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Environmentally sustainable activities in a changing energy sector

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Abstract

The share of renewable energy in the energy sector is rapidly growing after the establishment of the Paris Agreement. This increasing shift towards more sustainable energy sources is also needed from a sustainable perspective as activities in the energy sector account for a large part of the world's GHG emission. This paper argues that environmental sustainable activities can positively impact the share price of large oil majors. Using data from companies, stock exchange markets, and historical oil prices, this paper examines whether publishing an annual, quarterly, or sustainability report, which highlight these environmental sustainable activities, can have an impact on the share price. The results show only for some companies a significant impact is noted from mentioning the sustainable activities in one or more reports and therefore, no conclusion can be drawn on the effect of publishing a report on the company's share price and further research need to be done in order to find significant evidence.

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Table of contents

1. Introduction

There are many macro trends impacting various industries and economics around the world. An example of a historical macro trend is the Industrial Revolution in the early 1900s when new manufacturing processes in Europe and the US were developed. The Industrial Revolution led among other things to a major rise in the GDP per capita. A similar trend is seen today with a push towards cleaner industries and the switch from fossil fuel to renewable energy. Renewable energy is gathered from self-renewing sources such as sunlight, wind, biomass, tidal waves, and surface water and moreover do not have the same harmful effects to the environment like fossil fuels have (Bull, 2001). This push is changing customer behaviours and market trends overall.

This trend is also seen in the global market for electric vehicles is rapidly expanding and is expected to grow from 121.8 billion dollars in 2020 to 236.3 billion dollars by 2027 (Blueweave Consulting, 2021). This shift from oil- and petrol-powered cars to electric vehicles is an example of how people are now more aware of the consequences of using fossil fuels and the impact of this on climate change. Also, the government of the Netherlands has set a target that in 2020, 14% of all energy used in the Netherlands must originate from sustainable sources (Ministerie van Algemene Zaken, 2017). And by 2050, almost all energy must be sustainable in order to reduce the Greenhouse Gas (GHG) emission. GHG is gas that absorbs and emits radiant energy within the thermal infrared range, water, carbon dioxide, methane, nitrous oxide, and ozone (Weisser, 2007). This trend is not just seen in the corporate sector, Dutch households are also pushing towards more sustainable use of resources for cooking and to heat their homes. The Netherlands has the highest percentage of renewable energy compared with all EU countries. In 2017, 6.6% of the energy generated came from renewable sources such as wind turbines and solar panels (CBS, 2019).

In order to reduce the GHG emission, the energy sector overall needs to shift from fossil-based energy to renewable energy. This is not just a corporate challenge or a locally experienced challenge but a much wider global challenge. The Paris Agreement is seen as a first step towards more low-carbon investments in order to stay below a 2 °C increase in world temperate. Under the Paris Agreement, Europe has to reduce GHG emission by at least 40% by 2030 compared to 1990. This target was adopted by the end of 2018 but in 2020 Europe raised this target to 55%. If countries want to meet this target by 2030, investments in fossil fuel need to be overtaken and up-scaling in low-carbon capital in the future is needed (McCollum, Zhou, Bertram, De Boer, Bosetti, Busch, & Riahi, 2018). Furthermore, companies need to invest more in projects that

collect their energy from hydropower, wind power, bioenergy, and solar energy instead of projects that collect their energy from fossil-based sources. When companies make new project investment decisions, they need to take into account that these projects must be net-zero or compensate negative emissions in some way. When doing this correctly, the level of GHG emission will not exceed the current amount and can be reduced to a lower level in the future. Energy intensive industries account for about 25% of the total CO2 emission in the world and are therefore the key GHG emitters. An example of key GHG emitters are large oil majors, which are adopting more ambitious climate targets in order to reduce their GHG emission (Gray, 2021). Large oil majors is a term used for the largest publicly traded oil and gas companies in the world, which are Royal Dutch Shell, ExxonMobil, BP plc, TotalEnergies, Chevron, and Eni (Sure Dividend, 2020). However, only focusing on decarbonisation of these industries is not enough to achieve the goal of a carbon-neutral industry and the Paris Agreement targets. If countries want to succeed the mission of lower GHG emissions, sufficient prioritization and policy effort is needed (Bataille, Åhman, Neuhoff, Nilsson, Fischedick, Lechtenböhmer, & Rahbar, 2018).

Many researchers tried to find the best strategies for the shift towards renewable energy sources. Lund (2007) studies the perspective of renewable energy in the making of strategies for a sustainable development of 100% renewable energy system. He argues that the necessary renewable energy sources are present, and if the energy system can improve their technology in the future, renewable energy systems can be created. Furthermore, economic growth and energy demand are linked since the dawn of the Industrial Revolution. As economies grow, energy demand increases; if energy is constrained, GDP growth pulls back in turn. Moreover, investors are looking at the green score and green rank of firms when deciding in which company to invest. Yadav, Han, and Rho (2015) argue that companies with repeated green rankings for improving their environmental performance showed significantly higher standardized cumulative abnormal returns (SCAR) than companies with either reduced or unchanged environmental performance. This indicates that investors recognize environmental performance announcements as positive news, leading to significant positive returns.

