The link between ESG and firm performance in healthcare industry: the moderating role of firm age and people awareness

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This paper examines the link between ESG and firm performance in healthcare industry moderated by firm age and advertising expenses from 2011 to 2020. Firm performance is measured by Tobin's Q, ROA, ROE and asset turnover. This study finds the evidence that environmental pillar is the most important metric to improve firm value in healthcare equipment & supplies and advertisement helps social and governance pillars to add more value. Biotechnology looks alike, but firm age can moderate environment pillar to increase the value. Moreover, social pillar is the most influential to add firm value for healthcare provider & services and the effect is much better with older firms. Also, advertisement helps environmental pillar to enhance firm value even though its score per se cannot. Correspondingly, advertisement can be a moderator for environmental and governance pillars to add firm value for pharmaceuticals while its ESG subcomponents per se cannot. The conclusions concerning other performance measures (profitability and efficiency) are outlined in the conclusion section. The study provides an opportunity for healthcare industry to leverage ESG for firm performance improvement and presents refined guidelines that employ different firm performance measurements and ESG metrics compared between crisis and non-crisis

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CHAPTER 1: INTRODUCTION

1.1 Background

One of the trends in portfolio management is the incorporation of environment, social and governance (ESG). ESG actually improves risk-adjusted returns and add more annual performance. Furthermore, volatility and the likelihood of negative daily return were reduced. Besides of that, fund managers can use ESG information to create risk-adjusted outperformance and transform investment toward a better long-term outperformance (Verheyden et al., 2016). According to the empirical study of Hartzmark and Sussman, funds with low sustainability ratings have net cash outflows while those with high ratings have net cash inflows (Hartzmark & Sussman, 2019). It is even clear to say once again that more people are interested in ESG. The relationship between ESG and firm performance is a big interesting issue. Most of the studies found a positive relationship (Jo & Harjoto, 2011) or under some conditions such as high customer awareness (Servaes & Tamayo, 2013). Meanwhile, some studies have negative and non-related relationships (Buallay, 2019; Makni et al., 2009). These findings could occur because costs of implementation of ESG initiatives may not be enough supported and cannot make more visible for stakeholders to approve. Moreover, there are high investments that would affect to firms' resource for the operations and come up with the detrimental firm performance. Particularly, different industries could affect the extent of ESG disclosure and the result would differ (Giannarakis, 2014).

According to the social structure changing to elderly society as can be seen from life expectancy globally increased from an average of 29 to 73 years in 2019 (Roser et al., 2013), the aging society has resulted in an increasing number of patients. Most of the illness in elders are chronic diseases that require constant medical attention and derive the use of more drugs as well so healthcare industry has growth potential. Especially during the epidemic crises like COVID-19, it affected stock markets in major affected countries that declined quickly (Liu et al., 2020). On similar lines as COVID-19 such as SARS, the Ebola, they affected in negative ways in terms of disinvestment, declining of stock price, etc. (Del Giudice & Paltrinieri, 2017).

However, investors are interested in stocks of healthcare as can be seen from the pouring money in healthcare stock. Investors believe that healthcare companies receive benefits from the pandemics as the companies are highly demanded in the supply of medicines and medical equipment, stocks performed well compared to other industries (Mittal & Sharma, 2021). In addition, healthcare industry is highly regulated as it relates to human life such as medical waste management, radiation protection rules, patient security rule, ethics and etc. (Singh et al., 2013) which are related to environment, social and governance. Meanwhile, healthcare may negatively impact environment and social from waste water, hazardous waste (infectious and sharp), emission of greenhouse gas (Raggi & Paglicci, 2015). For examples, unwell-managed waste disposal may cause risk to children for exposure to blood born viruses while playing with discarded syringes and needles. Besides, unfenced waste disposal places may spread diseases and increase the risk of disease and contamination from the visiting of animals and human scavengers (Alemayehu et al., 2015). This industry involves with many stakeholders so investors might pay attention to companies' compliance regulations which can represent ESG performance. Notably, if companies overlooked the good management or violate the regulations, contradiction between the aim and the negative impact would happen because this industry instead of protecting and improving health risk but creates the risk by itself. Therefore, it would affect to social image given that healthcare industry has close relation with various stakeholders and need to maintain a satisfactory level of corporate reputation (Giannarakis, 2014). From this matter, the reputation of healthcare companies could build the customers' trust and be a foundation for improvement (Leatherman & McCarthy, 1999) so ESG can play an important role to enhance both reputation and trust which are crucial elements for this industry to add more value and corporate performance.

1.2 Research gap and motivation

First, several past literatures have investigated ESG-firm performance relationship which include many sectors. Industry is an important factor to influence the relationship (Van Beurden & Gössling, 2008). Therefore, this study needs to narrow the sample to the healthcare industry where has growth potential and may be more attractive to investors. It constitutes a good example to the research sample to see how healthcare companies can balance ESG practices in their business strategy. Second, there are not many literatures studying the association between ESG and firm performance in healthcare industry. The past relevant researches which study in this industry mostly focus on the relationship but rarely include quality study for examining factors to influence the ESG-firm performance relationship or how ESG impact to the performance. Third, healthcare industry is diversified including healthcare providers & services, healthcare equipment & supplies, biotechnology & medical research and pharmaceutical. These subsectors are relatively different especially in aspect of nature of business and so do the correlations among performance measures as shown in Table 1. Thus, investigation in disaggregate level by subsector can be useful to see how different impact of ESG on firm performance. Lastly, there is no study using COVID health-19 as an indicator to moderate the impact of ESG on firm performance in this industry. The study employs COVID-19 as a moderator because this pandemic occurred in the period that ESG disclosure has already been popular and it affect to overall businesses in global market. While, other pandemics in similar line as COVID-19 such as Spanish Flu in 1918, SARS in 2003, Avian Flu in 2004, Swine Flu in 2009 and EBOLA in 2014 are not in the period that ESG was in trend. Some pandemics did not affect in global like SARS in China, EBOLA in Africa. Therefore, COVID-19 is an appropriate situation to substitute other negative risks for this study.

1.3 Research questions

There are several scholars have explored the connection between Environment, Social and Governance practices and corporate performance before but in different context that gives this paper an opportunity in order to apply the concept in industry-level context in term of specific industry like healthcare. Therefore, this paper formulates the main research questions are as follow:

R1: What is the most subcomponents of ESG that affect to firm performance in healthcare industry?

R2: Does the relationship between ESG and firm performance in healthcare industry change during the pandemic, COVID-19?

R3: What is the moderator of the relationship between ESG and firm performance in healthcare industry?

1.4 Objectives

The objective of this study is to examine the impact of ESG on firm performance in different dimensions in healthcare industry and to study whether the relationship between ESG and firm performance changes during COVID-19. The advantage of the result is to emphasize that whether ESG can be an important indicator to mitigate the risk during the time of crisis. Also, it would be useful for investors who want to invest in uncertain times due to high demand and further growth in healthcare industry. In other words, they are able to make stock prediction by applying ESG in their decisions. Furthermore, another two aims are to provide insight for executives and managers to improve sustainability strategy by allocating resource to ESG activities appropriately and to investigate the factors that influence the association between ESG and firm performance in healthcare industry.

1.5 Contributions

This study can address the gaps of the existing literature. First, this study specifically focuses on firm age and people awareness which are qualitative factors to translate the relation between ESG and firm performance. Moreover, prior studies examine the moderating role of age and advertising intensity to influence CSR-firm

performance but there is scarce study about age and advertising spending interact with ESG to see the moderating role to drive firm performance in this industry. Most past researches apply these variables as control variables to see which related to financial performance. Second, the result of ESG is likely to be time-varying, this paper expands time scope covering 2020 which include the risk from pandemic or negative risk. As a result, this paper could raise the importance of ESG during the crisis and also help investors and portfolio managers to create portfolios that have potential to generate return. Third, particular insights may be provided by knowing which individual components of ESG (environment, social and governance) is the most important on firm performance for healthcare industry so management can invest appropriately in ESG activities.

CHAPTER 2: LITERATURE REVIEW

2.1 Concept and theory

Environment, Social and Governance practices in companies linked to three theories in the relationship between ESG and firm performance. Stakeholder theory is the first theory. Freeman defined stakeholder as groups and individuals who can affect or are affected by the achievement of an organization's objective including shareholders, customers, suppliers, employees and government which are both internal and external stakeholders (Freeman, 2010). Stakeholder theory emphasizes that social responsibility improved stakeholder relationship and come up with the benefits (Barnett & Salomon, 2012). For instance, talented employees are attracted to apply jobs so competitive advantage for companies will occur in the future (Greening & Turban, 2000) so that they will become potentially productivity to generate a better performance. In this sense, making a good relationship with stakeholders could bring trust to the companies and result in success. The reason is improving customer satisfaction or meeting demand of stakeholders can increase market value and profitability, the long-term benefits (Harrison & Freeman, 1999).

Second approach is agency theory. Jensen and Meckling defined the theory that connects to the relationship between principals and agents who are on behalf of principals in business transactions in order for principals to get the best interests and agents get paid for their works (Jensen & Meckling, 1976). The inability of principals to know the information of agents' decision causes an information asymmetry from moral hazard so that agency cost incurred to avoid conflict of interest. The degree of agency conflict will be different depending on the effectiveness of corporate governance to reduce the problem (McColgan, 2001). Krüger argued that CSR is likely to be driven by agency cost because it might be invested by managers at shareholders' money in order to improve their personal images and to secure their positions (Krüger, 2015). Therefore, corporate governance plays important role to minimize the conflict of interest because a good corporate governance can optimize the business performance in the best interest of principals, limit agency cost and corporation can be survival by assisting the board's performance to control the business operation (Tarmuji et al., 2016). In other words, the effectiveness,

transparency of management system can build trusts and confidence to stakeholders thereby it can be said that corporate governance could make sustainable growth and add value.

The last approach is legitimacy theory. It is about organizations and society are associated because the businesses need to ensure that they behave in bounds and norms of societies. As Shocker and Sethi (Shocker & Sethi, 1973) stated “In a dynamic society, neither the sources of institution must constantly meet the twin tests of legitimacy and relevance by demonstrating that society requires its services and that the groups benefiting from its rewards have society approval”. It seems like a social contract that the organizations should comply otherwise societies might not support companies. ESG disclosure is one of the ways to explain particular sustainability reporting practices and allow societies to assume that the entities have proper actions being consistent with expectation of societies or social contracts. This view is supported by some statement made by Lindblom (1994), as quoted by Gray and Lavers (1995) (Gray et al., 1995), that “legitimacy is a condition or status which exists when entity’s value system is congruent with the value system of the larger social system of which the entity is a part. When a disparity, actual or potential, exists between the two value systems, there is a threat to the entity’s legitimacy”. Therefore, entities are pressured to increase their reporting of environmental, social and governance information which is non-financial to meet stakeholders’ demands of accountability and to reinforce its legitimacy (Manes-Rossi et al., 2020; Peña & Jorge, 2019).

2.2 Relevant researches

There are empirical studies in the prior relevant literatures producing mixed conclusions of the impact of ESG on firm performance in healthcare industry. First, some studies suggest a positive relationship between ESG and firm performance. Kuykendall found that healthcare is one of the sectors which is an obvious industry where positive trend between ESG rating and stock market performance exists (Kuykendall, 2019). The possible reason is due to the characteristics that related to ESG policies unintentionally. Profitability and performance are intertwined with ESG

motives. Park, K studied ESG rating and financial performance in U.S firms in many sectors including healthcare (Park, 2019). The paper informed that ESG is significantly and positively affect to firm performance in term of return on assets except environmental pillar score. In this sense, firm value can be developed by ESG score. Moreover, ESG can improve firms' efficiency or asset turnover which healthcare sector has ability to generate higher income relative to ESG with companies' assets (Kuzey et al., 2021). In addition, weighted average cost of capital and cost of equity can be reduced by ESG and corporate governance dimension (Piechocka-Kaluzna et al., 2021) that lower cost of capital brings higher valuation (Giese et al., 2019).

