ESG Transparency on Firm Performance: An Empirical Research of Covid-19 in Global Logistics Firms

By

Tianyi Xie

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Saint Mary's University

Approved: Rahman Khokhar
MFin Director

Approved: J. Colin Dodds
Supervisor

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Abstract

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Supply chain management (SCM) facilitated by the forces of globalization and technology evolution was playing an unassailable role in serving the world. The impact of Covid-19 caused disruption to these supply chains.

The objective of this paper is to investigate the quasi-potential impact of the environment, social, and governance (ESG) disclosure on the firms' performance in the transportation and logistics industry and the influence of the pandemic.

The empirical analysis, conducted on a sample of worldwide publicly traded companies, shows that the ESG disclosure score (ESGD) especially ESGD at higher level significantly contributes to firm value despite a relatively lower level of ESGD increases with a drop in firm value at the onset of the Covid-19 pandemic. As expected, the results also indicate that the effect of ESGD is significantly associated with a positive change in firm value during the pandemic and post-pandemic period.

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Chapter 1 | Introduction

Fifty-one years later, the article, "The Social Responsibility of Business is to Increase its Profits" (Friedman, 1970), is still as influential as his Enlightened Shareholder Value (ESV) argument for profit maximization. In the past thirty years, corporate stakeholders and governments are in an ascending trend to understand and to improve the non-financial disclosure. Regardless, Friedman's argument did not assume that investors only care about profits and more importantly, defend profit maximization as the only way to the enterprises' value creation for the stakeholder when it serves the society in the long-run (Edmans, 2020). However, it may be the reason why there has been an exponential growth in the number of enterprises investing in and disclosing environmental impacts (such as carbon emissions, energy consumption, paper consumption, etc.), social (such as employees, facilities, percentage women in management, etc.), and governance (director average age, board size, total

CEO compensation, etc.). The evidence confirms the momentum that 80 percent of companies of the world currently report Environmental, Social and Governance (ESG) compared to less than 20 percent of companies had disclosed ESG data in the 1990s. Furthermore, by 2020, the worldwide growth number of non-financial information disclosure of sustainability reporting rate in N100 (5,200 companies comprised of the top 100 companies by revenue each of 52 countries) had increased by 5% in 2017 to 80 percent in 2020. This can be compared with the leading G250 (the largest 250 worldwide companies by revenue in the ranking of Fortune 500 in 2019) that had more than 90 percent sustainability reporting rate, but this has varied from year to year since 2017 (KPMG, 2020).

The booming attention of 'sustainability' has resulted in a growing number of firms' ESG information disclosure. The

urgency of business to recognize its purpose and

responsibility to conduct in a socially responsible manner is

arguably greater than ever before, Gelles and Yaffe-Bellany

(2019). Correspondingly, the popularity of establishing the

relationship studies between ESG and firm performance is

soaring in response to public interest for information

transparency (Eccles et al., 2011).

To examine the willingness of non-financial firms to disclose

corporate social behavior, the data were obtained from

Bloomberg as ESG Disclosure scores and three sub-scores as

a reflection of a quantified transparency of a company in

reporting its CSR (Corporate Social Responsibility).

The outbreak of Covid-19 and the disruption to supply chains

led to a global impact on economic and significant

government responses around the world. In recent reports by

Dun& Bradstreet, 2020, it found that no less than 16.3% and 93.8% companies in the Fortune 1000 have one or more direct Tier 1 and one or more direct Tier 2 suppliers respectively in Wuhan, China. Supply chains thus play an essential role as pillars in maintaining the resilience of the global economy.

Therefore, albeit the extant study of ESG score and firm performance, a key question remains unexplored: Does ESG disclosure score prompt value creation, particularly in the logistics industry? If it does, then what role did the pandemic play in impacting the relationship between ESG disclosure and firm performance?

Motivated by the extant studies (Buchanan et al., 2018; Lins et al., 2017) and lack of academic literature evidence to provide a definitive answer, the pursuit of this research is to

use Bloomberg's comprehensive ESG Disclosure scores and a comparably large size sample to shed light on the interaction between firm performance and ESG (or CSR) Disclosure scores.

Furthermore, the paper examines the potential role of the Covid-19 crisis via identifying the time-varying ESG-firm performance effect.

Given the large number of studies in the literature that have been conducted to find the link between the ESG disclosure and firm performance, this paper attempts to contribute new outcomes to the existing studies in two key respects. First, in prior studies, the impact of ESG disclosure can be endogenous to the factors which can result in deviating from an unbiased assessment on ESG-firm valuation, i.e., firms tend to do good when they are doing well (Hong et al., 2012).

Second, the interaction of ESG and firm performance is affected by what ESG disclosure information engages: the conflict resolution or the over-investment effect (Buchanan et al., 2018). In order to overcome these problems to identify the factors more accurately, I test the ESG disclosure effect around the 2020 Covid-19 outbreak. Inspired by and benefiting from a previous study that took the 2008 financial crisis as an exogenous shock to companies (Buchanan et al., 2018), I use the Covid-19 crisis so as to disentangle the recursive relationship between ESG activities and firm performance.

Following Buchanan et al., 2018 in probing the CSR practice effect on firm value by applying a Difference-in-Difference (DiD) model, I try to isolate the effect of ESG disclosure scores on the changes of firm value. Existing theoretical research shows that there may be a positive, negative or non-

related association between ESG practices and firm

performance, while the majority of them presents a positive

link. To align with prior studies, I confirm that the ESG

disclosure score (ESGD) is beneficial to firm value and more

statistically significantly positive while ESGD is at a

relatively higher level.

Finally, this paper provides ramifications to socially

responsible investments (SRI). The results are suggestive that

at the onset of the Covid-19 pandemic, the conflict-resolution

advantages of ESGD dominate the over-investment costs

with a positive effect of ESG activities on firm value.

