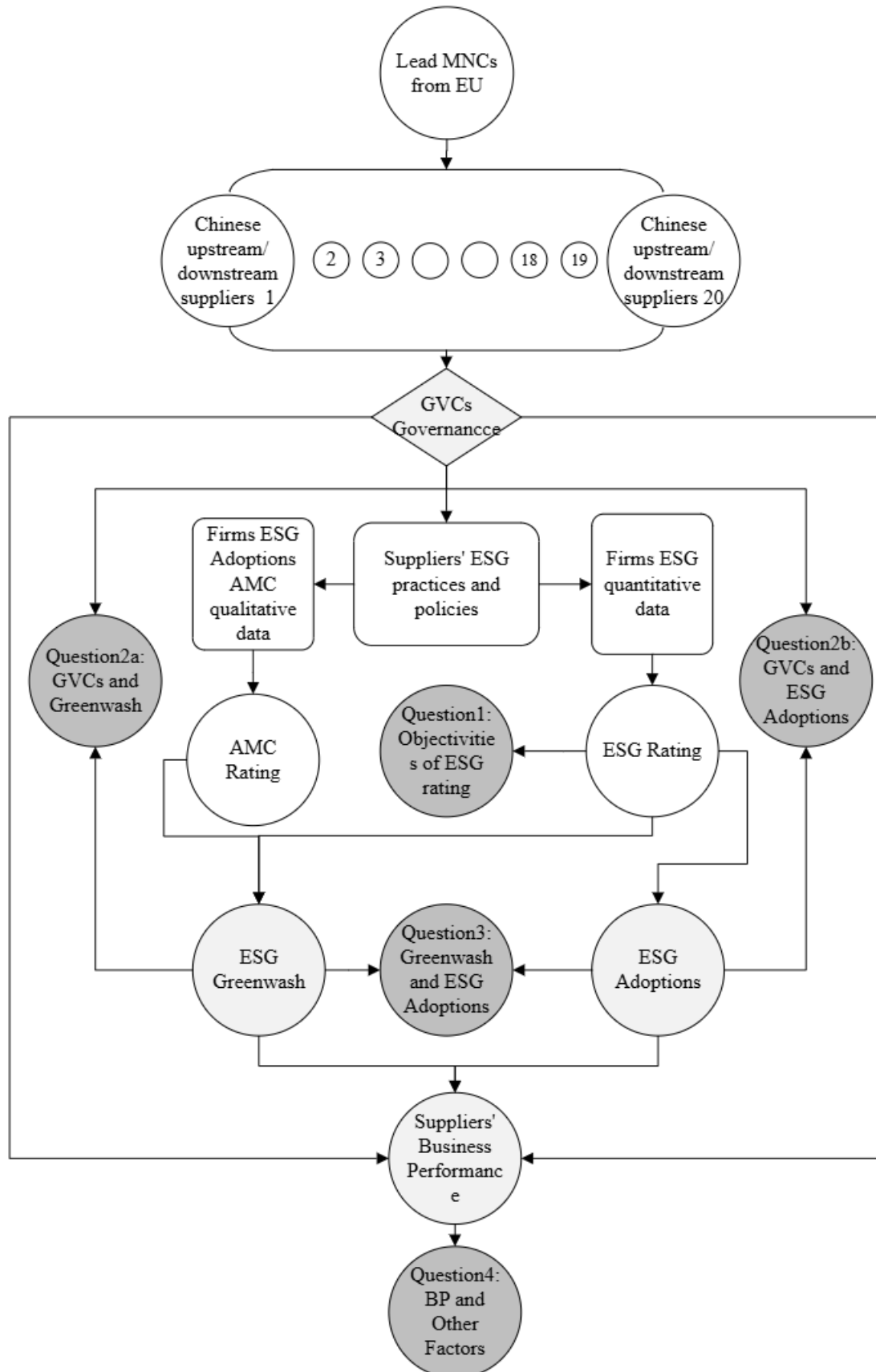


Figure 38: Theoretical roadmap of integration of factors of GVCs governance, ESG greenwash, ESG adoptions and suppliers' business performance

5.5 Research Contribution

Two main contribution areas are made by this study. By stood on the framework of assessment of measurement process's objectivities (Ijiri and Jaedicke 1966 and Wojdak 1970), it first provides the overall assessment of the consensus of ESG rating measurement in four factors of measurement input object, measurer's bias, measurement systems and the output of the measurement. Second, it provided empirical results to investigate the relationship between several factors of GVCs, suppliers' ESG adoptions, ESG greenwash and business performance.