This paper tests if environmentally sustainable activities such as investment in renewable can have an effect on the share price of oil majors. The research question concerns:

What is the impact of the announcement of environmentally sustainable activities on share price of large oil majors?

By examining this research question, this paper contributes to the rising interest in how companies can adjust their strategies to respond to the transition from fossil-based energy to renewable energy. It contributes to knowledge of renewable energy strategies and the effect of this transition on the share price of large oil companies. This thesis can illustrate how a renewable strategy can be rewarded by the market and therefore how large oil companies can adjust their strategy away from just fossil fuels while still being rewarded by the market. Besides, this thesis can provide policymakers the information they need to adjust their laws and policies to further stimulate an investment climate for renewable energy going forward.

Chapter 2 provides the theoretical background of this research. First, renewable energy and sustainability of companies will be explained together with their relation towards the performance and share price of companies. Second, the effect of macro factors, like oil prices and the impact of increases or decreases in oil price on the share price are outlined. Chapter 3 provides information about the selected data and the observations of the datasets. Chapters 4 and 5 will discuss the method and results of the obtained analysis. Lastly in chapter 6 a conclusion will be presented with a discussion of the limitations of this research.

2. Theoretical framework

2.1 Renewable energy and new strategies

As mentioned in the introduction, the demand of companies and countries for sustainable energy sources is growing with the establishment of the Paris Agreement and the rise of carbon emission. If the presented -2 degrees Celsius goal wants to be met to limit global warming, the emission of GHG needs to be reduced as soon as possible. This can be partly achieved by switching from fossil fuel to renewable energy. China and the US together already account for 43% of CO_2 emission (Union of Concerned Scientists, 2020). The rise in attention for climate change has resulted in a rapid expansion of the market for renewable energy projects. The expansion of the renewable market is needed to allow for the replacement of conventional energy sources to still meet the increasing demand for energy while at the same time reduce the emission of GHG. The share of renewable energy in the global electricity market jumped to 29% in 2020, up from 27% in 2019 (IEA, 2020). Furthermore, almost all regions of the world have renewable sources of one type or another and in 2019 about 18.8% of the energy consumed in Europe came from renewable sources (Eurostat, 2021). So in order to meet the Paris Agreement a radical transition towards a

reduction of energy-related CO_2 emissions needs to take place. This energy transition is mainly based on the shifting from fossil-based to zero-carbon in the energy-sector (IRENA, 2021).

The replacement of fossil-based energy is not just a simple transfer from one source of energy towards another source but contains for example a change in strategies and investments. Foreign Direct Investment (FDI) inflows and stock market development play an important role in promoting renewable energy consumption and can fund the transfer towards this new energy source (Kutan, Paramati, Ummalla & Zakari, 2018). The study by Paramati, Ummalla, and Apergis (2016) also investigates the impact of FDI inflows and stock market on renewable energy use. They find that these two factors positively impact clean energy consumption and that policy makers can help with the transition by initiating investment in the clean energy market. Similarly, Paramati, Apergis, and Ummalla (2017) study the effect of domestic and foreign capital on clean energy use in three country groups, specifically the EU, the G20 and Organisation for Economic Co-operation and Development (OECD) countries. The results show that domestic and foreign capital positively affect clean energy use and that political globalization can help with reducing GHG emissions.

Five of the eight oil majors have undertaken considerable investment into renewable energy according to Pickl (2019). He distinguishes between oil majors with smaller levels of proved oil reserves, which are moving into the renewable space fast, and oil majors with large pools of oil reserves. The future of renewable energy contains high uncertainty and correctly predicting the outcomes in the future is nearly impossible. In certain regions of the world, such as Europe, the transfer from fossil-based energy to renewable energy is rapid. However, the outcome of the transition can vary across regions and this makes it difficult to define which technology will dominate the market in the future. In order to succeed in the future, oil companies need to develop strategies that are able to succeed under a wide set of possible future market conditions. These strategies need to be flexible and evolve quickly to respond to changes in the market (Fattouh, Poudineh, & West, 2019). The challenge in the long run for many oil countries is to achieve economic and income diversification to assure the ultimate safeguard against the uncertainty of the changing energy market.

As mentioned above, policymakers can help with the transition towards renewable energy consumption. Government policies play an important role in promoting local generation and use of renewable sources (El-Ashry, 2012). This can be done through renewable energy targets, tax credits, and multiple informal actions to promote renewable energy at the local level. Also, policies targeting direct energy use are more effective than those targeting indirect energy use (Steg,

Dreijerink, & Abrahamse, 2006). Direct energy use includes fuels used to power vehicles, machinery or built infrastructure while indirect energy use includes fuels used to manufacture the vehicles, machinery, consumable goods, and buildings. Additionally, the results show that push measures were more effective and accepted when revenues are allocated within the energy domain rather than to general funds. So not only the energy companies play a role in the energy transition but government policies have a big impact too.