With the development backdrop, tendency and purpose of

this study that have been introduced as above, the

organization of the rest of this paper is as follows. Chapter 2

provides a literature review on ESG practice and the status

quo of other related existing studies. Chapter 3 presents the

research methodology and the descriptive summary with

Chapter 4 that discusses the empirical analysis and results.

Chapter 5 is by way of a conclusion, and Chapter 6 reflects

on the limits of this paper and the potential extensions for

future research.

Chapter 2 | Literature Review

2.1 | ESG and Firm Performance

The explosive growth in perspective of CSR has led to not only Socially Responsible Investing (SRI), but also academic research. Many theoretical studies have drawn their attention to the relationship between the Environmental, Social, Governance (ESG) and the firm performance (FP). The traditional argument of profit maximization (Friedman, 1970), as referenced in Chapter 1, was challenged with studies of CSR but the results were mixed.

I am defining CSR as actions that appear to further social good beyond the interests of the firm and that are required by law (McWilliams and Siegel, 2001). In terms of this definition, beyond the interests of shareholders, the CSR *inter alia* influences stakeholders. Despite the former studies having provided inconsistent results, the effect of ESG (or CSR) on corporate financial performance varies with the different extent of influential

ownership and dependency of the economic cycle (Buchanan et al.,

2018).

Friede et al, 2015 showed a majority of cases that had a positive

impact of ESG on firm performance appeared stable over time. In

addition, other studies indicate that stronger ESG practices can

lead to a lower cost of debt and be rewarding in valuation in capital

markets (Eliwa et al., 2019). Furthermore, the ESG activities were

found to be advantageous in addressing the internal and external

corporate governance and censorship mechanisms which were

associated with the social enhancement within the firm (Jo and

Harjoto, 2011).

Existing hypotheses that include conflict resolution and reputation-

built have guided researchers to expect a positive interaction of

ESG (or CSR) on a firm's financial performance (Freeman, 2020;

Jo and Harjoto, 2011; Makni et al., 2009). Based on these two

theories, ESG activities can be tapped into the alleviation of

difference, between stakeholders and the management team. For

example, ESG actions that are normally embodied in a CSR

engagement department can often offset the damage resulted by

the firm (often core business) through the ESG expenses. The

positive relationship can be explained by the stakeholder theory

and is reasonable to be expected by investors.

Even though most of the evidence-based research has proven

a value-enhancing interaction of an ESG effect on firm value,

it is recognized that ESG *per se* can on its own lead to a

decrease in the value of the firm. However, it can benefit

from the lower cost of debt. For instance, findings in 28

different countries suggest that one unit increase in a single

country's score of sustainability is linked to an average

decrease in the cost of bank loans (Hoepner et al., 2016). In

contrast, the ongoing discussions is suggestive of a negative

relationship between engagement in CSR activities and

corporate financial performance. For example, on the contrary, studies document that ESG disclosure can result in higher cost to the firm (Yoon et al., 2018). Furthermore, other findings also suggest that a negative interaction between CSR disclosure and company value due to the agency problem and stakeholder protection from managerial entrenchment (e.g. Barnea & Rubin, 2010; Cespa & Cestone, 2007). More specifically, being consistent with prior research, a test based on a sample of Canadian firms indicated an inverse association between ESG disclosure and enterprise financial performance (Richardson & Welker, 2001).

Empirically, the insignificant link between ESG disclosure and firm value also exists (e.g. Qiu et al., 2016). Similarly, a study for Canadian firms found no statistical significance in

the relationship between corporate social performance (CSP) and financial performance (Mahoney and Roberts, 2007).

2.2 | Role for Global Supply Chain during Covid-19

After the introduction of the theory of a schematized nature in organizational behavior of distribution management, it foresaw the picture of a future that interlocked flow systems in an industrial company that had to be interdependent on one another (Forrester, 1958). Even though this article is over sixty years old, it seemingly has captured the key dynamic factors in management that are associated with the contemporary development of supply chain management (SCM).

The terminology of supply chain management has emerged since the past thirty years which is not merely a new word for logistics, regardless its definition varies (Cooper et al., 1997).

I use the definition of a supply chain as "a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/ or information from a source to a customer" (Mentzer et al., 2001).

The irreversible force of globalization and technology evolution has led to the integration of the world and as a result the global supply chains are becoming more vital than ever before. Globalization brought ultra-management challenges in supply chain management triggering the attention from academics and practitioners. Not only a domestic problem, supply chain management (SCM) has also ascended into a national-wide imperative for the product delivery service.

In the context of the Covid-19 outbreak, supply chain risks have severely exposed firms, particularly those in the transportation and logistics sector. The coronavirus pandemic has impacted the stream from retailers to manufacturers. For example, most companies and countries need to keep a steady delivery of different kinds of goods, especially medical supplies. Working virtually and 'staying at home' have increased the demand on some sectors such as online shopping and the technology industry with the surge in digital transactions. However, with less commuting and travel, the price of crude oil faced a drastic decline in demand. Henceforth, firms are involved in coping with more challenges in filling deliveries.

Chapter 3 | Research Methodology

3.1 | Research design

In this paper, I examine the relation of ESG disclosure score and firm performance and corporate value's reaction to before and after the threshold of outbreak of Covid-19 in year-end 2020. Compared to the prior reviews, there are mainly two obstacles in this empirical study.

One is that former studies such as Waddock and Graves in 1997 that found a recursive relationship between a firm's societal performance and its financial performance. Whereby, the endogenous issue of firm performance and ESG disclosure score needs to be taken into consideration. Not only the suggestive evidence demonstrates that *ceteris paribus* CSR activities can lead to superior financial performance, but also an improved future CSR engagement as well.