Figure 39 has provided the framework of the finding for the area of assessment of measurement process's objectivities. The factor of ESG measurement input is found with deviations between different observers. The breakdown structure constructed by three bodies are different, in which PRI offers by simple structure of climate change, biodiversity, human right and governance, ESG disclosure standard include additional one section of economic contrition but without requesting on governance pillar and ESG rating agencies have provided most details issues while they are not aligned between different raters. After taking an example of ESG raters issue's structure from MSCI, this study found more deviations of issue reflected by different observers. Further example, the social issues in the eye of citizens in developed economies are different from the residents in developing economic zones. Similar deviations can also be found from different regulators based on diverse levels of economic development. Second, few biases are found from ESG measurers side. Measures might remain original bias. Financial orientation bias is followed by the origin of the ESG rating concept which is applied for screening of investment activities and is tended to remove attention on those non-

financial relevant ESG information. Halo bias effects show the measurers' subjective judgement will be consistent during the measurement process. If one organization's one specific ESG issue was rated good, another issue for this firm would also stay outstanding than other firms. Client's changing demands lead to the operation of rating activities that are dynamic. Furthermore, the nature of the ESG data created external bias for raters. Because firms may create mass of data in different resources, while firms tended to not share data by one side reason of lacking capabilities to prepare data or by another side reason of unwilling to share data. Factors of measurement systems are not aligned. It found that the methodologies of ESG measurement lack transparency because of the business principle of confidentiality and the high pressure of market competition. Measurement system also stays misaligned, because the construction of ESG issues is dynamic both across time and among different raters and the different business visions were stood by different raters. Finally, this study applied effects of missing data and relevant treatment results to explain how the various ESG measurement output was created. Two treatments of missing data methods of grading lowest value and exclusion of grading were applied in this study. It found the more missing data found in the firms, the less ESG rating followed by the grading lowest value treatment. While the exclusion grading method has significantly increased overall rating sample by over one point. The exclusion grading method also helps those firms with higher missing data status improve ESG rating more than lower missing data firms. Various outputs represented by different motivations for firms to disclosure ESG data found.