The second empirical results suggest a non-significant relation between ESG and firm performance. Constantinescu, who studied the impact of sustainability disclosure on firm's value for energy and healthcare industry found that there are no significant connections between ESG disclosure and firm value in healthcare industry (Constantinescu, 2021). The discussion of the adverse aspect is related to the research of Deswanto and Siregar (2018) that investors do not concern for the environmental aspect when making a decision on the capital market (Deswanto & Siregar, 2018). Also, (Kuzey et al., 2021) studied ESG and firm performance which measured by three dimensions: market-based, accounting-based and sales-based performance in three service sectors like tourism, healthcare and financial sectors. They suggest that ESG and change in ESG performance cannot improve firm value and profitability for healthcare sector. The reason is investors are satisfied with the current level of CSR engagement or ESG score because excessive level might be costly and then could be harmful to firm performance. Due to the empirical evidence of Kuzey et al., (2021), CSR committees cannot moderate the association in healthcare sector. Therefore, the moderators need to further examine to provide useful insights into how ESG affects to firm performance. The mixed findings of connection between ESG and firm performance need to further investigate in order to minimize the biasness.

CHAPTER 3: RESEARCH HYPOTHESES

To answer the research questions, we have developed four hypotheses as follow;

3.1 ESG and firm performance hypothesis:

According to the indefinite outcomes of the prior literatures, this paper needs to study deeply whether individual components of ESG is positively impact to firm performance and firm value. In addition, ESG disclosure reflects transparency about company's performance because this nonfinancial information could affect financial performance over the long term and have sustainability (Eccles et al., 2012). Healthcare is an industry where non-financial information is disclosed such as CSR disclosure because it concerns the relation with various stakeholders and maintenance of reputation (Giannarakis, 2014). Firms with good reputation bring customers to buy their products and services so cash flows increase and firm value is added (Gillan et al., 2021) so the first hypothesis states:

H1a: ESG disclosure has a positive impact on firm performance in healthcare industry.
H1b: ESG combined score has a positive impact on firm performance in healthcare industry.
H1c: Subcomponents of ESG have a positive relationship with firm performance in healthcare industry.

3.2 COVID-19 hypothesis:

COVID-19 is one of the risks that impacts wide range on health and economic. ESG is the factor to mitigate the risk in unusual situation (Broadstock et al., 2021) and firms with higher ESG score perform better during the pandemic (Engelhardt et al., 2021). Mittal and Sharma suggest that healthcare and pharmaceutical sector are affected in different way compared to other sectors resulted from benefit from the

pandemic goes to this industry (Mittal & Sharma, 2021). Therefore, the second hypothesis states:

H2: The relation between ESG and firm performance during COVID-19 in healthcare industry changes relative to the previous pandemic period.

3.3 Firm age hypothesis:

Firm age plays an important role to increase visibility through accumulating reputation and confidence given it is related to stakeholders and experience. Generally, older firms have built relationship with customers for a long time while younger firms lack of experience and reputation so they are in low visibility for stakeholders (D'Amato & Falivena, 2020). In other words, younger firms are unable to provide creditability and confidence to the stakeholders relative to those who are older so that younger firms need to work hard in order to improve the relationship with customers. As previously mention that firm age affects to reputation, the development of customer satisfactions can improve reputation where reflects the association Saeidi et al., 2015 and be an instrumental role for healthcare industry to make people trust and confident. On the other hands, the impact of ESG may not have much on firm performance for those who are well-known because people already put their trust in these companies and firm performance is already well-performed. Therefore, the third hypothesis states:

H3: Younger firm has positive impact on the relationship between ESG and firm performance in healthcare industry

3.4 People awareness hypothesis:

Advertising expense can be a proxy of people awareness in companies. (Baron, 2001) cited that firms may adopt a practice labelled as socially responsible because it increases demand for its product. Firms, which signal to people that they are involved in environment-oriented activities or advertise their good deeds, such as taking care of social including community, would obtain a good social image and customers' awareness. Therefore, it could make firms more notable than other peers (Lee & Kim,

2021). Due to the fact that providing the information or signaling good deeds is to inform consumers about their brands' ESG achievement to increase trust, it can reduce information asymmetry between companies and consumers (Lee et al., 2022). This is why advertising creates reputation and trust where are important to healthcare industry. Consequently, customers will know how the company is involved in sustainability activities then customers will reward company for its efforts. This view has been supported by Servaes and Tamayo who studied advertising spending as a moderator for CSR implementation and firm value for a sample in U.S. companies (Servaes & Tamayo, 2013). They found that high customer awareness drives CSR activities, one of the components to determine ESG performance, to add firm value. Therefore, the fourth hypothesis states:

H4: High people awareness has positive impact on the link between ESG and firm performance in healthcare industry.

CHAPTER 4: DATA AND METHODOLOGY

4.1 Sample and Data

The samples were collected from the Refinitiv Datastream where includes global economic, financial and business information. The research includes data on healthcare companies in firm-year record between 2011 and 2020 as longest period possible. This study looks more deeply to gain insight about how important healthcare industry is by using market capitalization in each of the markets as a framework to select markets. Therefore, the samples come from countries in the United State of America, China, Japan, the United Kingdom, Germany, Switzerland, South Korea, France, India, Australia and Canada which combined market capitalization of these countries is accounted for more than 80 percent in total of healthcare industry. Moreover, these countries are big enough to be counted as a healthcare industry. The healthcare industry in the database comprises of various subindustries such as healthcare equipment & suppliers, healthcare providers & services, biotechnology & medical research and pharmaceuticals. Although they are in the same industry, they have dissimilarities such as business structure, business model, customers and etc. that might be affected to ESG in different ways. First, the broad classification of healthcare equipment & supplies includes medical equipment, supplies, medical software & technology services and etc. These businesses help to support in treatment or diagnostic which is used by physicians and other medical personnel. Second, healthcare providers & services is a business that provide treatment and medical care which the main customer is patients. Segments of this subsector is comprised of healthcare facilities & services, hospital, clinics & primary care services, medical & diagnostic laboratories and others. Third, there are many segments in biotechnology such as biotechnology & medical research, bio therapeutic drugs, bio diagnostics & testing and bio diagnostics & testing. It is a business that do research and develop about technology and treatment. In short, it finds solution to help greater ease and accuracy in diagnosis and treatment. It also engages in development and production of molecule, drug, cell therapies, gene therapies by mainly using genetic information. Finally, pharmaceutical, including segments such as pharmaceutical, alternative medicine and etc., engages in develop, manufacture and market medicine. It has to

take time to succeed due to research & develop and testing before launching products to market.

According to table 1 which shows the correlation of performance measures among each subsector, there are low correlations so it can emphasize that four subsectors are exactly different and it could help to justify the rationale of disaggregate level of this paper. Hence, the subindustries are investigated separately and comparatively in the empirical part.

Tobin's Q	Healthcare providers & services	Healthcare equipment & supplies	Biotechnology	Pharmaceutical
Healthcare providers & services	1			
Healthcare equipment & supplies	0.0861	1		
Biotechnology	0.022	-0.0106	1	
Pharmaceutical	0.0756	0.1232	-0.0711	1
ROA	Healthcare providers & services	Healthcare equipment & supplies	Biotechnology	Pharmaceutical
Healthcare providers & services	1			
Healthcare equipment & supplies	0.0482	1		
Biotechnology	0.024	0.0436	1	
Pharmaceutical	0.019	0.0193	0.0104	1
ROE	Healthcare providers & services	Healthcare equipment & supplies	Biotechnology	Pharmaceutical
Healthcare providers & services	1			
Healthcare equipment & supplies	0.0522	1		
Biotechnology	0.0254	0.0053	1	
Pharmaceutical	0.0529	0.0086	0.0083	1
Asset turnover	Healthcare providers & services	Healthcare equipment & supplies	Biotechnology	Pharmaceutical
Healthcare providers & services	1			
Healthcare equipment & supplies	0.2749	1		
Biotechnology	0.1926	0.0156	1	
Pharmaceutical	0.3536	0.3325	0.0068	1

Table 1 Correlation of performance measures among different subsectors

The financial information measuring the firm performance in the samples were also retrieved from Refinitiv Datastream and they are presented in US dollars which is a globally secure currency.

4.2 Variable

The study identified sets of variables: dependent variable, independent variables, moderators and control variables. These variables have been commonly utilized in the relevant literature.

4.2.1 Dependent variable

Dependent variable is a firm performance in which this paper studies in different measures proxied by Tobin's Q, return on assets (ROA) and return on equity (ROE) and asset turnover (Kuzey et al., 2021). The rationale of studying four different dimensions of corporate performance is that they capture things differently. First, Tobin's Q is calculated from total market value of equity plus book value of debt divided by total assets. It reflects firm value or market performance which rely on investors' expectation and demand for stocks that affect to price or value. For instance, the demand may not correlate to operating performance due to different investors' perception. Second, ROA is calculated by earning profit before tax by total assets. ROA reflects the profitability that companies generate based on their assets. Third, ROE is calculated by earning profit before tax by total equity. It reflects profitability that equity shareholders who are the last claimants will receive from investment in stocks. Last, asset turnover calculated from total revenues divided by total assets which represents the efficiency. It shows capability of a company to generate revenue from assets. All of the dependent variables' formulations follow to the prior study as mention in the first place.

4.2.2 Independent variables

Independent variables comprise of subcomponent of ESG score. The scores consider resource use, emissions, environment innovation, workforce, human rights, community, product responsibility, management, shareholders and CSR strategy and then environmental, social and governance pillar scores incurred before aggregate them into a single ESG score. The score is between 0 and 100. According to samples

from the database which have both disclosed and undisclosed ESG scores, ESG disclose is a dummy variable taking 1 if ESG score exists and 0 otherwise (Van Brecht et al., 2018). Thus, the study tests whether ESG disclosure can affect firm performance.

4.2.3 Moderator variables

The current study uses firm age and people awareness as moderators to test whether firm age and people awareness can be factors to translate the relationship between ESG and firm performance. Firm age is calculated from the year that companies start business operation (Saeidi et al., 2015). People awareness is proxied by advertising intensity calculated from advertising spending divided by total revenue (Servaes & Tamayo, 2013). To explore a moderation role of firm age people awareness in the association, interaction terms are included between Env, Soc and Gov. To test whether ESG impact to firm performance would impact in different way relative to the period before the pandemic. COVID-19 variable is inspired by Broadstocket al., 2021 which they used the lockdown date as a base day to identify which period is normal or pandemic and then they included interaction terms in Env, Soc and Gov for testing the resilience of the scores. However, COVID-19 is a dummy variable where the period during 2019 to 2020 is equal to 1 and 0 otherwise.

4.2.4 Control variables

The control variables include board characteristic can drive firms to engage in ESG and firm performance (Giannarakis, 2014; Uyar et al., 2020). Free float reflects a dispersed ownership structure. Firms with non-concentrated ownership or having dispersion in ownership may be motivated to disclose information about sustainability (Kuzey & Uyar, 2017). Firm size is determinant of sustainability in sense of that larger firms have more resource to exploit ESG or sustainability activities and leverage is negatively impact on CSR so that managers may be controlled by external creditors (Crisóstomo et al., 2011; Kuzey & Uyar, 2017). In other words, more leverage may have a greater tendency to practice ESG initiatives to appease creditors

(Kuzey et al., 2021). Additionally, firm age also affects to firm performance because old firms are likely to have more resource or wealth than younger firms so they may develop business easier than younger firms. These variables are implications to influence firm performance. The description of control variables shows in Table 2.

Table 2 Variables used in the panel data regression model

Variables	Type of variables	Definitions
Tobin's Q	Dependent	Firm value: market value of equity plus book value of debt divided by total assets.
ROA	Dependent	Return on assets: Income before tax divided by total assets
ROE	Dependent	Return on equity: Income before tax divided by total equity
Eff	Dependent	Asset turnover: Total revenues divided by total assets
Env	Independent	Environmental pillar score between 0 and 100
Soc	Independent	Social pillar score between 0 and 100
Gov	Independent	Governance pillar score between 0 and 100
ESG disc	Independent	ESG disclosure: 1 if it exists 1 and 0 otherwise
Age	Moderator	Firm age: number of years in business
Adver	Moderator	Advertising intensity: advertising expenditure divided by total revenue
Covid	Control	The time of COVID-19: 1 if period is between 2019 and 2020 and, 0 otherwise.
BSize	Control	Board size: number of directors on board
Bindep	Control	Board independence: percentage of independent directors on board
CEOdual	Control	CEO duality: 1 if CEO is the same person as a chairman
FF	Control	Free float: percentage of shares held by investors who are not for strategic business
FSize	Control	Firm size: Natural logarithm of total assets is a proxy
Lev	Control	Leverage: total liabilities divided by total assets

4.3 METHODOLOGY

The study uses four models to examine the association between dependent variables and independent variables for healthcare industry. The sample is presented in firm-year records for 10 years between 2011 and 2020. The models applied panel data regression analysis which should be used instead of ordinary pooled-Ordinary Least Squares (OLS) regression. To determine the appropriate tools of analysis between a random effects estimator and a fixed effects estimator as mentioned, Hausman's test (Hausman, 1978) is employed.