Another one is that the ESG-firm value relationship can be affected

through two opposite mechanisms with different effects. A firm's

financial performance can be strengthened by ESG engagement

through reconciling the conflicts between managers and

stakeholders. On the other side, ESG activities can also whittle

down the company's financial performance due to over-

investment. Impacted by them, the overall outcome is

interchangeably determined by which is more dominant (Buchanan

et al., 2018).

Aiming to tackle the empirical obstacles, I apply the Difference-in-

Difference (DiD) model to examine the discrepancy in a

company's financial performance across firms in the same sector

with different ESG disclosure score in response to time-varying

effects on the Coronavirus outbreak. Inspired by the previous

literature, I take advantage of the pandemic caused by Covid-19 to

elucidate the potential endogeneity from the relationship of ESG

disclosure score and firm performance. Uniquely, the global

economic crisis caused by the outbreak of Covid-19 differs from

past crises that triggered immense and heterogeneous firm value

fluctuations. I utilize a unique object of an unpredictable

exogenous event for the single observation in this paper which is

beneficial to circumventing the unrelated endogeneity with respect

to the recursive interaction of ESG and firm performance

(Meyer,1995; Roberts & Whited, 2013).

Furthermore, my empirical research model is devised to locate

time-varying effects on ESG-firm value fluctuations. Given that

performing ESG practices is naturally a cost to the firm value, the

unexpected outbreak of coronavirus can enlarge these costs.

Eventually, I examine the variations in firm performance measured

by Tobin's Q for ESG firms surrounding the Covid-19 crisis, while

controlling other relevant variables.

Following the study by Lins et al. (2017) in the 2008 financial crisis, I measure the firm's disclosure in the 2018 concerning that firms might adjust their ESG policy and that it could lead to differences in ESG disclosure scores in anticipation of cases reported of the pandemic that could cause potential risks in the future. Besides, in order to examine whether the association between the ESG disclosure score and firm performance holds when it comes to the period of during the pandemic and post-pandemic, I define the 'Crisis' as a dummy variable that equals one in the period of 2020Q1 and 2020Q3 and zero otherwise. 'Post-Crisis' is also denoted as a dummy variable set to one in the period of 2020Q4 and 2021Q2 and zero otherwise.

In the regression analysis, to align with the previous studies of ESG and firm's financial performance, Model 4.1 and Model 4.2 unveil the difference of variations in firm performance during the

period of pre-pandemic crisis and pandemic crisis and the period of

pandemic crisis and post-pandemic crisis. Dummy variables –

Crisis and Post-Crisis in Model 4.2 would represent the difference.

Furthermore, I control the time dummy in year and quarter

respectively.

To ascertain the Difference-in-Difference of ESGD firm

performance, the key variables are the interaction terms which are

ESGD * Crisis and ESGD * Post-Crisis in Model 4.2 separately.

By controlling the other factors that can possibly affect the

difference in firm performance over time, the objective is to test

how the ESG disclosure can lead to firm performance through the

changes around the Covid-19 crisis by far.

3.2 | Sample and Summary statistics

3.2.1 | Sample construction

To construct my sample, I gathered relevant information on firms'
ESG disclosure score in 2018 by using the classification of the
Bloomberg database for publicly traded firms in the transportation
and logistics sector.

The ESG score is comprised of areas of environment, social, and
governance. The data on Bloomberg's ESG score are provided for
comparable companies reported with over 11,700 companies
covered in more than 100 countries with over 10 years historical
records. And the data collected by Bloomberg are from corporate-
sourced filings such as corporate social responsibility (CSR)
reports, annual reports, official websites, and a proprietary
Bloomberg survey that makes requests directly from companies'
data (Bloomberg, 2020).

Bloomberg designs its proprietary weighting methodology, and
thus the different company can show a different score and

categories. The underlying data from Bloomberg is standardized globally by industry-targeted operating data. The industries are sorted into a wide range of categories for metrics selection by higher, medium, and lower for its environmental impact and by higher and lower social impact, particularly pertaining to safety. And governance data are updated exclusively for all industries. This paper considers ESG score and ESG disclosure score as comprehensive measurements, so this industry metrics selection would not be an issue.

The ESG disclosure score is different from the ESG score. It measures with its three sub-sectors score that quantifies the transparency of a company in disclosing its environment, social, and governance data that has been disclosed for the latest fiscal year. But ESG disclosure score does not quantify the firms' ESG performance and is based on the collected raw data points from 100 out of 219 (Bloomberg, 2020). The ESG disclosure score is

evaluated according to the most common disclosing fields and presented as a percentage of total available areas across the ESG on Bloomberg. For more details, the overall disclosure score that is higher represents a more comprehensive non-financial report. Similarly, the weighted disclosure score is normalized from zero that firms do not report their ESG data to a hundred that report all ESG information. The final disclosure score is accounted for only one targeted-industry type.

In this study, I focus on firms in transportation and logistics sector under the hierarchy of industrials industry for which all disclosure scores are counted based on industrial services. Therefore, the ESG disclosure score I use is comparatively applicable throughout transportation and logistics (or supply chain) industry.

Apart from the ESG disclosure score, I also obtain the accounting data from Bloomberg. In this paper, a micro-cap supply chain

company is defined as the firm that has market capitalization below $1 billion as of year-end of 2019. The study removes micro-cap companies in the transportation and logistics industry because these stocks tend to be less liquid to confront the turmoil and face higher demand while the market is reflectively awakening to fulfill the delivery. Furthermore, I also exclude firms with missing data such as lacking necessary ESGD scores and accounting data. Unlike the prior studies about financial crisis and outbreak of Covid-19 (Lins et al., 2017; Buchanan et al., 2018), I did not exclude the financial firms that have suffered from this unprecedented epidemic because they could not receive any direct financial assistance.