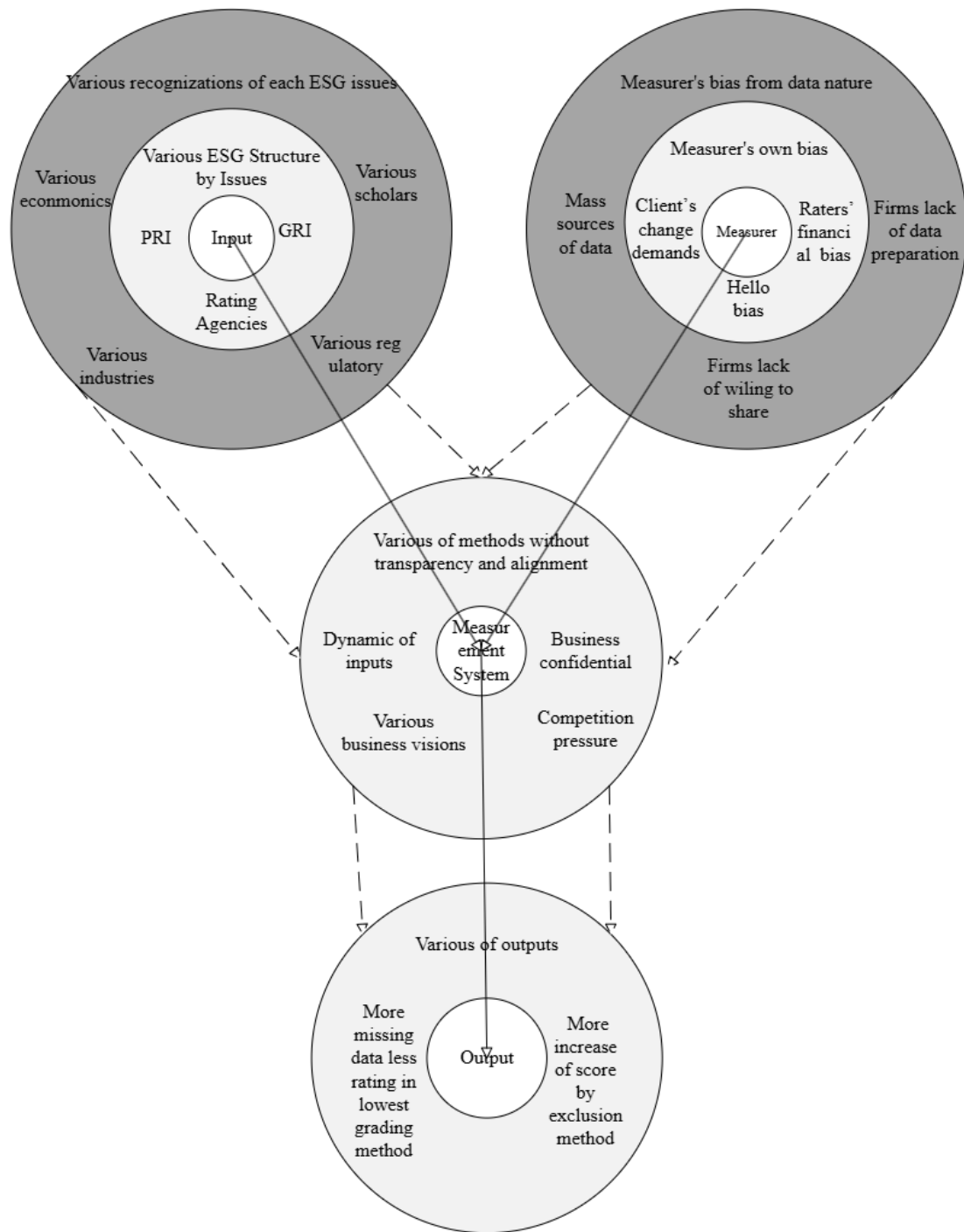


Figure 39: Challenges of the objectivity of ESG rating measurement

This study has provided a second contribution by the investigation of several relationships between several factors in figure 40. First relationship is between factor of GVCs governance and greenwash. It found the hierarchy firm, which is governed by full strength, performed significantly low value of ESG greenwash amount the total sample. It thus further created the correlation regression analysis between ESG greenwash and found that the values of total ESG greenwash and greenwash of each pillar are significantly correlated negatively with the governance strength. It means firms with great GVCs governance, are found less ESG greenwash activities in this study. The second relationship is the GVCs governance and ESG adoptions. It found the GVCs governance factor is positively correlated with ESG adoption in Environmental pillar. This means greater GVCs governance for the suppliers are followed with more motivation and actual adoptions in environmental pillar. However, this study also found the total ESG adoptions, adoption in social pillar and adoptions in governance pillar are not correlated with suppliers' GVCs governance strength. In the third relationship, this study has not found the correlation between factors of ESG greenwash and ESG adoptions. Finally, it found suppliers' business performance is not correlated with several factors of GVCs governance strength ESG greenwash and ESG adoptions.