The proposed research models are developed based on hypotheses as:

Model 1*:* $Y_{i,t} = \alpha + \beta_1 ESGdis_{i,t} + \beta_2 Covid_{i,t} + \beta_3 ESGdis*Covid_{i,t} + \sum_{k=1} \gamma_i Control_{i,t} + \varepsilon_{i,t}$

Model 2*:* $Y_{i,t} = \alpha + \beta_1 ESG_{i,t} + \beta_2 Covid_{i,t} + \beta_3 ESG*Covid_{i,t} + \sum_{k=1} \gamma_i Control_{i,t} + \varepsilon_{i,t}$

Model 3: $Y_{i,t} = \alpha + \beta_1 ESG_{i,t} + + \beta_2 ESG*Age_{i,t} + \beta_3 ESG*Adver_{i,t} + \beta_4 ESG* Covid_{i,t} + \beta_5 Adv_{i,t} + \beta_6 Covid_{i,t} + \sum_{k=1} \gamma_i Control_{i,t} + \varepsilon_{i,t}$

Model 4: $Y_{i,t} = \alpha + \beta_1 Env_{i,t} + \beta_2 Soc_{i,t} + \beta_3 Gov_{i,t} + \beta_4 Adver_{i,t} + \beta_5 Covid_{i,t} + \beta_6 Env*Age_{i,t} + \beta_7 Soc*Age_{i,t} + \beta_8 Gov*Age_{i,t} + \beta_9 Env*Adver_{i,t} + \beta_{10} Soc*Adver_{i,t} + \beta_{11} Gov*Adver_{i,t} + \beta_{12} Env* Covid_{i,t} + \beta_{13} Soc* Covid_{i,t} + \beta_{14} Gov* Covid_{i,t} + \sum_{k=1} \gamma_i Control_{i,t} + \varepsilon_{i,t}$

Y is dependent variables which is firm performance proxied by Tobin's Q, ROA, ROE and Efficiency.

i is companies in the samples

t is time variable

k is number of control variables including BSize, BInd, CEOdual, FF, FSize and Lev

ε is error term

According to the samples, there are companies that disclose and do not disclose ESG score so model 1 is performed to examine whether ESG disclosure affect to firm performance in H1a in step 1. After that, ESG combined score will be further investigated to see whether the overall of ESG can affect firm performance in model 2 for the second step which is applied to H1b. They are expected to be positive. For model 3, after we know ESG in overall affects or does not affect firm performance, the moderating roles of firm age and advertising expenditure are included in this step, in order to see whether they can moderate overall ESG score to enhance firm performance. Thus, model 3 is applied to H3 and H4. Then, to test subcomponents of ESG score have impact on firm performance, H1c would be verified in model 4 and it is expected to be positive as well. Then, the purpose of the second hypothesis (H2) is to see how the relation between ESG and firm performance changes during the pandemic. Another two hypotheses (H3 and H4) also apply with model 4 to see the impact of firm age and advertising intensity on the impact of ESG subcomponents on firm performance.

CHAPTER 5: RESULTS

5.1 Descriptive statistics

The descriptive statistics is the summary of all variables used in the empirical analysis over the 10 times period from 2011 to 2020. Different four types of subsectors in healthcare industry, healthcare providers & services, healthcare equipment & supplies, biotechnology & medical research and pharmaceutical, are shown separately. Healthcare providers & services has the highest mean of return on equity and asset turnover. The highest mean of Tobin's Q is for biotechnology & medical research while pharmaceutical has the lowest one. Biotechnology & medical research has the lowest mean of return on asset, return on equity and asset turnover. Lastly, pharmaceutical also has the highest mean of return on asset. The mean of ESG score for different subsectors in healthcare industry is in the range of 29 to 45. When we look in dept by separating combined ESG score to sub-components, it shows that pharmaceutical has the highest mean of environment dimension, 31.54 and healthcare providers & services has the highest mean of social dimension, 43.23 and it also has the highest mean of governance dimension which equals to 52.77. Overall, governance dimension usually has the greatest mean of score compared to the other dimensions.

According to the Table 3, the main subsector of this industry is pharmaceutical observed from the largest number of observations followed by biotechnology & medical research, healthcare equipment & supplies and healthcare providers & services, respectively. Likewise, pharmaceutical has the largest number of advertising expenses disclosure. It could result from the fact that it is the main subsector in healthcare industry which is the biggest so that it needs more competitive than others. On the contrary, the number of observations of biotechnology & medical research that disclose advertising expenses is the smallest. It implies that this subsector rarely invests in advertisement or there may be a small amount of advertising expenses that are insignificant to disclose.

	Healthcare providers & services (1)					Healthcare equipment & supplies (2)				
Variable	Obs	Mean	S.D.	Min	Max	Obs	Mean	S.D.	Min	Max
Tobin'sQ	1983	6.432	35.646	0	622.443	4776	7.682	33.69	0.001	570.092
ROA	1983	-0.727	4.851	-104.272	16.89	4776	-0.807	6.095	-161.64	173.173
ROE	1983	-0.295	2.325	-47.442	24.697	4776	-0.668	3.813	-78.168	77.024
Eff	1983	0.853	0.819	0	18.592	4776	0.708	0.671	0	9.368
ESGdis	1983	0.262	0.44	0	1	4776	0.22	0.414	0	1
ESG	520	43.459	20.175	3.161	89.85	1050	39.557	20.235	1.854	89.634
Env	520	25.415	28.607	0	92.341	1050	19.814	25.713	0	79.644
Soc	520	43.223	21.519	2.238	93.348	1050	41.499	24.093	0.341	96.589
Gov	520	52.765	23.993	0.721	94.188	1050	46.233	22.583	0.373	93.761
Age	1983	19.224	13.96	0	86	4776	25.574	24.91	0	174
Adver	471	0.288	2.399	0	36.698	1536	0.094	1.085	-0.015	33.162
Covid	1983	0.276	0.447	0	1	4776	0.261	0.439	0	1
FSize	1983	18.538	3.154	6.568	26.174	4776	17.901	2.732	6.804	25.275
Lev	1983	2.777	26.967	0.004	819.591	4776	2.437	40.444	0.001	2560.256
BSize	520	9.137	2.656	3	22	1050	8.647	2.491	1	30
Bindep	1983	0.183	0.326	0	1	4776	0.158	0.316	0	1
ceodual	520	0.36	0.48	0	1	1050	0.514	0.5	0	1
FF	1983	0.683	0.28	0	1	4776	0.711	0.255	0	1

	Biotechnology & medical research (3)					Pharmaceutical (4)				
Variable	Obs	Mean	S.D.	Min	Max	Obs	Mean	S.D.	Min	Max
Tobin'sQ	6419	9.075	34.528	0.007	631.939	6665	5.561	29.591	0.001	601.86
ROA	6419	-1.324	7.47	-204.877	198.739	6665	-0.46	5.46	-151.792	247.291
ROE	6419	-1.116	3.912	-84.402	16.333	6665	-0.307	2.131	-69.348	7.367
Eff	6419	0.267	0.63	0	20.543	6665	0.651	1.099	0	53.122
ESGdis	6419	0.239	0.426	0	1	6665	0.147	0.354	0	1
ESG	1532	29.632	13.78	0.78	84.229	977	42.059	23.509	1.43	94.409
Env	1532	5.588	14.702	0	80.606	977	31.54	31.388	0	95.382
Soc	1532	42.688	19.502	0.542	97.731	977	43.152	26.251	0.542	97.221
Gov	1532	33.748	19.325	0.952	92.466	977	48.136	22.812	2.292	96.99
Age	6419	17.587	17.572	0	120	6665	28.056	26.447	0	352
Adver	848	0.493	5.181	0	138.185	3092	0.281	7.041	-0.002	382.782
Covid	6419	0.289	0.454	0	1	6665	0.252	0.434	0	1
FSize	6419	17.247	2.381	6.492	24.976	6665	18.542	2.698	6.381	25.96
Lev	6419	2.823	32.178	0	1462.417	6665	1.248	16.993	0	937.463
BSize	1532	7.574	1.787	1	14	977	9.499	2.971	3	21
Bindep	6419	0.173	0.323	0	1	6665	0.086	0.228	0	1
ceodual	1532	0.343	0.475	0	1	977	0.42	0.494	0	1
FF	6419	0.768	0.217	0.01	1	6665	0.612	0.261	0.01	1

Table 3 Descriptive statistics

5.2 Correlation analysis

According to Table 4.1 and 4.2, the tables show the correlation among all variables used in the analysis. These tables are slightly different because we separate ESG score and subcomponent score from ESG disclosure. Therefore, we have two different tables as shown.

The results show that ESG disclosure has a positive correlation with ROA and ROE ($p<0.001$) in healthcare providers & services and healthcare equipment &

supplies. In biotechnology samples, ESG disclosure positively correlates with ROA ($p<0.01$), Moreover, it positively associates with ROE ($p<0.05$) in pharmaceutical. When looking in more detail at the score level as shown in table 3.2, it indicates that ESG score has a positive correlation with ROA, ROE and asset turnover while negative connection on Tobin's Q in healthcare providers & services sample. Correspondingly, the correlation of Soc and Gov on Tobin's Q is negative but there is no significant relationship between Env and Tobin's Q. In addition, Env also positively correlates with ROA and ROE as same as Gov. Also, asset turnover is positive to Env, Son and Gov.

In healthcare equipment & supplies sample, the result shows that ESG score has a significant positive correlation with ROA and ROE which is an opposite result to Tobin's Q. This correlation is similar to the association between ESG subcomponents and firm performance measures as mentioned previously. However, there is no significant correlation between asset turnover and ESG, its separated components. Besides, the correlation between ESG including its subcomponents and performance measures in pharmaceutical subsector is the same result.

Finally, in biotechnology, ESG positively correlates with ROA, ROE and asset turnover while it has a negative correlation with Tobin's Q. This result is similar to Env and Gov. Moreover, Soc has a significant positive impact on ROA and asset turnover but it negatively affects Tobin's Q.

Table 4.1 Correlations among variables

Healthcare providers & services (1)

	Tobin's Q	ROA	ROE	Asset T/O	ESGdis	Age	Adver	Covid	FSize	Lev	FF
Tobin's Q	1										
ROA	-0.0411	1									
ROE	-0.0635	0.548***	1								
Asset T/O	0.118*	0.174***	0.0618	1							
ESGdis	0.0219	0.131**	0.102*	0.0314	1						
Age	-0.118*	0.0816	0.054	0.326***	-0.0606	1					
Adver	0.00152	-0.438***	-0.210***	-0.149**	-0.0589	-0.0861	1				
Covid	0.117*	-0.0827	-0.113*	-0.0859	0.136**	-0.0186	0.0547	1			
FSize	-0.124**	0.432***	0.299***	0.051	0.565***	0.103*	-0.136**	0.00816	1		
Lev	-0.173***	-0.328***	-0.152***	0.0865	-0.0085	0.174***	-0.0507	-0.0445	-0.120**	1	
FF	-0.0512	-0.235***	-0.118*	0.0654	0.422***	-0.0808	0.0934*	-0.0098	0.166***	0.0725	1

Healthcare equipment & supplies (2)

	Tobin's Q	ROA	ROE	Asset T/O	ESGdis	Age	Adver	Covid	FSize	Lev	FF
Tobin's Q	1										
ROA	-0.348***	1									
ROE	0.00123	0.0970***	1								
Asset T/O	0.0875***	-0.185***	0.0438	1							
ESGdis	0.0161	0.101***	0.0858***	0.0228	1						
Age	-0.0573*	0.107***	0.0753**	0.021	0.171***	1					
Adver	0.0207	-0.0698**	-0.0314	-0.0761**	-0.0346	-0.0455	1				
Covid	0.00772	0.0152	0.0275	-0.0592*	0.105***	0.00484	-0.0239	1			
FSize	-0.163***	0.444***	0.163***	-0.133***	0.542***	0.313***	-0.0984***	0.0538*	1		
Lev	0.246***	-0.695***	-0.0191	0.405***	-0.0653*	-0.0678**	0.00276	-0.0329	-0.371***	1	
FF	0.0261	-0.0266	-0.0082	-0.0184	0.360***	0.0542*	-0.0173	-0.0312	0.242***	0.0482	1

Biotechnology & medical research (3)