Considering the cases of Covid-19 first informally reported at the end of 2019 till in March of 2020 when the World Health Organization (WHO) formally declared the outbreak of Covid-19. The pandemic crisis is defined as the period from January 2020 to

September 2020. In this period, the outbreak of coronavirus has been found around the world. This period in the view of this research also corresponds to the time that most companies had not reacted to the crisis.

Combining all firms with sufficient data coverage on Bloomberg database, eventually this paper includes a sample of 258 firms with 1,557 observations for which all ESG disclosure scores required are available in the year-end of 2018.

3.2.2 | Definition of key variables

As mentioned earlier, the main proxy for firm value is Tobin's Q which is the ratio of the physical assets' market value of a firm to the replacement cost of its assets for each firm calculated as market value of assets divided by book value of assets. The emergence of Tobin's Q can be traced back to 1966 (Kaldor, 1966) and was popularized ten years after by James Tobin. Tobin's Q is

considered the nexus between macroeconomics products and financial markets and is deemed useful and significant for the valuation of a company. The ratio differs from returns based on accounting with the underlying hypothesis that a company's market value is equal to the replacement costs of a company's assets in the long-term, i.e., absorbing the future cash flows and uncertain risk in the forward-looking perspective. The ratio varies from returns based on stock because the ramification of higher Tobin's Q denotes the manager performance contributes greater value to the firm from invariable capital.

Following the quarterly accounting constructure (Edmans et al., 2017), I set the quarterly measurement. Tobin's Q is computed as book value of assets minus book value of equity minus deferred taxes, plus market value of equity at end of quarter q before the end of 2019 or the last quarter ending in 2019. Then all divided by book value of assets at the end of quarter q-1. Tobin's Q as the

dependent variable is unbiased from estimation errors in terms of econometric theory.

Enlightened by the previous studies involving the determinants of Tobin's Q (Buchanan et al., 2018; Servaes & Tamayo, 2013; Kalcheva & Lins, 2007; Laeven & Levine, 2008), I control the relevant variables for a firm's financial performance in the year before the outbreak of Covid-19. The control variables include firm size, sales growth, capital expenditures, fixed assets to book assets, cash holdings, leverage, R&D intensity, profitability. All accounting data are derived from the quarter q that is the end quarter before the end of 2019 or the last quarter ending in 2019. Market capitalization is in millions of US dollars. Book assets are valued at the end of quarter q.

Firm size, denoted as LNBA, is measured as the natural log of book assets at the end of quarter q. Sales Growth Rate, denoted as

SGR, is captured as the sales in quarter q over the sales in quarter q-4 minus one. Capital expenditures/ book assets, denoted as CAPEX/BA, is measured as the ratio of capital expenditures changing from the previous quarter to q divided by the total assets in the end of prior quarter q-1. Fixed assets/ book assets, shown as FA/BA, is calculated as the book value of property, plant, and equipment at the end of quarter q over the book value of total assets at the end of quarter q. Leverage, denoted as LEV, is the ratio of total debts over total assets, both measured at the end of quarter q. Cash, shown as CASH, is computed as cash plus short-term investments at the end of quarter q over the total assets at the end of quarter q. R&D Intensity, denoted as RDI, is measured by the research and development expense at current quarter q divided by total assets at the end of quarter q-1 and is set to zero when research and development expense is unobservable. Profitability, shown as PROFITABILITY, is measured as the ratio of net income through the quarter q over the total assets at quarter q. An aggregated variable description is provided in Appendix A.

3.2.3 | Descriptive statistics

The companies in the sample need to fulfil the requirements: First, a company chosen as participating in a supply chain is publicly listed and included in company classification of transportation and logistics in the Bloomberg dataset. Second, the company sample excludes the micro-firm for which in this paper it is defined as explained earlier as the firm with market capitalization less than one billion US dollars as of the last quarter of year 2019. Last, chosen firms are required to have sufficient data coverage from accounting statements uncovered in indicated quarters and overview non-financial ESG disclosure score data in the 2018. After the fulfillment of the requirements above, a sample of 1,557 observations in 257 firms was obtained for which variables were available.

Table 3.1: Summary Statistics

Variables	Mean	Std. Dev.	25th perc.	Median
ESGD	32.561	13.542	21.070	30.990
Tobin's Q	1.406	0.805	0.922	1.113
LNBA	8.959	1.201	8.093	8.788
SGR	0.0008	0.438	-0.186	-0.012
CAPEX/BA	0.0002	0.0115	-0.0032	0.0001
FA/BA	0.439	0.251	0.228	0.458
LEV	0.340	0.181	0.230	0.330
CASH	0.130	0.093	0.059	0.110
RDI	0.001	0.0034	0	0
PROFITABILITY	0.007	0.0185	0.0004	0.0067

Table 3.1 (Continued)

Variables	75th perc.	Min	Max
ESGD	43.390	9.500	65.290
Tobin's Q	1.575	0.314	4.589
LNBA	9.706	6.680	12.157
SGR	0.129	-0.864	2.351
CAPEX/BA	0.0037	-0.043	0.040
FA/BA	0.642	0.002	0.9226
LEV	0.461	0	0.8281
CASH	0.181	0.002	0.465
RDI	0.0002	0	0.025
PROFITABILITY	0.0148	-0.056	0.075

Table 3.1 provides the summary description of major variables described earlier. In the first row of Table 3.1, the main variable of interest in this paper, ESGD, is significantly positive with a mean value of 32.561, a standard deviation value of 13.542, 25th

percentile value of 21.07, a median value of 30.99, and 75th

percentile value of 43.39. The result shows the average and median

level of ESGD (Environmental, Social, and Governance

Disclosure) score of ESGD firms with 9.5 minimum score and

65.29 maximum score as supply chain providers on the onset of the

outbreak of the epidemic at the end of or close to the end of year

2019. The second row indicates that Tobin's Q is mostly greater

than zero, with a mean value of 1.406, a standard deviation value

of 0.805, 25th percentile value of 0.922, a median value of 1.113,

and 75th percentile value of 1.575 demonstrating the ramification

of both of shareholders and stakeholders of the firms were more

likely to be confident about the persistence of services offered by

supply chain provider firms that as a part of their portfolios, its

workers, or involved in business engagements confronting

unprecedented uncertainties.