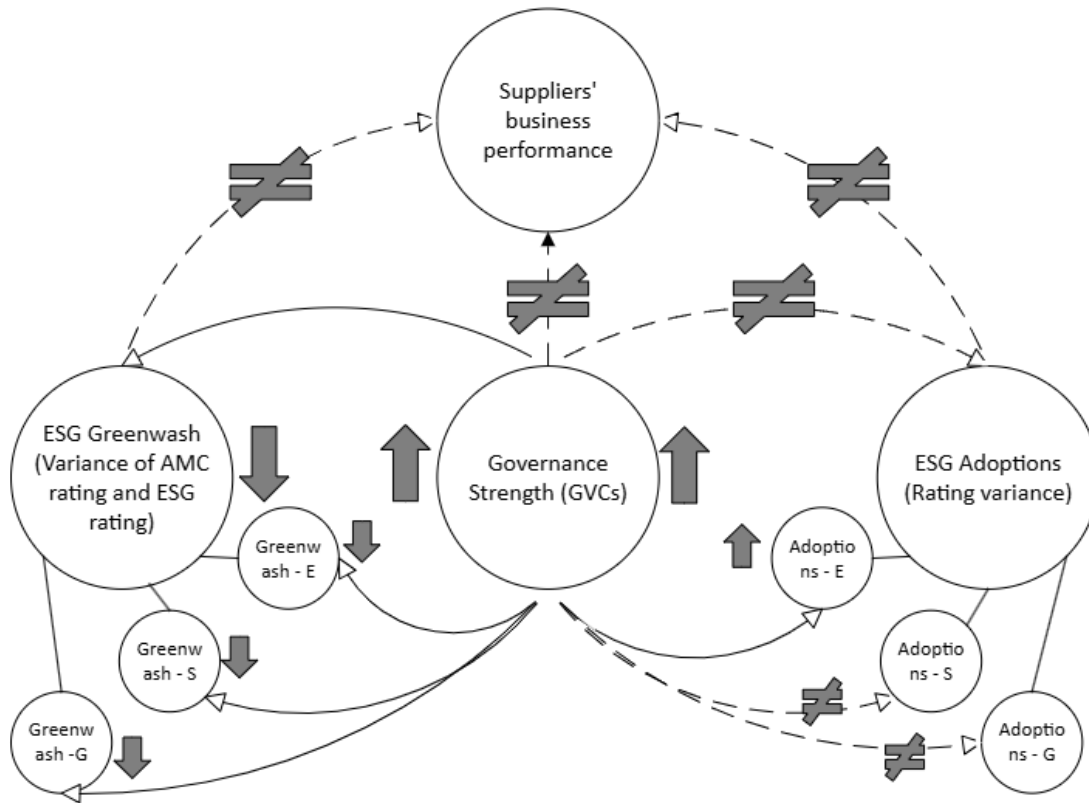


Figure 40: Correlations analysis between different factors of GVCs governance, ESG greenwash, ESG adoptions and suppliers' business performance

5.6 Implication and Recommendation for Practices

For social investors: this study has challenged weak positions of the objectivity of ESG rating measurement. Without knowing the measurement process and construction of ESG issue, it creates clear concerns by only using the ESG data to improve investment return. The investor could not only rely on the ESG data to select its investment portfolio. As the immature ESG rating measurement at current stage, the investor should use mixture method or mixture data source to decide the investment activities. For example, by mixture with credit rating and ESG rating together or by mixture with MSCI ESG data and Bloomberg ESG data, the decision will be strength with lower risk by trusting only

one method or one source data. Furthermore, no correlation between business performance and ESG rating found in this study showed that the investment in ESG is not a short-term returnable investment according to collected data analysis. ESG investment strategy should not be used as a short-term strategy to increase investment profitability. Furthermore, an ESG compensation plan should also look for long-term sensitivity, not a short-term plan, because the management could pick one of the suitable ESG ratings between different raters for benchmarking.

For focal firms: Although this study has challenged the ESG rating's objectivity, it does not mean ESG is not important. Instead, it indicates that more attention has been paid to looking at the content of ESG. It might not have created short-term payback value for firms to make significant efforts according to the findings on suppliers' business performance. However, it might have long-term benefits for firms which still need time to be confirmed. Firms with an advanced understanding on ESG will retain early movement advantage of ESG adoptions than others. It will increase intangible reputation value for firms which also benefited in long term. It will increase firms' capabilities to manage risk from relevant ESG regulators. For example, the carbon neutralization in both EU and China will certainly ask firms to take action to reduce the emission in next years before the deadline of neutralization. In other words, early preparation on ESG adoptions will help reduce the excessive cost in future.

Focal firms also need to treat service from raters carefully. Since the weak ESG rating objectivity, focal firms might result in a reliable performance in one agency but bad rating in another rating agencies. The advice and service from raters who offer a bad rating for the firm might be doubtful because the intention in background might not need genuine advice for improvement actions but just a statistical change in the measurement process. Firms' selective disclosure of ESG, referred to as greenwash, are detectable. Firms say more but doing less will reduce the rating according to findings in this study. Furthermore, it is important to improve firms' capabilities to improve data preparation

according to the standard. Because most raters treat the missing as greenwash tendency rather than lack of capabilities. Meanwhile, the more availability data of firms shows a better rating which is also found in this study.

MNCs played a key role within their network in adoptions of ESG within GVCs governance. The influence of MNCs on ESG activities will lead to an increase in attention from society, which asked MNCs to do more ESG in different regions. The GVCs governance, proofed as positive influence on ESG in this study, asked the MNCs' managers to integrate the business development strategy together with ESG strategy with suppliers. Cooperation between lead firms and suppliers can generate not only financial benefits but also non-financial benefits for the sustainable development of society. However, this study has found the influence of adoptions only on limited in Environment which might be due to the priority of ESG issues in China restricted on Environment. Therefore, MNCs' managers should have considered the factor of regulatory priority on ESG adoptions. Connections with the priority of regulatory can improve managers' cost efficiency in the adoptions of ESG. Meanwhile, the link between business development and ESG adoptions has also asked suppliers within MNCs' network to stay close with lead firm. Because MNCs' ESG strategy is intended to develop ESG together with their suppliers. Suppliers can also demonstrate their capability in preparing ESG adoptions and strength business relationship with the lead firm.