	Tobin's Q	ROA	ROE	Asset T/O	ESGdis	Age	Adver	Covid	FSize	Lev	FF
Tobin's Q	1										
ROA	-0.600***	1									
ROE	-0.0072	0.154***	1								
Asset T/O	0.0473	-0.150***	0.110**	1							
ESGdis	-0.0151	0.0892**	0.0198	-0.0057	1						
Age	-0.0833*	0.0889**	0.0791*	-0.0193	0.0298	1					
Adver	0.00037	-0.0461	-0.0464	-0.0789*	-0.0404	-0.0017	1				
Covid	-0.027	0.0438	-0.0684*	-0.044	0.188***	0.0461	0.05	1			
FSize	-0.314***	0.486***	0.200***	-0.131***	0.561***	0.129***	-0.0508	0.0768*	1		
Lev	0.468***	-0.733***	0.0165	0.283***	-0.051	-0.0516	-0.0021	-0.0148	-0.409***	1	
FF	0.0417	-0.0567	-0.0264	0.0441	0.220***	0.0276	0.0328	-0.0029	0.0657	0.119***	1

Pharmaceutical (4)

	Tobin's Q	ROA	ROE	Asset T/O	ESGdis	Age	Adver	Covid	FSize	Lev	FF
Tobin's Q	1										
ROA	-0.411***	1									
ROE	-0.0507**	0.146***	1								
Asset T/O	0.225***	-0.114***	0.0289	1							
ESGdis	-0.0256	0.0304	0.0408*	-0.0345	1						
Age	-0.0848***	0.0628***	0.0829***	-0.0064	0.282***	1					
Adver	0.00604	-0.0318	-0.0336	-0.0173	-0.0118	-0.031	1				
Covid	-0.0199	-0.0162	-0.0615***	-0.0449*	0.135***	-0.0221	0.00109	1			
FSize	-0.296***	0.261***	0.229***	-0.184***	0.540***	0.325***	-0.0654***	0.0094	1		
Lev	0.287***	-0.599***	-0.0332	0.299***	-0.0004	-0.0272	0.0087	-0.008	-0.213***	1	
FF	0.0253	-0.0622***	-0.0968***	-0.0495**	0.226***	0.0317	0.028	0.0234	0.0922***	0.0455*	1

Table 4.2 Correlations among variables

Healthcare providers & services (1)

	Tobin's Q	ROA	ROE	Asset T/O	ESG	Env	Soc	Gov	Age	Adver	Covid	FSize	Lev	FF	BSize	Bindep	ceodual
Tobin's Q	1																
ROA	0.14	1															
ROE	0.0588	0.756***	1														
Asset T/O	0.119	0.338***	0.337***	1													
ESG	-0.230*	0.225*	0.245*	0.493***	1												
Env	-0.0678	0.287**	0.247*	0.507***	0.839***	1											
Soc	-0.267**	0.0858	0.134	0.376***	0.911***	0.747***	1										
Gov	-0.206*	0.259**	0.279**	0.439***	0.840***	0.542***	0.589***	1									
Age	0.0544	0.0517	0.0665	0.285**	0.175	0.0465	-0.0025	0.388***	1								
Adver	0.0066	-0.386***	-0.287**	-0.238*	-0.256**	-0.289**	-0.185	-0.224*	-0.118	1							
Covid	0.288**	-0.249*	-0.185	-0.177	-0.0435	0.0175	0.0319	-0.149	-0.006	0.126	1						
FSize	-0.208*	0.212*	0.171	0.406***	0.762***	0.786***	0.617***	0.634***	0.0488	-0.157	-0.126	1					
Lev	-0.272**	-0.128	-0.0684	0.104	0.221*	0.144	0.078	0.349***	0.121	-0.195*	-0.055	0.177	1				
FF	-0.333***	0.14	0.257**	0.266**	0.272**	0.202*	0.311**	0.174	-0.165	0.0807	-0.213*	0.308**	0.0036	1			
BSize	-0.138	0.161	0.117	0.183	0.284**	0.469***	0.142	0.225*	0.124	0.0716	-0.0676	0.516***	0.04	0.108	1		
Bindep	-0.157	-0.137	0.00101	0.383***	0.456***	0.207*	0.318***	0.599***	0.153	0.0519	-0.0447	0.444***	0.293**	0.326***	0.0956	1	
CEOdual	0.069	-0.261**	-0.186	0.12	-0.0182	-0.0014	0.0428	-0.0893	0.114	0.0349	0.171	-0.0425	-0.226*	-0.0269	-0.155	0.0699	1

Healthcare equipment & supplies (2)

	Tobin's Q	ROA	ROE	Asset T/O	ESG	Env	Soc	Gov	Age	Adver	Covid	FSize	Lev	FF	BSize	Bindep	ceodual
Tobin's Q	1																
ROA	0.148**	1															
ROE	0.0505	0.167**	1														
Asset T/O	0.0373	0.334***	0.063	1													
ESG	-0.153**	0.257***	0.138*	-0.0573	1												
Env	-0.115*	0.216***	0.133*	-0.0355	0.854***	1											
Soc	-0.0931	0.215***	0.0999	-0.0768	0.926***	0.784***	1										
Gov	-0.200***	0.245***	0.143**	-0.0218	0.826***	0.566***	0.580***	1									
Age	-0.174**	0.198***	0.022	-0.105	0.594***	0.577***	0.505***	0.512***	1								
Adver	0.129*	-0.315***	-0.0538	-0.283***	-0.0642	-0.0826	-0.0521	-0.0474	-0.0304	1							
Covid	0.209***	-0.0974	0.0514	-0.134*	0.0144	-0.0473	0.0778	-0.0422	-0.0854	0.0634	1						
FSize	-0.194***	0.402***	0.0946	-0.0363	0.700***	0.735***	0.612***	0.551***	0.503***	-0.223***	-0.113*	1					
Lev	-0.115*	-0.227***	0.0979	0.186***	0.113*	0.181**	0.084	0.0748	0.00269	-0.207***	-0.0412	0.172**	1				
FF	-0.244***	-0.162**	0.0289	-0.0677	0.381***	0.233***	0.370***	0.342***	0.101	0.0365	-0.059	0.315***	0.0787	1			
BSize	-0.201***	0.177**	0.0605	0.119*	0.504***	0.648***	0.416***	0.367***	0.398***	-0.0575	-0.124*	0.711***	0.250***	0.200***	1		
Bindep	0.0431	-0.143*	0.0463	-0.0043	-0.039	-0.268***	-0.0287	0.084	-0.457***	0.0651	0.0215	-0.190***	0.133*	0.378***	-0.255***	1	
CEOdual	-0.126*	0.0409	0.0764	0.154**	-0.0927	0.0272	-0.055	-0.173**	-0.103	-0.270***	-0.0419	0.123*	0.125*	0.0185	0.118*	-0.104	1

Table 4.2 Correlations among variables

Biotechnology & medical research (3)

	Tobin's Q	ROA	ROE	Asset T/O	ESG	Env	Soc	Gov	Age	Adver	Covid	FSize	Lev	FF	BSize	Bindep	ceodual
Tobin's Q	1																
ROA	-0.0287	1															
ROE	0.0428	0.430***	1														
Asset T/O	0.111	0.251**	0.228**	1													
ESG	-0.184*	0.304***	0.0707	0.151	1												
Env	-0.122	0.343***	0.164*	0.124	0.774***	1											
Soc	-0.258**	0.187*	-0.0549	0.166*	0.821***	0.479***	1										
Gov	-0.029	0.228**	0.0981	0.0914	0.813***	0.507***	0.440***	1									
Age	0.00082	0.348***	0.0659	0.104	0.281***	0.164*	0.226**	0.286***	1								
Adver	-0.0601	-0.221**	-0.137	-0.214**	-0.135	-0.122	-0.0828	-0.12	-0.0719	1							
Covid	0.0881	-0.103	-0.143	-0.116	0.0583	0.118	-0.0757	0.112	-0.014	0.164*	1						
FSize	-0.181*	0.680***	0.303***	0.0735	0.589***	0.496***	0.502***	0.420***	0.292***	-0.203*	-0.163*	1					
Lev	-0.193*	-0.501***	-0.214**	0.0801	-0.0224	-0.0852	0.0258	0.00432	-0.0362	0.129	-0.0319	-0.136	1				
FF	0.0178	-0.0891	-0.0472	0.0778	0.151	0.00705	0.299***	0.027	0.240**	0.105	-0.207**	0.0753	0.142	1			
BSize	0.0694	0.287***	0.156	0.11	0.272***	0.362***	0.205*	0.121	0.256**	-0.0457	-0.153	0.452***	-0.0729	0.164*	1		
Bindep	-0.147	-0.0321	-0.0008	0.148	0.433***	0.0924	0.593***	0.278***	0.0745	-0.0062	-0.206*	0.241**	0.096	0.567***	0.0653	1	
CEOdual	0.0449	-0.0363	0.118	0.231**	-0.118	-0.134	0.00921	-0.177*	0.0385	0.0233	0.0203	0.0877	0.0996	-0.01	0.0761	-0.0107	1

Pharmaceutical (4)

	Tobin's Q	ROA	ROE	Asset T/O	ESG	Env	Soc	Gov	Age	Adver	Covid	FSize	Lev	FF	BSize	Bindep	ceodual
Tobin's Q	1																
ROA	-0.188***	1															
ROE	-0.0757	0.728***	1														
Asset T/O	-0.0307	0.219***	0.164***	1													
ESG	-0.130**	0.226***	0.276***	-0.0968	1												
Env	-0.125*	0.232***	0.269***	-0.0947	0.931***	1											
Soc	-0.104*	0.159**	0.243***	-0.0635	0.943***	0.849***	1										
Gov	-0.129**	0.253***	0.234***	-0.121*	0.775***	0.638***	0.557***	1									
Age	-0.252***	0.113*	0.0433	0.173***	0.327***	0.383***	0.317***	0.159**	1								
Adver	0.0791	-0.396***	-0.297***	-0.238***	-0.102*	-0.114*	-0.0987*	-0.0567	-0.0666	1							
Covid	0.0882	-0.140**	-0.157**	-0.0788	-0.0484	-0.0283	-0.0358	-0.0721	-0.197***	0.0208	1						
FSize	-0.284***	0.284***	0.340***	-0.103*	0.721***	0.710***	0.705***	0.472***	0.408***	-0.160**	-0.208***	1					
Lev	-0.147**	-0.234***	-0.0445	0.0543	0.230***	0.109*	0.340***	0.0607	-0.0042	-0.0316	0.00849	0.370***	1				
FF	-0.101*	-0.0872	0.035	-0.333***	0.354***	0.313***	0.355***	0.253***	0.124*	-0.0088	-0.144**	0.411***	0.325***	1			
BSize	-0.147**	0.0719	0.151**	0.0451	0.438***	0.435***	0.490***	0.172***	0.407***	-0.106*	-0.181***	0.591***	0.321***	0.192***	1		
Bindep	0.0941	-0.138**	-0.0339	-0.292***	0.255***	0.0958	0.328***	0.180***	-0.195***	-0.0277	0.0307	0.190***	0.509***	0.464***	0.0368	1	
CEOdual	-0.0793	0.0776	0.0472	-0.077	0.229***	0.219***	0.290***	0.0384	-0.0229	-0.0667	-0.116*	0.320***	0.166***	0.223***	0.239***	0.280***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.3 Empirical results

This paper will find whether ESG disclosure has an impact on firm performance in different measures which is presented in Table 5.1. According to model 1 in table 5.1, ESG disclosure positively affect to firm performance in aspect of Tobin's Q or enterprise value for all subsectors in healthcare industry at 1% and 5% significant level. In the same way, ESG disclosure significantly affect asset turnover in pharmaceutical in positive way ($p<0.05$). These findings support H1a hypothesis because ESG disclosure helps to add firm value for all subsectors and enhance efficiency in pharmaceutical. Also, there is insignificant changes of impact between ESG disclosure and firm performance measures except for Tobin's Q that it will be more positive during the Covid-19 for healthcare equipment & supplies and biotechnology, which support H2. Conversely, there are no significant relationship between ESG disclosure and other measures like ROA and ROE which reject hypothesis H1a. Therefore, it is necessary to look in term of ESG level as people may prioritize scores more than just viewing them disclosed or undisclosed ESG.