Table 3.2: Correlation Matrix

	ESGD	Tobin's Q	LNBA	SGR	CAPEX/BA
Tobin's Q	0.01				
LNBA	0.41	-0.24			
SGR	-0.10	0.05	-0.02		
CAPEX/BA	-0.01	-0.03	-0.01	-0.03	
FA/BA	0.03	0.02	0.01	-0.10	0.01
LEV	0.21	-0.19	0.21	-0.11	0.0002
CASH	-0.01	0.16	-0.06	0.01	-0.01
RDI	0.05	0.22	0.01	0.05	-0.01
PROFITABILITY	-0.08	0.31	-0.16	0.38	-0.08

Table 3.2 (Continued)

	FA/BA	LEV	CASH	RDI
LEV	0.19			
CASH	-0.31	-0.22		
RDI	-0.13	-0.15	0.05	
PROFITABILITY	-0.05	-0.35	0.04	0.12

The definitions of overall variables are shown as above and other

company characteristics computed as control variables in the

model are as shown in Table 3.1 as well. The correlation matrix of

all variables employed in the model is presented in Table 3.2.

Values of Tobin's Q and other control variables are winsorized at

the 1st and 99th percentiles.

Chapter 4 | Pandemic-Period Firm Performance

4.1 | Baseline Results

I estimate the regression model of firm performance prior to the onset of the crisis period as an association with firms' pre-pandemic ESG disclosure ratings and an amount of control variables. The model shows in Equation 4.1 as:

Tobin's $Q_{i,t} = \alpha_0 + \alpha_1 ESGD_{i,2018} + \alpha_2'X_{i,t-1} + \text{Time Fixed Effect} + \varepsilon_{i,t}$,

……………………………………………………..................4.1

where the dependent variable, Tobin's Q, is at quarter q ending at or closing to the last quarter of year 2019 measured as the ratio of assets in book value, minus equity in book value, minus deferred tax liabilities plus equity in market value at the quarter q and all divided by the assets in book value at the previous quarter q-1. The main explanatory variable of interest, $ESGD_{i,2018}$, is the model's proxy sourced from Bloomberg proprietary model formed as an overview of environmental, social, governance disclosure score in the year 2018. $X_{i,t-1}$ is a vector of control variables. More detailed

of control variables of firm's characteristics are also displayed in

Table 3.1 and Appendix A. Standard errors of heteroskedasticity

consistence are noted in parentheses. Specifically, ***, **, and *

mark that the parameter estimation significantly differs from zero

at 1 percent, 5 percent, and 10 percent level, respectively.

I control the year fixed effect in Column (1) in Table 4.1 that

shows that firms with higher ESG disclosure score ratings perform

significantly greater than those with lower ESGD firms. The effect

of ESG disclosure score on firm performance is economically

impactful: a one-standard-deviation increase in ESGD (13.542) is

associated with a 9.57 (13.542* 0.00707* 100%) percentage point

(13.542* 0.00707* 100%) increase in the value of Tobin's Q.

Nevertheless, specifications presented in Column (1) of Table 4.1

have a concern that a strong performance of higher ESG disclosure

score firms can be a fallacy that existing omitted variables are

correlated with ESGD, instead of ESG disclosure itself. To eliminate this possibility, under the assurance of healthy financial performance, I employ several proxies that are proven to affect the value of Tobin's Q in prior studies as company's characteristics. I calculate the firm's financial health and characteristics as the end of year 2019, or as close as to firms that lack of disclosure of the fiscal year end before the onset of the pandemic outbreak.

To confirm that higher ESG disclosure score firms do have a better performance than those with a lower score at the onset of the Covid-19 outbreak, the results in Column (2) of Table 4.1 that control time fixed effect as quarterly indicate that the outperformance from higher ESGD firms does not attenuate but strengthens when the additional variables are included. More importantly, the effect remains financially positive. For instance, in Column (2), a one-standard-deviation increase in ESGD (13.542)

is associated with a 9.34 (13.542* 0.0069* 100%) percentage point increase in firm performance before the onset of the crisis.

When it comes to the control variables, based on the Model 4.1 in Column (1), a one-standard-deviation increase in firm size (1.201), sales growth rate (0.438), capital expenditures to book assets (0.0115), and fixed assets to book assets (0.251) is in association with a variation of firm performance of -19.22 (1.201* (-0.16)* 100%), -38.50 (0.438* (-0.879)* 100%), -1.01 (0.0115* (-0.879)* 100%), and 7.91 (0.251* 0.315* 100%) percentage points, respectively. Moreover, a one-standard-deviation increase in leverage 0.181, cash 0.093, R&D intensity 0.0034, and profitability 0.0185 results in a change of firm performance of -2.66 (0.181* (-0.147)* 100%), 12.62 (0.093* 1.357* 100%), 14.96 (0.0034*43.99*100%), and 21.26 (0.0185*11.49*100%), separately.