For ESG raters: although raters create confusion on the disagreement of rating result, it has been no doubt about the positive value of ESG rating that the rating has raised the attention of different stakeholders' awareness and practices in ESG. On one side, investors are screening social activities by rating tools which give firms more pressure to be correct on ESG practices and policies. On the other hand, firms are motivated by maintaining ESG activities if the rate is good or improve the practices if the rate is not good.

However, raters can do more on consolidation of ESG rating measurement methodologies and construction of ESG concept. Raters knowing the weakness of unquantified ESG data nature can help the standard bodies to improve the disclosure standard to quantify ESG data. Raters struggling points of data availability can help ESG regulator to direct firms to maintain data by the law.

Raters' profitable purpose is unavoidable to be challenged on the point of the independence issue. Therefore, if the vision of the business is to help firms to improve their rating, this challenge cannot be avoided. Meanwhile, like rating service in credit area, it will not remain few raters in the long term. It thus recommends rater's position to another two profitable directions. Raters' familiarity with ESG data will help develop talents on ESG data preparation, which is a lack position from firm's side. Second, rater can help firms to ensure the ESG data. Like an audit service in the accounting world, an independent party to ensure the ESG data should be the party who has complete knowledge of ESG, which is fitted with current ESG raters.

Raters should also consider the power of GVCs in rating activities. First, a transparent and aligned ESG measurement system should be discussed with MNCs. It has found the hierarchy firm as a significant low ESG greenwash. MNCs can help mitigate the risk of rating divergence. Second, power of GVCs helped less greenwash within the supply chain network. If MNCs are trained in the preparation of ESG data, it would spread the knowledge to different suppliers. Finally, an open measurement system to different MNCs can help mitigate risk of independence issue. The influence of GVCs power can give fair comment to the rater's measurement system to the public.

5.7 Implication and Recommendation for Policy

Two main regulators discuss in this study. One of them is ESG disclosure standard regulators, who provide standard guidelines for firms to disclose ESG activities. Another regulator is the national or economic region ESG authorities, who have asked firms to present ESG activities by the relevant laws.

For ESG disclosure standard regulator: disclosure standard bodies should make more alignments between different regulations. International standard bodies should also make efforts to get alignment with different domestic guidelines, because different regions have various priority of ESG issues. This effort will help reduce the difficulty in the construction of firms' ESG input and help firms to prepare ESG data. Second, the disclosure standard should be more quantified. As the measure bias found by the study, the nature of ESG data, which is not quantified by various sources, is measured differently from various raters. Third, disclosure standard bodies should work together with MNCs in preparing the guidelines. MNCs naturally helped distribution of ESG standards with suppliers around world within the GVCs governance. MNCs in this study show that there is a low greenwash tendency, which is worth it for disclosure bodies to understand the difficulty in the implementation of disclosure standard.

For national or economic regional ESG authorities: It provides several implications for economic regions regulators. First, it is urgent to get alignment of ESG concept between regulations between different regions. Although ESG issues are hardly to be the same in short time in different societies, the different priorities provide difficulty for various actors. For example, the lead firm's GVC governance in ESG adoptions is originally in all three pillars from EU, while it has led to a significant impact only on the environmental pillar. It means EU's ESG regulations on social and governance pillars needs support from the alignment with regulations in China. As discussed in the raters' part, the various measurement output by different input required support by connections

of regions regulations. Managers in MNCs and in their network are also difficult in adopting various ESG concepts from their host countries and home countries.

Second, regional regulatory should help coordinate the alignment between different disclosure bodies. This study has found the various guidelines have led to different focus and quality of data in ESG. Disclosure bodies should be organized by different regional regulations together to move on priority of the data standards because the society will move in efficient and beneficial directions if the resources are distributed into the key area, such as climate change issue, which needs more resources to fight for the survival foundation of human beings.

Finally, this study provides a valuable view on MNCs for regulatory in ESG practices. Although existing literature has criticized the profitable purpose of MNCs' ESG practices within GVCs governance, it found positive impact from MNCs both on mitigating ESG greenwash risk and improving ESG practices. It is worth for regional regulations to understand MNCs more deeply and motivate their supply chain network to follow with public expectation rather than a direct pressure or increase of negative criticism on MNCs. More connections with MNCs positioned in regulations' view can also help improve the efficiency of ESG regulations adoptions. Because GVCs governance from MNCs guides suppliers in ESG practices which can help centralize resources from regulation in monitoring the implementation.