Following to the first step, the next step considers in level or score of ESG. For model 2 in table 5.2, it can indicate whether overall ESG score can improve firm performance for different subsectors in healthcare without the interaction term of firm age and advertising expense. The results show that combined ESG has a significantly positive impact on Tobin's Q for healthcare providers & services and healthcare equipment & supplies at 5% significant level which supports H1b. The impact of ESG on firm value is more positive for pharmaceutical business during Covid-19, which cannot reject H2, while there are insignificant changes in other subsectors. With respect to ROA, ROE and asset turnover, the impact of ESG score is insignificant. In other words, combined ESG score cannot enhance profitability to firms and equity shareholders and efficiency that reject H1b. Hence, this paper needs to separate combined ESG score to subcomponents that will be presented in the last step in table 5.4.

Subsequently, to consider whether firm age and advertisement have an ability to drive ESG to enhance firm performance in overall, they are included as interaction terms with ESG score in model 3 as shown in table 5.3. According to table 5.3, it

shows that ESG score of healthcare providers & services and healthcare equipment & supplies still has a significant positive effect on Tobin's Q ($p<0.1$ and $p<0.01$, respectively). This finding is consistent with model 2. It suggests that overall ESG score can increase firm value for these 2 subsectors. It also supports H1b hypothesis. However, there are significant effects in positive way on ROA, ROE and asset turnover in healthcare providers & services, ROE and asset turnover in healthcare equipment & supplies, and asset turnover for biotechnology ($p<0.05$). These findings are inconsistent with model 2 due to an omitted variable problem that there are additional variables, advertising intensity and interaction terms on model 3.

Due to the inconsistency, the coefficient of ESG on model 2 includes an impact of advertisement on ROA, ROE and asset turnover which is negative. Another reason is the correlation between ESG and advertising intensity is negative. Therefore, model 3 is appropriate for analysis. Thus, ESG can increase ROA, ROE and asset turnover for healthcare providers & services, ROE and efficiency for healthcare equipment & supplies and asset turnover for biotechnology.

With respect to model 2 on the interaction of ESG with Covid, the impact of ESG on Tobin's Q in pharmaceutical business is significantly positive at 5% significant level. This finding is as same as the effect of ESG on asset turnover in healthcare equipment & supplies at 5% significant level. On the other hand, there are negative impacts of ESG on ROA in pharmaceutical and asset turnover in biotechnology at 1% and 5% significant level, respectively. For model 3, these results are inconsistent with model 2. The reason is there is an endogeneity problem in model 2 due to omitted variable like advertisement and it is negative to the firm performance measures. Therefore, advertisement should be included in model for an analysis. Furthermore, the interaction term of ESG with Covid-19 variable, which is a dummy variable, has a significant positive effect on ROE ($p<0.01$) with coefficient of 0.0663 for healthcare equipment & supplies.

	Tobin's Q				ROA				ROE				Asset turnover			
VARIABLES	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ESGdis	4.592**	5.026***	4.478***	3.670***	-0.122	-0.323	-0.415	-0.362	-0.166	-0.127	-0.00539	-0.19	-0.0514	0.0208	0.0236	0.121**
	(2.4060)	(1.8020)	(1.4280)	(1.6230)	(0.4050)	(0.3560)	(0.3740)	(0.4080)	(0.2070)	(0.2570)	(0.2140)	(0.1520)	(0.0610)	(0.0277)	(0.0281)	(0.0746)
ESGdisxCovi	-0.283	3.911**	4.395***	1.51	-0.53	-0.237	-0.258	-0.0934	0.138	0.277	-0.318	-0.191	-0.0114	-0.0267	0.0401	-0.012
	(2.5120)	(1.9860)	(1.7030)	(1.5830)	(0.4230)	(0.3920)	(0.4460)	(0.3980)	(0.2380)	(0.2830)	(0.2550)	(0.1490)	(0.0637)	(0.0305)	(0.0335)	(0.0728)
Covid	0.069	1.183	-0.961	-1.997**	0.631**	-0.122	-0.163	0.177	-0.125	0.0992	0.0218	0.0478	-0.0244	-0.0271	-0.0285	0.0251
	(1.8070)	(1.1660)	(1.0640)	(0.8630)	(0.3040)	(0.2300)	(0.2790)	(0.2170)	(0.1330)	(0.1670)	(0.1590)	(0.0810)	(0.0458)	(0.0179)	(0.0209)	(0.0397)
Age	1.262***	0.244**	-0.0426	0.733***	-0.115**	-0.0187	0.0064	-0.0654**	0.0172**	-0.00318	-0.00083	-0.0249**	-0.0102	0.00209	0.00208	-0.0131**
	(0.2730)	(0.1040)	(0.0947)	(0.1280)	(0.0458)	(0.0205)	(0.0248)	(0.0321)	(0.0074)	(0.0148)	(0.0142)	(0.0120)	(0.0069)	(0.0016)	(0.0019)	(0.0059)
FSize	-10.10***	-12.90***	-8.010***	-8.122***	0.808***	1.190***	1.270***	0.758***	0.193***	0.0314	0.181***	0.173***	-0.0576***	-0.0622***	-0.0231***	-0.0896***
	(0.6160)	(0.6110)	(0.4010)	(0.3500)	(0.1040)	(0.1210)	(0.1050)	(0.0879)	(0.0333)	(0.0872)	(0.0600)	(0.0328)	(0.0156)	(0.0094)	(0.0079)	(0.0161)
Lev	0.531***	0.098***	0.409***	0.634***	-0.0263***	-0.0082***	0.0106***	0.0453***	0.00438**	0.00198	0.00413**	0.00484***	-0.000852	-0.00062***	-0.000313	-0.00142*
	(0.0211)	(0.0108)	(0.0114)	(0.0168)	(0.0036)	(0.0021)	(0.0030)	(0.0042)	(0.0019)	(0.0015)	(0.0017)	(0.0016)	(0.0005)	(0.0002)	(0.0002)	(0.0008)
FF	-5.231	-2.951	-10.50***	-2.761	-1.603**	-0.392	0.0484	-1.309**	-0.412	-0.445	0.911**	-0.321	-0.111	-0.274***	-0.0785	-0.00172
	(4.3600)	(3.4420)	(2.8910)	(2.3540)	(0.7330)	(0.6790)	(0.7570)	(0.5920)	(0.2950)	(0.4910)	(0.4320)	(0.2210)	(0.1110)	(0.0528)	(0.0568)	(0.1080)
Constant	170.4***	232.6***	153.6***	136.4***	-12.43***	-21.21***	-23.22***	-11.92***	-3.930***	-0.859	-4.903***	-2.601***	2.216***	1.969***	0.688***	2.659***
	(11.6500)	(10.8600)	(6.9820)	(6.5400)	(1.9590)	(2.1420)	(1.8280)	(1.6440)	(0.6190)	(1.5500)	(1.0450)	(0.6140)	(0.2950)	(0.1670)	(0.1370)	(0.3010)
Observations	1,983	4,776	6,419	6,665	1,983	4,776	6,419	6,665	1,983	4,776	6,419	6,665	1,983	4,776	6,419	6,665
R-squared	0.445	0.138	0.296	0.301	0.099	0.032	0.028	0.028	0.134	0.001	0.004	0.007	0.025	0.026	0.003	0.009

Table 5.1 Regression results of ESG disclosure

	Tobin's Q				ROA				ROE				Asset turnover			
VARIABLES	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ESG	0.0121**	0.0273**	-0.00378	-0.00125	-0.00104	-0.00186	-0.00338	-0.00339	-0.00248	-0.00118	0.0139	0.00349	-0.000342	-0.000875	-0.000163	-0.00161
	(0.0069)	(0.0172)	(0.0178)	(0.0078)	(0.0006)	(0.0013)	(0.0023)	(0.0031)	(0.0020)	(0.0167)	(0.0187)	(0.0082)	(0.0011)	(0.0009)	(0.0010)	(0.0007)
ESGxCovid	0.00203	-0.00377	-0.00347	0.0125**	-0.000833	-0.000678	-0.00079	-0.00522***	0.00298	0.0214*	0.000283	0.00499	0.00131	0.00132**	-0.00150**	0.000395
	(0.0057)	(0.0116)	(0.0135)	(0.0057)	(0.0005)	(0.0009)	(0.0017)	(0.0019)	(0.0020)	(0.0113)	(0.0141)	(0.0052)	(0.0009)	(0.0006)	(0.0007)	(0.0005)
Covid	-0.222	0.919	0.58	-0.593**	0.0527*	0.0124	0.0492	0.356***	-0.0669	-0.69	-0.341	-0.32	-0.0971**	-0.107***	0.0443*	-0.0609**
	(0.3020)	(0.5810)	(0.4820)	(0.2910)	(0.0271)	(0.0429)	(0.0614)	(0.1020)	(0.0982)	(0.5660)	(0.5060)	(0.2760)	(0.0468)	(0.0311)	(0.0264)	(0.0256)
Age	-0.012	0.243***	-0.0338	-0.00208	-0.00545*	-0.0128**	0.00166	0.00706	0.00404*	-0.0479	-0.0559	-0.0102	-0.000927	0.00296	0.00993**	0.00212**
	(0.0342	(0.0850)	(0.0862)	(0.0069)	(0.0031)	(0.0063)	(0.0110)	(0.0145)	(0.0022)	(0.0828)	(0.0907)	(0.0392)	(0.0053)	(0.0046)	(0.0047)	(0.0008)
FSize	0.03	-2.810***	-0.991***	-0.498***	0.103***	0.271***	0.159***	0.168***	0.0563**	0.529	0.317	-0.258	-0.213***	-0.105***	-0.0152	-0.0101
	(0.1700)	(0.3410)	(0.1950)	(0.1200)	(0.0153)	(0.0251)	(0.0249)	(0.0632)	(0.0219)	(0.3320)	(0.2050)	(0.1700)	(0.0264)	(0.0182)	(0.0107)	(0.0122)
Lev	3.047***	1.125**	1.511***	1.581***	-0.259***	-0.383***	-0.230***	-2.635***	-0.0681	2.153***	-2.165***	0.29	0.0674	0.0392	0.0980***	-0.00363
	(0.4790)	(0.5520)	(0.3190)	(0.2390)	(0.0429)	(0.0407)	(0.0407)	(0.0812)	(0.1070)	(0.5370)	(0.3350)	(0.2190)	(0.0742)	(0.0295)	(0.0175)	(0.0209)
FF	-2.705***	2.554	-2.326*	-0.65	0.129*	0.416***	0.403**	0.802**	0.219	2.124	3.368**	-0.349	0.108	0.119	0.0044	0.00862
	(0.8500)	(1.9540)	(1.2940)	(0.7280)	(0.0761)	(0.1440)	(0.1650)	(0.3380)	(0.1600)	(1.9030)	(1.3610)	(0.9110)	(0.1320)	(0.1050)	(0.0709)	(0.0719)
BSize	-0.127**	0.119	-0.258**	0.0319	-0.00422	-0.0189**	0.00211	-0.0141	-0.013	-0.0338	0.0549	-0.0213	-0.00984	-0.00863	0.0083	0.000507
	(0.0551)	(0.1130)	(0.1020)	(0.0493)	(0.0049)	(0.0084)	(0.0130)	(0.0172)	(0.0124)	(0.1100)	(0.1070)	(0.0464)	(0.0085)	(0.0061)	(0.0056)	(0.0044)
Bindep	-0.927	-0.049	0.0893	-0.753	0.0695	0.0242	0.0437	0.0111	-0.0608	-0.934	-0.796	-0.102	0.0598	-0.063	-0.0869*	-0.270***
	(0.5700)	(1.3370)	(0.9400)	(0.5670)	(0.0510)	(0.0986)	(0.1200)	(0.2110)	(0.1450)	(1.3030)	(0.9880)	(0.5690)	(0.0882)	(0.0716)	(0.0515)	(0.0514)
ceodual	0.0604	0.0911	-0.0731	0.0834	-0.0118	-0.00857	-0.161***	-0.0291	0.0136	0.0853	0.467	-0.0145	-0.0438	-0.0466*	0.0523**	-0.0277
	(0.2280)	(0.4900)	(0.4540)	(0.2270)	(0.0204)	(0.0361)	(0.0578)	(0.0810)	(0.0574)	(0.4770)	(0.4770)	(0.2180)	(0.0352)	(0.0262)	(0.0249)	(0.0204)
Constant	3.197	49.26***	26.60***	13.12***	-2.006***	-5.229***	-3.681***	-3.118**	-1.091***	-11.40*	-8.341**	6.098*	5.561***	2.896***	0.302	0.894***
	(3.4690)	(6.8790)	(3.7110)	(2.3900)	(0.3110)	(0.5070)	(0.4730)	(1.3390)	(0.3990)	(6.7010)	(3.9030)	(3.6060)	(0.5370)	(0.3680)	(0.2030)	(0.2440)
Observations	520	1,050	1,532	977	520	1,050	1,532	977	520	1,050	1,532	977	520	1,050	1,532	977
R-squared	0.132	0.113	0.086	0.067	0.239	0.284	0.114	0.6	0.17	0.028	0.061	0.011	0.258	0.135	0.057	0.077