Table 4.1: ESGD Score: Yearly and Quarterly Performance

Independent Variables	Tobin's Q (1)	Tobin's Q (2)
ESGD	0.00707***	0.00690***
	(0.00160)	(0.00160)
LNBA	-0.160***	-0.161***
	(0.0200)	(0.0200)
SGR	-0.119**	-0.136***
	(0.0486)	(0.0510)
CAPEX/BA	-0.879	0.165
	(1.462)	(1.478)
FA/BA	0.315***	0.308***
	(0.0767)	(0.0765)
LEV	-0.147	-0.139
	(0.127)	(0.126)
CASH	1.357***	1.339***
	(0.230)	(0.231)
RDI	43.99***	43.61***
	(7.311)	(7.392)
PROFITABILITY	11.49***	11.63***
	(1.492)	(1.503)
2020-Q1		-0.217***
		(0.0585)
2020-Q2		-0.146**
		(0.0615)
2020-Q3		-0.0881
		(0.0638)
2020-Q4		-0.0324
		(0.0669)
2021-Q1		-0.00744
		(0.0674)
2021-Q2		0.172
		(0.149)
Year 2020	-0.117**	
	(0.0500)	
Year 2021	0.0270	
	(0.0671)	
Constant	2.298***	2.316***
	(0.170)	(0.170)

Time Fixed Effects	Yes	Yes
Observations	1,557	1,557
R-squared	0.219	0.225

As a result, the financial impact of ESGD ratings on logistics' firm performance during the pandemic is greater than three-fifths of the impact of cash holdings, but slightly less than half of the impact of profitability delineating that corporate social responsibility disclosure score is a potential aspect of explaining the entire firm performance in the pandemic period.

In Table 4.2, by separately controlling time fixed effects sorted by yearly and quarterly, I re-examine the prior model, but in lieu of directly taking the ESGD score as my proxy for explanatory, I split the firms into ESG disclosure score quartiles and conclude three dummies for quartile proxy from 2 to 4 where the intercept denotes the effect of the first quartile. By adopting this approach, the analysis can be applied to examining whether the effect of a firm's non-financial disclosure policy on firm performance is more

pronounced at a very high or very low part in the quartile of ESG

disclosure. The result in Column (1) while controlling the year for

fixed effect shows the variation in firm performance through the

whole industry from the best to the worst ESG disclosure score

quartile. This is captured by the coefficient on ESGD4 - 16.6

percentage points.

For firm performance in quarterly time fixed effect, the variation is

slightly less at 16.2 percentage points. This result again indicates

that companies with higher ESG disclosure ratings had the best

pandemic crisis period financial performance than those with lower

ratings. Whereas, from the worst to the medium, differences in

firm financial performance are at least slightly negative in both of

yearly and quarterly time fixed effects.

Featured by the entire set of control variables, in Columns (1) and

(2) in Table 4.2, Tobin's Qs add up to about minus 15.7 percentage

points and minus 15.4 percentage points from the lowest level to the second lowest level of ESGD quartile as ESGD2, respectively. The downside effect of ESGD on firm financial performance attenuates 6.97 percentage points $(((-0.0873)- (-0.157))* 100\%)$ and 6.37 percentage points $(((-0.0903)- (-0.154))* 100\%)$ till minus 8.73 percentage points and minus 9.03 percentage points while accruing from the second lowest ESGD quartile of ESGD2 to the third ESGD quartile of ESGD3.

Turning to firmly strengthening the financial performance from the third ESGD quartile of ESGD3 to the fourth ESGD quartile of ESGD4, the improvement yields a more conspicuous performance for a value enhancement of 25.33 percentage points $(((0.166- (-0.0873))* 100\%)$ and 25.23 percentage points $((0.162- (-0.0903))* 100\%)$ for yearly and quarterly time fixed effects, respectively.

Consequently, my findings are that the ESG disclosure score has a significantly positive impact on the firm value with greater rating and can destroy the company's performance while situating in a lower ESGD quartile with lower rating as well. This suggests that during the crisis period, shareholders were majorly pessimistic when a firm in the supply chain had an inadequate corporate social responsibility disclosure rating and most reassured optimistically when the firm's ESG disclosure score is in high-grade. Apparently, before splitting, the collective benefit of investing in ESG activities outweigh the cost of its engagement. In contrast, in the relative lower quartile of ESGD2 and ESGD3, it is much costly for a firm with both of a deteriorating performance and negative coefficients to implement ESG practices compared with a firm with both of a value-enhancement and a positive coefficient in ESGD4.

For control variables in the model, firm performance has significantly positive associations with cash holdings, research and

development intensity, and profitability, but significantly negative

associations with firm size and sales growth rate.

Table 4.2: Dummies for Quartiles of ESGD Score: Yearly and Quarterly Performance		
Independent variables	Tobin's Q (1)	Tobin's Q (2)
ESGD2	-0.157***	-0.154***
	(0.0553)	(0.0552)
ESGD3	-0.0873	-0.0903
	(0.0590)	(0.0592)
ESGD4	0.166***	0.162**
	(0.0641)	(0.0637)
LNBA	-0.158***	-0.159***
	(0.0195)	(0.0194)
SGR	-0.119**	-0.136***
	(0.0488)	(0.0513)
CAPEX/BA	-0.967	0.0710
	(1.457)	(1.472)
FA/BA	0.251***	0.245***
	(0.0770)	(0.0767)
LEV	-0.0951	-0.0880
	(0.129)	(0.128)
CASH	1.318***	1.300***
	(0.231)	(0.232)
RDI	46.74***	46.35***
	(7.428)	(7.499)
PROFITABILITY	11.29***	11.43***
	(1.465)	(1.474)
2020-Q1		-0.217***
		(0.0588)
2020-Q2		-0.146**
		(0.0614)
2020-Q3		-0.0892

		(0.0637)
2020-Q4		-0.0337
		(0.0665)
2021-Q1		-0.00918
		(0.0672)
2021-Q2		0.164
		(0.145)
Year 2020	-0.117**	
	(0.0500)	
Year 2021	0.0240	
	(0.0667)	
Constant	2.543***	2.556***
	(0.173)	(0.172)
Time Fixed Effects	Yes	Yes
Observations	1,557	1,557
R-squared	0.228	0.234

4.2 | Comparing Firm Performance Inside and Outside of the Pandemic Period

By far, the evidence above has pointed out that ESGD score has a positive influence on the firm performance before the onset of the pandemic of Covid-19 i.e., the ESGD score can fortify the firm performance during the overall periods. In this section, I test if this positive relationship is exclusive to periods of the outbreak of the Covid-19 and the post-crisis when the world started to be reflective to the epidemic that might be attributed to other unobservable

factors correlated to the ESGD score which is omitted in the

model.