5.8 Research Limitations and Future Research

This study may have limitations. First, the semi-structure interview could not be conducted fully by face to face with all participants due to the high distance locations between different suppliers' location around China. This might have resulted in less data

collection for participants over phone calls than face to face. However, these various locations of suppliers retained the advantage of diversity of the samples in this study. Second, the researcher's interview skills might be developed by the practices of interview, which means the later interviewed participants might be collected with more data than earlier participants. While the study was explained in the pilot section by a full practice of improvement on interview skills during the pilot study. Third, the dual role conflict derived by the key role of the researcher's management in the hierarchy firm. Few of the firms might not fully provide the data or provide only superior performance ESG data to the researcher because they are afraid that the negative impression might give to the researcher by the management role in the hierarchy firm. Meanwhile, those participants firms might have already indicated good governance strength, which means the low governance strength might have denied joining the research. However, the research takes efforts to eliminate this risk by stating on paper with the clarification on the separation role of management in this search from the employer and oral speaking on the clarification during the interview. Fourth, the model of objectivity on ESG rating measurement is extended from accounting measurement which might have not perfectly fitted for ESG areas. Fifth, GVCs governance applied in this study is the business operation from EU' MNCs to Chinese' suppliers, which remained meaningful for ESG content between EU and China, while it might not indicate same meaning for MNCs' from China to other countries or MNC's EU to other third economic regions. Sixth, this study limited samples for investigation of business performance, which might be challenges about the validation of the findings.

Therefore, the study might ask for two directions in future research. Since globalization has not only involved between China and EU, but it is also worth to extend the sample to investigate the relationship between role of GVCs and ESG adoptions with more countries or economic regions. Second, suppliers' business performance is found with no direct link to ESG rating in this study by comparing two years data. It is worth extending

the data to a long-term view to investigating whether suppliers' long-term business performances are impacted by ESG adoptions and GVCs.

5.9 Concluding Remarks

MNCs' ESG adoptions are found integrated with several factors of globalization, ESG greenwash and ESG rating, since the main economic regions of EU and China has announced its carbon neutralization policies (EU 2019 and Li.2023). However, the policy between different regions is still different. This study thus chooses a lead firm from EU, hierarchy firm as subsidiary in China and their upstream and downstream suppliers to analysis the relationship between varied factors of suppliers' ESG greenwash, ESG adoptions and business performance. Because of the application of tool of ESG rating this study, it thus evaluates the objectivity of ESG rating measurement before using it in the study.

It first applies the theory model in figure 37 to evaluate the objectivity of ESG rating measurement in first research questions. Figure 38 explains the background of research organizations and the reason they are chosen. It also illustrates collecting quantitative ESG data to do ESG rating and conduct analysis of AMC rating from qualitative data for generation of greenwash data. GVCs, measured by governance strength between different suppliers, are used to explore the relationship with ESG greenwash and ESG adoptions for research question 2. The third research question is the investigation of the relationship between suppliers' ESG greenwash and ESG adoptions. The fourth research question is concertation on suppliers' business performance with other distinct factors of role of GVCs, ESG greenwash and ESG adoptions.

The first research contribution is presented in figure 39. It explained the objectivities of ESG measurement input, measurer's bias, measurement system, and measurement output. It found that the ESG measurement inputs are constructed differently by different observers both on the ESG structure and details of ESG issues. It also found the measure's own origin bias and the external bias from ESG data nature might lead to the alignment of measurement. Measurement systems also lack transparency and alignment between raters. It applied empirical results to explain significant differences of the output of measurement by using different methods to treat missing data. The second contribution is shown by figure 40. It found the GVCs governance has helped restraining firms greenwash activities by the order of the governance strength in both total ESG greenwash and all three pillars. ESG adoptions in the environment are positively impacted by the role of GVCs. However, GVCs' influence on ESG adoptions is not found in total adoptions and pillars of social and governance. Furthermore, it could not find evidence of the relationship suppliers' ESG greenwash and ESG adoptions. Finally, it also shows the short business performance is not correlated with other factors of GVCs, ESG greenwash and ESG adoptions.

This part has provided recommendations for the role of social investors, focal firms, ESG raters and regulators. It has called up the importance role of MNCs and GVCs governance for all different stakeholders. Because one adoption actions from MNCs can lead to several adoption activities from their suppliers around the world, which can improve the policy and practices efficiency. It has asked social investors and firms to use ESG rating data carefully because of the weakness of the objectivities of ESG rating. ESG raters should provide more advice for disclosure standards bodies and national regulators for improving the alignment of construction of ESG concept. ESG raters' independence can be improved by switching focus on the development of ESG talents and insuring on ESG data. Regulators are asked to get more alignment because globalization has unavoidably combined the social issues to the global issue within different economies. In the end, this study suggests future research on the role GVCs in

other countries or economics and investigate impact of ESG on long-term business performance.