Table 5.2 Regression results of combined ESG score

	Tobin's Q				ROA				ROE				Asset turnover			
VARIABLES	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ESG	0.0427*	0.0618***	-0.00897	-0.00137	0.00191**	-0.001	-0.0175	-0.00161	0.00618**	0.0446**	-0.105	-0.00788	0.00631**	0.00222**	0.00963**	-0.00178
	(0.0399)	(0.0291)	(0.0682)	(0.0164)	(0.0011)	(0.0013)	(0.0058)	(0.0008)	(0.0037)	(0.0277)	(0.0632)	(0.0028)	(0.0032)	(0.0017)	(0.0047)	(0.0013)
ESGxCovid	-0.00606	-0.0281	-0.0219	0.0104	0.000348	0.000136	-0.00115	0.000586	0.00071	0.0663***	-0.00507	0.000802	-0.00105	0.000528	-0.0021	0.00309***
	(0.0226)	(0.0178)	(0.0223)	(0.0087)	(0.0006)	(0.0007)	(0.0015)	(0.0004)	(0.0022)	(0.0252)	(0.0166)	(0.0015)	(0.0018)	(0.0008)	(0.0016)	(0.0007)
ESGxAge	-0.000217	-0.000135	0.00123	-0.000105	-0.000073**	1.75E-05	0.00056	1.11E-05	-0.00029**	-0.00071*	0.00138	5.49E-05	-1.67E-05	-0.0000538**	-0.00031**	1.88E-05
	(0.0017)	(0.0007)	(0.0023)	(0.0002)	(0.0000)	(0.0000)	(0.0002)	(0.0000)	(0.0002)	(0.0006)	(0.0021)	(0.0000)	(0.0001)	(0.0000)	(0.0002)	(0.0000)
ESGxAdver	-0.0714	-0.307	0.00385	0.0328	-0.0148	-0.0246	-0.0156	0.0095*	0.0436	-0.443	0.188	0.013	-0.068	0.0256*	0.00691	0.0210*
	(0.8120)	(0.4690)	(0.3900)	(0.1470)	(0.0225)	(0.0191)	(0.0292)	(0.0075)	(0.0785)	(0.5620)	(0.3200)	(0.0251)	(0.0633)	(0.0243)	(0.0272)	(0.0120)
Covid	0.172	2.342***	1.157	-0.501	-0.0604**	-0.00345	0.039	-0.0438*	-0.099	-2.050*	-0.249	-0.0893	-0.0505	-0.0393	0.0603	-0.189***
	(1.0920)	(0.8050)	(0.9450)	(0.5130)	(0.0303)	(0.0339)	(0.0697)	(0.0262)	(0.1040)	(1.0920)	(0.7630)	(0.0876)	(0.0855)	(0.0429)	(0.0664)	(0.0420)
Age	0.0538	-0.0201	0.0103	0.05	0.00555*	-0.00132	-0.0482***	-0.00661**	0.0131	0.036	0.259	-0.0102	0.00763	0.0140**	0.0189**	-0.0141***
	(0.1080)	(0.0514)	(0.1220)	(0.0585)	(0.0029)	(0.0054)	(0.0157)	(0.0030)	(0.0081)	(0.0383)	(0.1720)	(0.0100)	(0.0096)	(0.0069)	(0.0082)	(0.0048)
Adver	-0.394	12.88	-3.813	-3.314	-0.209	1.251	0.109	-0.221	-2.438	13.57	-5.999	0.835	0.752	-0.783	-0.595	-0.931***
	(26.1000)	(16.2100)	(9.5740)	(4.0610)	(0.7120)	(0.8150)	(0.6860)	(0.2070)	(2.2980)	(16.4400)	(7.5150)	(0.6940)	(2.1750)	(1.0330)	(0.6710)	(0.3330)
FSize	-0.0475	-0.251	-1.037***	-1.043***	0.0254**	0.037	0.213***	0.0616***	0.0259	-0.00354	0.0016	0.177***	-0.115***	-0.275***	-0.0552**	-0.128***
	(0.4790)	(0.3410)	(0.4020)	(0.3610)	(0.0129)	(0.0244)	(0.0396)	(0.0184)	(0.0362)	(0.2370)	(0.4340)	(0.0618)	(0.0412)	(0.0309)	(0.0272)	(0.0296)
Lev	-2.303	-1.89	-2.794**	-4.149***	-0.240***	-0.245***	-0.389***	0.0246	-0.0554	1.756	-3.398***	-0.204	-0.186	-0.0726	0.0697	0.323***
	(2.2720)	(1.1550)	(1.2920)	(0.8470)	(0.0621)	(0.0510)	(0.1010)	(0.0433)	(0.1940)	(1.0680)	(1.1030)	(0.1450)	(0.1850)	(0.0647)	(0.0890)	(0.0694)
FF	-6.856***	-6.439**	-3.293	0.537	-0.0154	0.245**	0.366**	0.0944	0.502**	-1.349	0.801	0.0647	0.0793	8.92E-05	0.0717	-0.0286
	(2.5160)	(2.6530)	(2.0540)	(1.2440)	(0.0688)	(0.1240)	(0.1710)	(0.0635)	(0.2130)	(2.0660)	(1.8760)	(0.2130)	(0.2030)	(0.1570)	(0.1410)	(0.1020)
BSize	-0.247	0.0973	0.198	0.0346	-0.00071	-0.000405	0.0182	-0.00169	-0.0102	-0.00728	-0.106	-0.00547	-0.0291**	-0.00526	0.0191	-0.000149
	(0.1750)	(0.1570)	(0.1930)	(0.0615)	(0.0048)	(0.0062)	(0.0147)	(0.0031)	(0.0154)	(0.1510)	(0.1610)	(0.0105)	(0.0139)	(0.0078)	(0.0134)	(0.0050)
Bindep	-2.502	2.285	3.102	0.496	-0.0499	0.0716	0.375*	-0.0606	-0.0859	0.167	-2.531	-0.217	-0.199	-0.308**	-0.0619	-0.171**
	(2.1410)	(2.2130)	(2.3370)	(0.8490)	(0.0588)	(0.0995)	(0.1920)	(0.0433)	(0.1860)	(1.8850)	(2.1040)	(0.1450)	(0.1720)	(0.1260)	(0.1610)	(0.0695)
ceodual	0.588	-1.452**	0.731	-0.489*	-0.0205	0.00578	0.159***	-0.0105	-0.0677	0.613	-0.504	-0.0412	-0.106	0.007	0.136***	0.0165
	(0.8610)	(0.7070)	(0.6960)	(0.2910)	(0.0238)	(0.0324)	(0.0521)	(0.0149)	(0.0791)	(0.5370)	(0.5710)	(0.0498)	(0.0677)	(0.0411)	(0.0483)	(0.0238)
Constant	12.98	12.24*	25.28***	24.24***	-0.416	-0.875*	-3.958***	-0.942**	-0.881	-1.465	1.091	-2.906**	3.353***	6.302***	0.866*	4.244***
	(9.4800)	(6.4870)	(7.7360)	(7.6500)	(0.2550)	(0.4940)	(0.7740)	(0.3910)	(0.7070)	(4.2720)	(8.4750)	(1.3080)	(0.8190)	(0.6270)	(0.5230)	(0.6270)
Observations	106	324	155	403	106	324	155	403	106	324	155	403	106	324	155	403
R-squared	0.109	0.113	0.133	0.156	0.245	0.151	0.436	0.098	0.186	0.07	0.202	0.154	0.017	0.362	0.12	0.278

Table 5.3 Regression results of moderating roles of firm age and advertisement on overall ESG score