To address this concern, I apply a difference-in-difference (DID)

regression of measurement of Tobin's Q on ESGD score with two

interactions of two time-dummy variables including crisis period

and post-crisis period and other control variables. To be more

specific, I build a panel of quarterly firm performance measured by

a proxy of Tobin's Q for the entire group of firms in the sample

from the first quarter in 2020, prior to the declaration of pandemic

crisis, to the second quarter in 2021, several months into the

adequate time for the reflective recovery. Taking the panel, I

estimate the model as follows:

Tobin's $Q_{i,t} = \beta_0 + \beta_1 ESGD_{i,2018} * Crisis_t + \beta_2 ESGD_{i,2018} * \text{Post-}Crisis_t$

$+ \beta_3' X_{i,t-1} + \text{Time Fixed Effect} + e_{i,t}$

…………………………………………………...............4.2

where Tobin's $Q_{i,t}$ is accordingly the quarterly value as the measurement of corporate performance. $ESGD_{i,2018}$ is my proxy for ESG disclosure score at the year-end of 2018. $Crisis_t$ is a dummy variable that is set to one if the time period is between the first quarter in 2020 (2020-Q1) and the third quarter in 2020 (2020-Q3) and equals zero otherwise. Post-$Crisis_t$ is another dummy variable that is set to one if the time period is between the fourth quarter in 2020 (2020-Q4) and the second quarter in 2021 (Q2-2021) and equals zero otherwise. $X_{i,t-1}$ is the vector of control variables as consistent with Model 4.1. I take the ESG disclosure score at the year-end of 2018 outside the pandemic period in order to circumvent the potential change that firms could possibly have adjustments of their environmental, social, governance strategies and disclosure policies that can lead to differences in the score of ESGD in anticipation of the unprecedented pandemic. ***, **, and * indicate that the parameter estimation significantly differs from zero at 1 percent, 5 percent, and 10 percent level, separately.

As in Model 4.1, time dummy variables are specified at yearly and quarterly levels and firms as before, with market values below $1 billion as of year-end of 2019 are excluded from the analysis. In Model 4.2, the coefficient on the interaction between 2018 ESG disclosure score and the crisis (β_1) captures the differentiated impact of ESGD on quarterly and yearly financial performance during the three quarters from the first quarter of year 2020 to the third quarter of year 2020 controlling time-series in quarterly and yearly performance.

The yearly and quarterly results are both presented in Table 4.3. More importantly, specifications in Columns (1) and (2) indicate that high-ESGD firms have an excellent performance under the crisis period. To be more precise, according to the financial significance, the coefficient of 0.00519 on the ESGD * Crisis interaction delineates that a one-standard-deviation increase in

2018 ESGD (13.542) is associated with a 703-baisis-point

(0.00519* 13.542* 100%) greater firm performance during the

pandemic period on a yearly basis. During the identical period, in

terms of the financial significance, the coefficient of 0.00594 on

the ESGD * Crisis interaction indicates that a one-standard-

deviation increase in 2018 ESGD (13.542) is similarly associated

with an 804-basis-point (0.00594* 13.542* 100%) higher

performance on a quarterly basis. After the pandemic crisis with

vigilant reflections, the relationship between ESGD and corporate

performance remains statistically significant.

Quantitatively, the coefficient of 0.00814 on the ESGD * Post-

Crisis interaction indicating that a one-standard-deviation increase

in 2018 ESGD (13.542) is associated with a 1102-basis-point

(0.00814* 13.542 * 100%) greater performance after the pandemic

crisis on a yearly basis. During the same period, the coefficient of

0.00663 on the ESGD * Post-Crisis interaction indicates that a

one-standard-deviation increase in 2018 ESGD (13.542) is associated with an 898-basis-point (0.00663* 13.542* 100%) higher performance on a quarterly basis.

These outcomes have proven that the greater firm's financial performance earned by high-ESGD firms are attributed not only to the unexpected event, but also the progress after the world supply chain had accommodated and was being reflective. Such evidence of firm performance in the post-pandemic world presents that the high-ESGD corporates keep benefiting from the ESG disclosure while engaging in the CSR under the confrontation to the chronic pandemic. The market recovery remains uncertain because new variants of Covid-19 keep developing such as Delta, that implies the level from the status quo to the fully adjusted post-pandemic would stay unclear and longer than ever expected.

The unpredictability of this event could disrupt the global economy. However, when the solutions such as different kinds of vaccinations are brought to the surface, prices overall would be adjusted to a new rebalanced level. That is to say that any benefiting ESG action of delivering the trust and sustainability to the investors would keep being reflected into the firm performance throughout the periods. In details reported in Table 4.3, the ESGD score is held constant as of the year-end 2018 aiming at justifying whether the measurement of ESG disclosure score has an impact on firm performance during and after the pandemic.

Simultaneously, I also try to control the firm fixed effect to avoid those time-invariant omitted factors, and thus ESGD itself can be also taken in by a firm's factors where all the standard errors are clustered by firm level. Undesirably, the relationship of interactions proves to be insignificant, even though the control variables are still significant as expected.

The signs of coefficients for control variables remain exhaustively consistent with the change value of Tobin's Q in the previous analysis of Model 4.1 when the values have slight differences.