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APENDIX

Appendix A: GVCs Governance Strength of Upstream Suppliers

Questions part 1	Very short (<0 month)	Short (0-0.5 month)	Normal (0.5 - 1 month)	Long (1-2 months)	Very long (>3 months)	Not available	Not applicable
Rating	1	2	3	4	5	(/)	(NA)
Hong long do you feel that the supplier can compensate the price when the supplier side has significant cost decrease (5% of sales price)							
Hong long do you feel that the supplier can compensate the price when the supplier side has significant market price decrease (5% of sales price)							
Questions part 2	Dislike	Less like	Like	More than like	Complete open	Not available	Not applicable
Rating	1	2	3	4	5	(/)	(NA)

Do you like to share production information with your suppliers							
Do you like to share financial information with your suppliers							
Do you like to share market development information with your suppliers							
Do you like to collaborate with your suppliers for capacity increase							
Do you like to collaborate with your suppliers for treasury management							
Do you like to collaborate with your suppliers for quality development							

Questions part 3	Not important	Less important	Important	More than important	Extremely important	Not available	Not applicable
Rating	1	2	3	4	5	(/)	(NA)
Do you think it important to check with your suppliers before deciding on an investment?							
Do you think it important to check with your suppliers before deciding about business extension?							
Do you think it is important to check with your suppliers before deciding on inventory management?							

Appendix B: GVCs Governance Strength of Downstream Suppliers

Questions part 1	Very short (<0 month)	Short (0-0.5 month)	Normal (0.5 - 1 month)	Long (1-2 months)	Very long (>3 months)	Not available	Not applicable
Rating	1	2	3	4	5	(/)	(NA)
How long do you feel you will get compensate from the customer side when you have significant cost increase (5% of the sales price)							
How long do you feel you will get compensate from the customer side when you have significant market price increase (5% of the sales price)							
Questions part 2	Dislike	Less like	Like	More than like	Complete open	Not available	Not applicable

Rating	1	2	3	4	5	(/)	(NA)
Do you like to share production information with your customers							
Do you like to share financial information with your customers							
Do you like to share market development information with your customers							
Do you like to collabourate with your customers for capacity increase							
Do you like to collabourate with your customers for treasury management							

Do you like to collabourate with your customers for quality developmen t							
Questions part 3	Not importa nt	Less importa nt	Importa nt	More than importa nt	Extremely importa nt	Not availabl e	Not applicabl e
Rating	1	2	3	4	5	(/)	(NA)
Do you think it is important to check with your customers before deciding on investment?							
Do you think it is important to check with your customers before deciding on business extension?							
Do you think it is important to check with your							

customers before deciding about inventory managemen t?							
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Appendix C: Semi Structure Interview Questions List

ESG Issues	Questions
Climate Change	How do you see the importance of each ESG issues in left side in your business?
Biodiversity and Land Use	
Raw Material Sourcing	
Toxic Emissions and Waste	
Health and Safety	
Human Capital Development	
Labor Management	
Supply Chain Labor Standards	Why do you think they are important or not important?
Product Safety and Quality	
Community Relations	
Privacy and Data Security	
Board	How do you see the future development for those ESG issues?
Pay	
Ownership and Control	
Accounting	
Business Ethics	

Appendix D: ESG Quantitative data Questionnaires

Questions	Unit/Remark	2021	2022	2023
What is the ownership structure of your firm? (A: Foreign invest B: Domestic private non-stock listed C: Domestic private stock listed D: Domestic stated owned)	A/B/C/D			
How much is the annual revenue of the company?	10K RMB			
How many employees are there be at the year end?	Headcount			
How much is the net profit in the year end?	10K RMB			
How many employees owned EV/HEV at the year end?	Frequency			
How many EV/HEV do the company own at the year end?	Frequency			
How much is the installed solar panel in year-end of company if available?	m ²			
How much is the installed solar panel for year-end employees if available?	m ²			
How much is the company coal consumption total in the year end?	Ton			
How much is the company gas consumption total at the year end?	Ton			
How much is the company gas consumption total at the year end?	Kw/h			
How much is the company biofuel and other renewables total at the year end?	Ton			