	Tobin's Q				ROA				ROE				Asset turnover			
VARIABLES	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Env	-0.0252	0.0484*	0.17**	0.0101	-0.000452	0.000229	0.00606**	0.000257	-0.00503	-0.00255	-0.0169	-0.00183	0.0175***	0.00228*	0.004	0.00372***
	(0.0513)	(0.0423)	(0.1140)	(0.0170)	(0.0014)	(0.0016)	(0.0038)	(0.0010)	(0.0047)	(0.0330)	(0.0263)	(0.0033)	(0.0041)	(0.0019)	(0.0052)	(0.0015)
Soc	0.0497*	-0.0441	-0.00856	-0.00427	0.001	-0.00108	-0.00293	-0.00143	0.0083**	0.0271	-0.0239	-0.00358	-0.00865	-0.000708	-3.30E-05	-0.00305
	(0.0585)	(0.0335)	(0.0634)	(0.0181)	(0.0016)	(0.0013)	(0.0030)	(0.0011)	(0.0055)	(0.0357)	(0.0220)	(0.0037)	(0.0047)	(0.0015)	(0.0039)	(0.0017)
Gov	0.00322	-0.0482	-0.00475	-0.0307	0.00196**	-0.000486	-0.00443	-0.00034	0.00302	0.0181	-0.0058	-0.00247	-0.00156	-0.000811	0.00524**	-0.00274
	(0.0426)	(0.0286)	(0.0640)	(0.0133)	(0.0012)	(0.0011)	(0.0031)	(0.0008)	(0.0043)	(0.0276)	(0.0228)	(0.0025)	(0.0034)	(0.0013)	(0.0039)	(0.0012)
EnvxCovid	0.02	0.0572**	-0.0371	0.0153	0.000337	0.000591	-0.00118	0.000599	0.00147	0.0935***	0.0432***	0.00567***	-0.000724	0.000864	-0.000764	0.00159
	(0.0205)	(0.0244)	(0.0262)	(0.0123)	(0.0006)	(0.0009)	(0.0014)	(0.0007)	(0.0021)	(0.0356)	(0.0144)	(0.0021)	(0.0016)	(0.0012)	(0.0017)	(0.0010)
SocxCovid	-0.0144	-0.0621**	0.0779***	-0.00153	-0.00109	-0.0022**	0.00195	0.000145	-0.00139	-0.0800**	-0.0346**	-0.00229	0.00168	-0.00216	-0.00111	-0.000332
	(0.0316)	(0.0285)	(0.0296)	(0.0128)	(0.0009)	(0.0011)	(0.0015)	(0.0007)	(0.0032)	(0.0403)	(0.0137)	(0.0023)	(0.0025)	(0.0014)	(0.0018)	(0.0011)
GovxCovid	(0.0029)	-0.0391**	(0.0430)	(0.0028)	0.0013	0.00168**	(0.0015)	(0.0003)	0.0006	0.0619**	(0.0100)	-0.00458**	(0.0017)	0.00211**	0.0001	0.00198**
	(0.0281)	(0.0194)	(0.0264)	(0.0110)	(0.0008)	(0.0007)	(0.0014)	(0.0006)	(0.0028)	(0.0291)	(0.0138)	(0.0019)	(0.0022)	(0.0010)	(0.0017)	(0.0009)
EnvxAge	-0.00023	0.00236	-0.00733*	-0.000166	4.54E-05	4.18E-05	-0.0003**	-4.02E-06	0.000209	0.000142	0.00115	-1.02E-05	-0.000480***	3.53E-05	-0.00021*	-3.12e-05**
	(0.0024)	(0.0011)	(0.0041)	(0.0002)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0002)	(0.0008)	(0.0011)	(0.0000)	(0.0002)	(0.0000)	(0.0002)	(0.0000)
SocxAge	-0.00269*	-0.000483	-0.000724	0.000117	-0.000095*	2.74E-06	-4.94E-05	9.08E-06	-0.00046**	-0.000725*	1.17E-05	3.10E-05	0.000381	-1.59E-05	2.69E-05	1.57E-05
	(0.0028)	(0.0006)	(0.0025)	(0.0002)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0003)	(0.0008)	(0.0009)	(0.0000)	(0.0002)	(0.0000)	(0.0002)	(0.0002)
GovxAge	0.000298	0.00161	0.00169	2.01E-05	-0.000056*	1.75E-05	0.000256	2.27E-06	-0.000102	-0.000115	0.000216	3.21E-05	1.17E-05	3.64E-05	-0.000102	2.60E-05
	(0.0016)	(0.0008)	(0.0025)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0002)	(0.0007)	(0.0009)	(0.0000)	(0.0001)	(0.0000)	(0.0002)	(0.0000)
EnvxAdver	5.638***	-1.837	0.29	0.0821*	0.021	-0.0395	0.0338**	0.00192	0.157*	-0.14	-0.125	-0.0143	-0.0988	-0.0765	-0.0238	-0.013
	(1.6770)	(0.7390)	(0.6580)	(0.0795)	(0.0471)	(0.0283)	(0.0237)	(0.0056)	(0.1600)	(0.8910)	(0.1650)	(0.0185)	(0.1330)	(0.0359)	(0.0322)	(0.0075)
SocxAdver	-0.228	0.878**	-0.101	0.062	-0.0279	0.00554	-0.00259	0.00986*	-0.0417	0.238	0.102*	0.0373*	0.038	0.0434**	0.00671	0.0227**
	(0.6670)	(0.4520)	(0.2120)	(0.1360)	(0.0190)	(0.0173)	(0.0098)	(0.0094)	(0.0673)	(0.6190)	(0.0810)	(0.0307)	(0.0525)	(0.0220)	(0.0124)	(0.0133)
GovxAdver	-0.485	0.927***	-0.337	0.313***	0.00428	-0.00643	-0.066	-0.00294	0.0369	-0.408	0.254**	-0.0127	0.000426	0.0253*	0.00944	3.69E-05
	(0.5220)	(0.4000)	(0.3680)	(0.0898)	(0.0148)	(0.0153)	(0.0175)	(0.0069)	(0.0523)	(0.5930)	(0.1540)	(0.0226)	(0.0411)	(0.0199)	(0.0221)	(0.0091)
Covid	0.381	3.043***	-1.616	-0.609	-0.0579*	-0.00289	-0.00919	-0.0341	-0.0707	-0.686	0.818	0.0449	-0.0739	-0.0902*	0.0498	-0.247***
	(1.1660)	(1.1180)	(1.2680)	(0.5420)	(0.0334)	(0.0428)	(0.0641)	(0.0309)	(0.1200)	(1.4040)	(0.6400)	(0.1010)	(0.0915)	(0.0506)	(0.0777)	(0.0471)
Age	0.138	0.0844	0.827***	-0.00692	0.00794**	-0.00384	0.00411	-0.0063**	0.0207**	0.0385	(0.0271	-0.00619	-0.00405	-0.000743	0.0118	0.000965
	(0.1200)	(0.1510)	(0.2910)	(0.0118)	(0.0033)	(0.0058)	(0.0068)	(0.0031)	(0.0103)	(0.0444)	(0.0463)	(0.0103)	(0.0098)	(0.0038)	(0.0094)	(0.0013)
Adver	18.07	-58.27**	5.423	-15.98***	0.402	0.916	1.113*	-0.183	-0.729	12.88	-10.32*	0.462	-1.687	-2.765***	-0.906	-1.158***
	(29.4000)	(23.6500)	(14.4700)	(4.0590)	(0.8200)	(0.9060)	(0.6750)	(0.2720)	(2.8150)	(25.6900)	(5.8190)	(0.8920)	(2.3550)	(1.0560)	(0.8530)	(0.3820)
FSize	0.0615	1.351**	-3.074***	-0.515***	0.0153	0.0583**	0.131***	0.0633***	0.0213	0.0317	0.339***	0.153**	-0.0844**	-0.129***	-0.0476	-0.0954***
	(0.5080)	(0.6650)	(0.7470)	(0.1770)	(0.0137)	(0.0255)	(0.0206)	(0.0192)	(0.0421)	(0.2470)	(0.1170)	(0.0630)	(0.0414)	(0.0224)	(0.0291)	(0.0207)
Lev	-2.71	1.161	-2.483	-2.747***	-0.229***	-0.236***	-0.371***	0.0421	-0.00754	1.445	-1.021**	-0.123	-0.158	0.0398	0.0679	0.393***
	(2.2630)	(1.3510)	(1.5690)	(0.7140)	(0.0630)	(0.0517)	(0.0693)	(0.0468)	(0.2100)	(1.0970)	(0.4490)	(0.1540)	(0.1810)	(0.0613)	(0.0911)	(0.0684)
FF	-2.283	(2.713	-9.365***	0.429	-0.0245	0.153	0.0562	0.0882	0.595**	-0.987	0.251	0.0732	0.136	-0.157	0.146	-0.114
	(2.8360)	(3.3230)	(3.1350)	(0.7970)	(0.0780)	(0.1270)	(0.1180)	(0.0656)	(0.2490)	(2.1680)	(0.8130)	(0.2150)	(0.2280)	(0.1470)	(0.1570)	(0.0859)
BSize	-0.233	0.0612	0.138	0.0819	-0.000102	-0.00343	0.0055	-0.00191	-0.0084	-0.0562	-0.0424	-0.00489	-0.0359**	-0.00338	0.0219	(0.00188
	(0.1810)	(0.1630)	(0.2280)	(0.0573)	(0.0051)	(0.0063)	(0.0105)	(0.0032)	(0.0174)	(0.1610)	(0.0820)	(0.0106)	(0.0143)	(0.0079)	(0.0135)	(0.0050)
Bindep	-3.146	9.110***	3.894	1.366*	-0.0759	0.1	-0.0105	-0.0513	-0.201	0.608	1.521	-0.178	0.279	-0.164	-0.144	-0.241***
	(2.4810)	(2.7870)	(3.2260)	(0.7390)	(0.0695)	(0.1070)	(0.1340)	(0.0444)	(0.2330)	(2.2600)	(1.0230)	(0.1460)	(0.1970)	(0.1260)	(0.1720)	(0.0666)
ceodual	0.444	-1.778**	1.05	-0.364	-0.0221	0.00141	0.014	-0.0161	-0.041	0.828	0.241	-0.0658	-0.131*	0.0103	0.171***	0.014
	(0.8470)	(0.8820)	(0.8680)	(0.2740)	(0.0240)	(0.0338)	(0.0408)	(0.0158)	(0.0830)	(0.5440)	(0.2920)	(0.0518)	(0.0668)	(0.0399)	(0.0521)	(0.0244)
Constant	6.799	-31.74**	56.64***	14.71***	-0.242	-1.171**	-2.600***	-0.990**	-1.002	-2.584	-6.183***	-2.614**	2.791***	3.683***	0.779	2.899***
	(10.0000)	(13.5000)	(14.4600)	(3.4700)	(0.2690)	(0.5170)	(0.4020)	(0.4040)	(0.8250)	(4.7770)	(2.3220)	(1.3270)	(0.8170)	(0.4290)	(0.5690)	(0.4170)
Observations	106	324	155	403	106	324	155	403	106	324	155	403	106	324	155	403
R-squared	0.231	0.315	0.305	0.265	0.244	0.201	0.685	0.108	0.224	0.106	0.307	0.194	0.103	0.013	0.103	0.243

Table 5.4 Regression results of ESG subcomponents and moderating roles of firm age and advertisement

This study hypothesizes one-sided tests except the Covid-19 hypothesis which is a two-sided test. According to table 5.1 through 5.4, variables such as ESG disclosure, ESG including its subcomponents, the interaction terms between ESG and firm age plus advertising intensity are one-sided tests. These variables are expected to be a positive sign except the interaction term of ESG and firm age that is expected to be a negative sign. Moreover, ESG interacted with Covid is a two-sided test. The R-squared from the results is in line with the journals involved (Kuzey et al., 2021).

This result is consistent to model 2. It means that ESG affects to ROE even more positive by 6.63% during Covid-19 relative to the previous pandemic time in this subsector. Also, it affects even more positive to efficiency in pharmaceutical ($p<0.01$) with coefficient of 0.00309 during Covid-19 which support H2. It suggests that ESG has even more positive effect by 0.309% in pandemic compared to non-pandemic.

Then, considering the moderating roles driving ESG, this study focuses both firm age and advertisement. First, in healthcare providers & services, firm age has a significantly negative impact on the relation between ESG and ROA, ROE ($p<0.05$). In healthcare equipment & supplies, the impact of firm age on the association between ESG and ROE, asset turnover is significantly negative ($p<0.1$ and $p<0.05$). For biotechnology and medical research, firm age is also negative to the relationship between ESG and asset turnover ($p<0.05$). The previous mentioned results support H3. Regarding advertisement, it has a significant positive impact on the relationship between ESG and ROA, asset turnover in pharmaceutical and it also significantly affect to the relationship between ESG and asset turnover for healthcare equipment & supplies ($p<0.1$). The previous mentioned results support H4.

Due to the fact that there are nonsignificant impacts of ESG in overall in some performance measure including the result from moderating roles, this study needs to separate ESG because the impact of combined ESG includes impact of its subcomponent so it leads to step 4 as shown in table 5.4 and verified by model 4.

First, concerning Tobin's Q, in healthcare providers & services, Soc has a significant positive effect and the interaction term SocxAge has a significant negative

impact on Tobin's Q ($p<0.1$), which support H1c and H3. The coefficients suggest that the increase in 1% of social score will increase Tobin's Q by 0.0497% and when firm age increases by 1%, social score will even decrease Tobin's Q by 0.00269%. While interactions of firm age with Soc and Gov have no significant effect, H3 hypothesis is rejected. On the other hand, Env and Gov are not significant to Tobin's Q but Env interacted with advertising intensity has a significant positive impact on Tobin's Q ($p<0.01$) that H4 hypothesis cannot be rejected. The coefficients suggest that the increase in 1% of advertising intensity, environmental score will even more increase Tobin's Q by 5.638%. Meanwhile, advertising intensity does not have a statistically significant impact on the relationship between Soc, Gov and Tobin's Q, rejecting H4. Next, in healthcare equipment & supplies, Env has a significant positive effect ($p<0.1$), supporting H1c, but there is no significant impact of Soc and Gov. Additionally, there is no significant impact of firm age on the relationship between subcomponents and Tobin's Q which reject H3. Unlikely, the interactions of advertisement with Soc and Gov have significant impact on Tobin's Q positively ($p<0.05$ and $p<0.01$, respectively) which supports H4. The coefficients suggest that the increase in 1% of environment score will add Tobin's Q by 0.0484%. Also, advertisement increases by 1%, social and governance score will improve Tobin's Q by 0.878% and 0.927%, respectively. As for biotechnology, Env has a significantly positive effect to Tobin's Q ($p<0.05$) and only EnvxAge is negative to Tobin's Q ($p<0.1$). These results support H1c and H3. Besides, there is no evidence that the interaction of subcomponents with advertising intensity is insignificant to Tobin's Q, rejecting H4. Lastly, in pharmaceutical subsector, subcomponents of ESG per se does not affect to Tobin's Q significantly but EnvxAdver and GovxAdver are significantly positive to Tobin's Q ($p<0.1$ and $p<0.01$, respectively) which support H4.

Second, as regards ROA, in healthcare providers & services, Gov has a significant positive effect ($p<0.05$) and the interaction term GovxAge has a significant negative impact on ROA ($p<0.1$) which support H1c and H3. Similarly, the impact of interaction term between Soc and firm age is significant negative ($p<0.1$). However, advertising intensity does not have a statistically significant impact on the relationship between ESG subcomponents and ROA. Also, each single component of ESG is not

significant to ROA. Firm age and advertising intensity do not have significant impacts on the relationship between subcomponents and ROA in healthcare equipment & supplies. It can be said that the result of this subsector rejects all hypotheses. Moreover, Env has a significantly positive effect to ROA ($p<0.05$) and only EnvxAge is negative to ROA and only EnvxAdver has a significant positive effect on ROA in biotechnology ($p<0.05$). These findings support H1c, H3 and H4. However, rather than EnvxAdver, there are no significant impact on ROA in biotechnology. The coefficients suggest that the increase in 1% of environment score will increase ROA by 0.00606% and when firm age increases by 1%, environment score will even decrease ROA by 0.000299% and when advertising intensity increases by 1%, the score will push ROA up by 0.0338%. Another subsector, pharmaceutical subsector, subcomponents of ESG per se does not affect to ROA significantly but SocxAdver is significantly positive to ROA ($p<0.1$), supporting H4.