	Table 4.3: Overview of ESG Disclosure Score	
Independent variables	Tobin's Q (1)	Tobin's Q (2)
ESGD * Crisis	0.00519*** (0.00175)	0.00594*** (0.00194)
ESGD * Post-Crisis	0.00814*** (0.00201)	0.00663** (0.00275)
LNBA	-0.154*** (0.0195)	-0.154*** (0.0194)
SGR	-0.129*** (0.0490)	-0.141*** (0.0510)
CAPEX/BA	-0.429 (1.452)	0.124 (1.474)
FA/BA	0.311*** (0.0768)	0.307*** (0.0768)
LEV	-0.134 (0.127)	-0.123 (0.127)
CASH	1.349*** (0.232)	1.342*** (0.232)
RDI	44.05*** (7.345)	43.80*** (7.385)
PROFITABILITY	11.59*** (1.494)	11.74*** (1.508)
2020-Q1		-0.409*** (0.0872)
2020-Q2		-0.339***

		(0.0913)
2020-Q3		-0.281***
		(0.0913)
2020-Q4		-0.248**
		(0.114)
2021-Q1		-0.222**
		(0.111)
2021-Q2		-0.0401
		(0.185)
Year 2020	-0.310***	
	(0.0764)	
Year 2021	-0.239**	
	(0.0937)	
Constant	2.465***	2.467***
	(0.186)	(0.186)
Time Fixed Effects	Yes	Yes
Observations	1,557	1,557
R-squared	0.218	0.222

Chapter 5 | Conclusions and Social implications

The result of a positive effect of ESG activities on firm value has proven that at the onset of the Covid-19 pandemic, the conflict-resolution advantages of ESGD dominate the over-investment costs. First, before the onset of the pandemic, the ESGD significantly contributed to firm value. Second, in ESGD quartiles, the ESGD at the lower-level quartile suggests that both the second and the third quartiles in the ESGD have negative effects on the firm value, while the third level quartile of ESGD has a slightly negative effect on firm value, despite being statistically insignificant. In contrast, the ESGD in the fourth quartile implies that the higher-level quartile of ESGD performs a superior effect on enhancing firm value.

Third, the results have shown that the effects of ESGD on the value change are all significantly associated with positive influences during the pandemic and post-pandemic period. In sum,

the interests of conflict-resolution in ESG disclosure outweigh the cost concern of over-investment in ESG activities overall. More accurately, the high ESGD firms outperform the low ESGD firms by at least a 25.23 percentage points improvement. The positive effect of ESGD also persists throughout the period.

In addition, I interpret the social outcomes as follows. First, driven by sustainable development in the world economy, the service delivered by the supply chain management firms with higher ESGD should be profitable and desirable in the long-run as the relation shows a value-creation to the firm performance as designed in present. Second, my results suggest that during the unique pandemic in the world it is worth investing in firm's ESG practices to increase the firm value. Though in the short-term the relatively lower ESGD firms might see value eroded while investing in ESG practices.

To conclude, the role of sustainability to the business world is as important as to confronting the chronically uncertain Covid-19 epidemic. Pay-offs of investing in ESG practices are desirable in increasing the firm value, while mitigating the concern of sustainability and remaining resilient.

Chapter 6 | Limitations and Suggestions for future research

Firstly, potential improvements in this paper can be traced to the fact that Covid-19 that is a recent occurrence given its emergence in the early 2020. As a result, I can only examine the short-term impacts. At the fourth wave with the Delta variant and other potential mutations, further research can examine a longer Covid-19 horizon.

Second, the interest of this research concentrates on the important role of the transportation and logistics industry given that the much higher demand for products and that the number of people being forced to work from home. As a result, the number and diversity of observations can be widened and enlarged. Simultaneously, a broader sample might generate differential outcomes when controlling both the firm fixed effect and the industry fixed effect.

Third, as in this paper I assess the mechanism of how ESG

disclosure affects firm value treating the surrounding onset of

Covid-19 as an exogenous shock to the supply chain industry in

order to examine the relationship between ESG disclosure and firm

performance by applying difference-in-difference (DiD) model.

Caveats exist. The omitted time-serious heterogeneity in firms

might give reasons to my findings, however, the results remain

convincing under the inclusion of a prior suggestion of an

association between ESG practice and firm value and a battery of

control variables. Furthermore, the link is constructed using the

previous academic literature and the proxy is proprietary models of

the specific dataset provider. Other channels might also affect the

firm value and other providers can have differential measurements.

In further research, to estimate other channels of explaining the

association between ESG practices can be another rewarding path.

Appendix A. Variable definitions

Variable	Definition
ESGD	An indicator of ESG disclosure score that is proprietarily computed by Bloomberg reported in the end of year 2018.
Crisis	A dummy variable set to one in the period of the first quarter in 2020 to the third quarter in 2020 and equals zero otherwise.
Post- Crisis	A dummy variable set to one in the period of the last quarter in 2020 to the second quarter in 2021 and equals zero otherwise.
Tobin's Q	The ratio is computed as book value of assets minus book value of equity, minus deferred taxes, plus market value of equity at end of quarter q before the end of 2019 or the last quarter ending in 2019, and then all divided by book value of assets at the end of quarter q-1.
Book assets	The value of book assets at the end of quarter q.
Firm size	The natural log of book assets.
Sales Growth Rate	The percentage change in current quarter q sales divided by quarter q-4 sales.
Capital expenditures/ book assets	The ratio of capital expenditures from q-1 to q divided by the total assets in the end of prior quarter q-1.
Fixed assets/ book assets	The book value of property, plant, and equipment at the end of quarter q over the book value of total assets at the end of quarter q.
Leverage	The ratio of total debts over total assets both measured at the end of quarter q.

Cash	Cash plus short-term investments at the end of quarter q over the total assets at the end of quarter q.
R&D Intensity	Research and development expense divided by total assets at the end of quarter q-1 and is set to zero when the research and development expense is unobservable.
Profitability	The ratio of net income through the quarter q over the total assets at quarter q.

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