How much is the company well water consumptions total in the year end?	Ton			
How much is the company tap water consumption total in the year end?	Ton			
How much is the production land size?	m ²			
How much is the total land size?	m ²			
How much is spare land size?	m ²			
How many times of land environmental assessment been done in last 3years	Frequency			
Which year is the latest renewal of quality certificate?	Year			
Did your company provide traceability record system?	Yes/No			
When is the last valid year of the wastewater license?	Year			
How much wastewater volume is at the year end?	Ton			
How much Solid Waste is the volume in the year end?	Ton			
When was the last environmental assessment year?	Year			
How much is total water consumption at the year end?	Ton			
How many long-term illness headcounts at year end?	Headcount			
When was the last occupational and health current assessment year?	Year			
How much is the production volume?	Ton			
How many new labors court cases in current year?	Frequency			
How much is the total plant land sizes?	m ²			

What is the name of the local community where your company stayed?	Name			
How many percentages of the shares belong to the majority shareholder?	%			
Did the share right tied to vote right?	Yes/No			
Does senior manager only responsible for finance?	Yes/No			
How much is the annual land environmental assessment cost?	10K RMB			
How much is the annual Investment of wastewater?	10K RMB			
How much is the annual training cost?	10K RMB			
How much do the last three years' training cost?	10K RMB			
How much is employee benefit cost?	10K RMB			
How much does the training cost in the quality department annually?	10K RMB			
How much is the accumulated investment in Lab?	10K RMB			
How much are the annual expenses in Lab?	10K RMB			
How many valid quality certificates?	Frequency			
How much is the annual environmental assessment cost	10K RMB			
How much is the annual donations to local community	10K RMB			
How much is the annual ICT Expenses	10K RMB			
How much is the annual ICT Investment	10K RMB			
How much is the short-term debt (with one year maturity)	10K RMB			
How much is the annual audit fee	10K RMB			
How much is quality team headcount	Headcount			

How many tenures of the safety manager in the company?	Years			
Did the company provide extra medical insurance for employees?	Yes/No			
How much is the coverage for the employees with extra medical insurance?	%			
Did CEO incentive link to safety performance?	Yes/No			
How much is CEO's safety bonus in percentage of total bonus?	%			
Did safety manager's incentive link to safety performance?	Yes/No			
How much is the safety manager's safety bonus as a percentage of the total bonus?	%			
How many employees' satisfaction survey frequency in last three years?	Frequency			
How many employees own company shares? (excluding salesperson)	Headcount			
How many employees will include variable bonus? (excluding salesperson)	Headcount			
Did the company provide share incentives?	Yes/No			
How many employees' satisfaction survey frequency in current year?	Frequency			
How many employees are working part-time degrees in the current year?	Headcount			
How is the average employee's age?	age			
How much average monthly salary for operators	10K RMB			
How much is the total annual overtime payment to employees?	10K RMB			
How many employees are the local community residents?	Headcount			

How many managers are from the local community residents?	Headcount			
How many managers are there and above in the organization?	Headcount			
How many employees have 10% or above shares?	Headcount			
How many senior managers are there in the organization?	Headcount			
What is the age of each senior manager?	NA			
Senior manager A	age			
Senior manager B	age			
Senior manager C	age			
Senior manager D	age			
Senior manager E	age			
Senior manager F	age			
Senior manager G	age			
Senior manager and others average	age			
How many years have the senior managers worked for the company?	NA			
Senior manager A	Years			
Senior manager B	Years			
Senior manager C	Years			
Senior manager D	Years			
Senior manager E	Years			
Senior manager F	Years			
Senior manager G	Years			
Senior manager and others average	Years			

How many female senior managers in the organization?	Headcount			
How much CEO Annual Dividend Received?	10K RMB			
How much CEO Annual Salary Received? (excluding dividend)	10K RMB			
How much salary of the total senior manager's team?	10K RMB			
How many accountings department headcount? (excluding senior manager)	Headcount			
How much is the accounting department salary? (excluding senior manager)	10K RMB			
How is the average age of managers and above employees in the current year?	age			
How many female managers in the organization?	Headcount			
How many total female employees in the organization?	Headcount			
How many Employees in Manager level and above in the organization?	Headcount			
How many master's degree employees?	Headcount			
How many bachelor's degree employees?	Headcount			
How many college degree employees?	Headcount			
How many college degree employees?	Headcount			
How many PCs can you buy within a few years?	Frequency			
How many Total PCs using in the organization?	Frequency			
How many percentages of Top10 T1 Suppliers with quality certificate?	%			
How many percentages of Top10 T1 Suppliers with traceability commitment %?	%			

How many times have audit been done for top 10 suppliers?	Frequency			
How many percentages of Top10 suppliers with traceability record system?	%			
How many annual customer complaints do you receive?	Frequency			