Third, with respect to ROE, in healthcare providers & services, Soc has a significant positive effect ($p<0.05$) and the interaction term SocxAge has a significant negative impact on ROE ($p<0.05$) which support H1c and H3. Although Env is not significant to ROE, Env interacted with advertising intensity has a significant positive impact on ROE ($p<0.1$) that supports H4. Meanwhile, advertising intensity does not have a statistically significant impact on the relationship between Soc, Gov and ROE, rejecting H4. Each subcomponent of ESG per se does not significantly affect to ROE in the remaining subsectors but it is required to be interacted with firm age and advertisement. For healthcare equipment & supplies, the relationship between ROE and the interaction term of Soc and firm age is significant negative ($p<0.1$), supporting H3. The coefficients suggest that when firm age increases by 1%, social score will even decrease ROE by 0.000725%. There is no significant effect rather than Soc. Also, the interaction of advertising expenses with subcomponents is not significant to ROE, rejecting H4. Next, the relationship between ROE and the interaction term of Soc and advertisement is significant positive ($p<0.1$) in biotechnology and pharmaceutical subsector. Correspondingly, GovxAdver also positively affect to ROE ($p<0.05$) in biotechnology. Contrastingly, firm age does not

significantly affect to the association between single components of ESG and ROE in both subsectors rejecting H3.

Finally, regarding asset turnover, in healthcare providers & services, Env has a significant positive effect ($p<0.01$) and the interaction term EnvxAge has a significant negative impact on asset turnover ($p<0.01$), which support H1c and H3, while other subcomponents do not. Besides, advertising intensity does not significantly affect to the association between ESG subcomponents and asset turnover, rejecting H4. In healthcare equipment & supplies, Env has a significant positive effect ($p<0.1$). Although Soc and Gov per se do not significantly affect to asset turnover, they have significantly positive impacts when they are interacted with advertisement ($p<0.05$ and $p<0.1$, respectively). However, firm age does not significantly moderate ESG subcomponents to influence asset turnover. In biotechnology & medical research, Gov has a significant positive effect ($p<0.05$) while others have insignificant impacts. Although Env per se does not significantly affect to asset turnover, the impact of EnvxAge on asset turnover is significantly negative ($p<0.1$). However, the interaction of firm age is significant only for Env but others are not. In the same way, there is no statistically significant impact of the advertisement interaction on asset turnover. In pharmaceutical subsector, Env has a significant positive effect ($p<0.01$) and the interaction term EnvxAge has a significant negative impact on ROA ($p<0.05$). The impact of SocxAdver on asset turnover is significantly positive ($p<0.05$) though Soc per se has no significant impact on asset turnover.

In regard to the pandemic, as for firm value measure, the result shows there are significant impact changes of Env, Soc and Gov in healthcare equipment & supplies ($p<0.05$). The impact of Env on Tobin's Q during Covid-19 has more positive than non-Covid-19 period with the coefficient 5.72% but the impact of Soc and Gov significantly change in opposite direction with coefficient 6.21% and 3.91%, respectively. In other words, Additionally, the change in impact of Soc is more positive way during Covid-19 with coefficient 7.79% in biotechnology. Concerning ROA measure, the result shows there are significant impact changes of Soc and Gov in healthcare equipment & supplies ($p<0.05$). The impact of Soc significantly changes in negative direction with coefficient 0.215% while the effect of Gov changes

significantly in positive way with coefficient at 0.168%. Rather than that, there are no significant impact of single components on ROA during the crisis. As for ROE measure, there is evidence that Env positively affect to ROE in positive direction at 1% significant level in healthcare equipment & supplies, biotechnology and pharmaceutical subsectors. Also, Soc negatively affects to ROE at 5% significant level in healthcare equipment & supplies and biotechnology. Lastly, Gov positively impacts ROE while negatively affect to ROE at 5% significant level. Regarding asset turnover measure, the finding indicates that Gov has a positive impact at 5% significant level in healthcare equipment & supplies and pharmaceutical. Otherwise, there are no significant impacts of other subcomponents on asset turnover during covid-19.

CHAPTER 6: DISCUSSION and CONCLUSION

6.1 Discussion

6.1.1 Impact of ESG on firm performance:

In general, ESG and its subcomponents should enhance performance. However, there are some empirical findings rejecting the hypothesis. The impact of governance is insignificant to firm value, profitability to shareholders and efficiency in healthcare providers & services. Regarding healthcare equipment & supplies, each subcomponent of ESG has no effect on ROA. Likewise, this result happens to ROE except social components that can improve ROE. In biotechnology, environment has no effect on ROE, social component also has no effect on firm value, ROA and efficiency. Moreover, governance has no impact on firm value, and ROA. Finally, in pharmaceutical, environment has no impact on ROA and ROE and social component has no effect on firm value. Governance also has no impact on profitability and efficiency.

With these rejected hypothesis results, management or board of directors do not possibly perform their duties with efforts. Then, it incurs agency cost. Also, it can be argued that ESG incurs costs (Alareeni & Hamdan, 2020; Buallay, 2018; Smith et al., 2007)and take long time to succeed while some performance like profitability capturing from year to year. In other word, it also gradually improves performance. Therefore, we may not see significant outcomes. It implies that ESG practice can incur financial cost which has priority before dividend payment to shareholders. Any purpose changing the increase shareholders' wealth will reduce effectiveness (Friedman)

6.1.2 Change in the impact of ESG on firm performance in Covid-19:

According to the empirical results as for the change in effect of ESG on firm performance, there is no significant change in healthcare providers & services. Plausible reason is that services business such as hospital, clinic, facility, diagnostic lab receives benefit from Covid-19 because it is direct to the disease. People may have high demand regarding the benefit that could affect performance, not ESG.

In healthcare equipment & supplies, Env helps to add firm value and ROE more during the bad circumstance while others do not. Possibly, there was a shortage of essential medical supplies during the pandemic so companies need to increase production and cause more pollution so firms with high environment score may imply that they are under regulations or policies and investors can trust them that they will not make a negative impact to society. Hence, Env may help to build trust more than others to investors and make higher demand in stocks to eventually add more value and benefit to shareholders. Beside of the shortage during the crisis, firms may be affected by the lack of liquidity from debtors. Therefore, the firms need to raise more money. Hence, financial costs may decrease firm value, plus doing CSR and CSR strategy by management incurs costs as well. It could jointly decrease firm value. It is in line with Buallay, 2018 argued that CSR develops because own benefit of executive management and board of directors work in social policies so costs to bank and costs paid to executive and board of directors would lower market value. Moreover, Soc decrease ROA and ROE during crisis. Costs are already high due to supply chain disruption. It causes high production, transportation and labor cost. Hence, cost form social will add operating cost and affect to return. However, governance is the most relevant to management who has a duty to exploit assets to generate revenue for firm especially in crisis. The crisis is a risk that may reduce benefit to firms and efficiency. Therefore, having good management can imply that managers use investors' money worthily. Thus, firms are likely to invest in good projects and encourage more revenue to companies. Also, agency problem will be less which is an inverse proxy of asset turnover. In the same way, governance helps to increase efficiency in pharmaceutical but it reduces ROE during the crisis. It probably comes from cost might be higher than normal situation because pharmaceutical

business needs to do more research about vaccine and medicine. Additionally, benefit from governance cannot cover these costs but incurs costs paying to members in the board or independence instead.

On the other hand, Env can help to generate more ROE in biotechnology and pharmaceutical during the pandemic. Due to the fact that investors trust on it because of good perception so relationship with stakeholders is better then, firms can generate return to equity shareholders who invest in stocks. As for social pillar in biotechnology, it can add firm value but reduce ROE during the pandemic. Due to the unpredictable results from R&D and testing products, it may produce highly profitable outcomes or have huge failure. In other word, this subsector involves in high risk. Investors may concern it especially in crisis because there is already volatility in share prices. Therefore, social pillar can increase investors' confidence that companies have ability to attract potential employees and reduce the failure. Meanwhile, it is costly hidden which can come up with declining in return to equity shareholders.

6.1.3 Moderating role of firm age:

Firm age is not a significant moderator to drive environment pillar to enhance firm value and profitability where biotechnology is an exception that environment can increase firm value and ROA. Correspondingly, governance pillar cannot be moderated by firm age to add firm value and profitability in younger firms except healthcare providers & services that governance pillar improves ROA. Also, social pillar cannot be moderated to increase firm value and profitability expect that it helps to increase firm value, ROA and ROE in healthcare providers & services as same as it is capable to add ROE in healthcare equipment & supplies. According to the study of D' Amato & Falivena, young firms have less credibility in the eyes of stakeholders about extent of engaging in social goals. Also, younger firms have less experience in developing CSR strategy and management so stakeholders mat not trust. Eventually, cash may not come inflow to companies. Therefore, investors may not have high demand in stocks based on ESG performance so firm value and profitability might not

be improved. It is in line with the study of Peloza stated that young firms have less reputation, differentiation among competitors may lead to financial performance. Reputation initially plays a mediating role between ESG and firm performance. Therefore, younger firms have less need to rely on ESG and can focus on their efforts for promotional gain (Peloza, 2006).

Concerning efficiency, social and governance pillars cannot be stimulated in younger firms. Possibly, younger firms have less wealth or resource and the relationship with stakeholders may not good as much as older firms. Therefore, younger firms may have less ability to train staffs or unable to make good workspace enough then it would affect productive work that leads to unimproved efficiency. Due to a lack of experience in younger firms, it implies that there is an ineffective monitoring or they do not highly understand in the best interest of shareholders and manager. Then, they do not know well about how to use investors' money creditably. Hence, agency cost occurs and it can imply that the companies do not have good efficiency because they cannot utilize assets well to generate revenue.

6.1.4 Moderating role of advertisement:

For healthcare providers & services, advertisement cannot moderate ESG subcomponents to enhance performance except environmental pillar that increase firm value and ROE. Correspondingly, only social and governance pillars are moderated to increase firm value and efficiency in healthcare equipment & supplies. Moreover, advertising expenses cannot drive subcomponents of ESG in biotechnology to improve firm performance except environmental pillar to add ROA, social and governance pillars to add ROE. Lastly, in pharmaceutical, social pillar is not drive to add firm value. Environmental and governance pillars are not drive by advertisement to increase profitability and efficiency. It is in line with the prior study of Hu Y et al., 2018 who found that the relationship between CSR and firm value is weakened for firms with high advertisement because stakeholders have a negative response (Hu et al., 2018). In other words, heavy advertising expenses and social responsibility may conceal improper behavior so trust is not built to stakeholders and it eventually harm

firm performance. Moreover, it will be redundant when firms undertake ESG and advertisement heavily. Advertisement may add more costs and firms need to pay to supplier first then owners will receive less. Likewise, advertising in corporate governance may not be necessary and cost to firms. Hence, benefit would not worth it then operational performance may not increase. Another plausible explanation is that stakeholders like suppliers and customers may not directly get benefit from advertisement. Therefore, they do not know the extent of ESG activities then firms would not benefit (Wang & Qian, 2011).

6.2 Conclusion

This paper focuses on healthcare industry in which comprises of healthcare providers & services, healthcare equipment & supplies, biotechnology & medical research and pharmaceutical. Firstly, in healthcare providers & services, social pillar is the most influential metric to add firm value and ROE or profitability to equity shareholders. It is even stronger in young firms. Although environmental pillar per se cannot increase firm value and ROE, it would increase them if it was moderated by advertisement. Moreover, environmental pillar is the most influential metric to improve efficiency and it is even more in young firms. As for ROA, governance pillar is the most influential metric to improve profitability to firms and it is even better in young firms. Although social pillar per se cannot increase profitability, it would be enhanced if social pillar is moderated by firm age. Advertisement is not a moderator to improve profitability to corporate. Secondly, in healthcare equipment & supplies, environment pillar is the most important to enhance firm value and efficiency. Moreover, social and governance pillars are capable to increase the measures when they are moderated by advertisement. Besides, social pillar helps young firms to improve ROE. Thirdly, in biotechnology & medical research, environmental pillar is the most crucial metric to increase firm value and profitability to firm or ROA. It can improve both measures more strongly for young firms. Furthermore, it will enhance ROA even more in firms with high advertisement. Advertising expenses can be a moderator because it can drive social and governance pillars to increase ROE. Lastly, in pharmaceutical subsector, ESG subcomponents per se cannot improve firm value,

ROA and ROE so they are required to be stimulated by advertisement, especially environment and governance to add firm value, and social to increase ROA and ROE. In addition, environmental pillar is the most crucial metric to improve efficiency and it is stronger in young firms. Advertisement can be a stimulator of social pillar to improve efficiency.

In conclusion, this study finds that ESG is capable to enhance corporate performance in healthcare industry. Additionally, the relationship between ESG and firm performance changes during the crisis. It is able to improve corporate performance and it can reduce performance as well. In regard to the moderating roles, firm age and advertisement can be moderators to drive ESG to improve firm performance. However, it differently affects performance in many measures from subsector to subsector. It is partly from ESG subcomponents in which may have different importance and also includes measures of performance that capture things differently. Therefore, there is no one size fits all approach for different types of subsectors in healthcare industry.

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