2.2 Sustainability

More attention is drawn toward the ecological footprint of firms by government and consumers in order to reduce carbon emission. All large oil majors now publish sustainability or Corporate Social Responsibility (CSR) reports to show their shareholders how they are going to handle the transition to zero-carbon energy in the coming decades and their impact on the climate in the previous year. The trend of companies publishing these reports is not only seen within the oil industries but also in other major corporates in general. In 2019, 90% of the largest 500 companies by market cap published sustainability reports, an increase from 86% in 2018 (Holbrook, 2020). The CSR reports are important since they allow companies to show their investors which short, medium and long-term projects decisions are made and how they are going to achieve the GHG targets. It is also a perfect opportunity to show the strategy which is a balance between economic prosperity, social justice, and environmental quality (Peattie, 2016).

Mahoney, Thorne, Cecil, and LaGore (2013) investigate the reason why firms publish more often their Corporate Social Responsibility (CSR) reports voluntarily since the motivations for issuing CSR reports are not clear. The first explanation for this is that firms use CSR reports as a signal of their commitment to CSR, which suggests that CSR reports are more likely issued by firms with stronger social and environmental records compared to firms without. The second explanation is about greenwashing, where the CSR Reports are used by firms to masquerade as "good" corporate citizens even when firms do not have strong social and environmental records. Firms who voluntarily publish CSR Report more often have higher CSR performance score and they use the CSR reports to announce stronger social and environmental records to stakeholders. These reports are thus used to inform the market about the current plans and commitments of companies in order to meet the GHG targets. Furthermore, firms sometimes selectively disclose relatively benign impacts to mask their underlying performance when under pressure to report environmental impacts (Marquis, Toffel, & Zhou, 2016). Firms that are more environmentally damaging are less likely to participate in selective disclosure, especially when located in countries where they are most exposed to scrutiny and global norms. Another way of showing the ecological

footprint of firms is with Environmental, Social and Fair Governance (ESG) ratings. Firms that use ESG ratings show lower volatility in their stock performance in comparison with firms in the same industry that do not use ESG factors (Ashwin Kumar, Smith, Badis, Wang, Ambrosy, & Tavares, 2016). This stimulates firms to be more open about their sustainability plans since this positively affect their stock performance.

However, consumer behaviour has to change as well towards more sustainable demand for certain products. Bhamra, Lilley, and Tang (2011) suggest that the interaction of the consumer with the products exposes cultural and social values which shape the consumption behaviour. A study by GreenPrint (2021) find that 64% of consumers are willing to pay more for sustainable products and when a product is clearly marked as environmentally friendly 78% of consumers are more likely to purchase it. There is sometimes still a lack of consumer awareness of the relation between their personal behaviour and the direct impact on the environment. This is called the attitude-behaviour gap, which for example exists in the energy use of households. People know how they can reduce their energy use but are indifferent to make any changes to their energy use (Valkila & Saari, 2013). But in some markets the demand for more sustainable products is rising. The sales of electric vehicles rose from 2017 to 2018 with 65% (McKinsey EV Index, 2021). However, the number of electric vehicles sold in 2019 increased with just 9%. Another market which is still growing rapidly is the market for solar panels. In 2021, 20% of household have solar panels which is a large increase compared with 0.2% in 2007 (Morton, 2021). This suggests that not only companies can play a role in the transition towards sustainable energy, but consumers can also have a large impact on the market of energy and the sustainability of certain products.

2.3 Oil prices

Share prices can be influenced by many aspects. In the energy sector, especially in the market of large oil majors, oil prices are important. Stock prices, oil prices and nominal exchange rates are cointegrated, and oil prices have a positive and statistically significant impact on stock prices as found by the study of Narayan, P. and Narayan S. (2010). Henriques and Sadorsky (2008) find that oil prices are a useful factor in forecasting the stock prices of alternative energy companies. The past values of oil prices can thus be used to predict the height of the future stock prices. Oil price volatility also helps to forecast aggregate output movements and it plays an important role in affecting real stock returns (Peter Ferderer, 1996). Another study by Kaufmann, Dees, Karadeloglou, and Sanchez (2004) shows a significant relationship among real oil prices and Organization of the Petroleum Exporting Countries (OPEC) activities. OPEC is a permanent intergovernmental organization of 13 oil-exporting developing nations that

coordinates and unifies the petroleum policies of its Member Countries. When oil demand is increasing but OPEC maintains the current production of oil, the oil price is expected to rise. Also the level of oil production in non-OPEC countries affect the oil price. Jiménez-Rodríguez and Sánchez (2005) find evidence of a non-linear impact of oil prices on real GDP. The impact on GDP growth is of a larger magnitude if the oil prices increase than when oil prices decline. The countries that import oil experience a negative impact on economic activity when oil prices increase. A similar study also find that oil price increases are much more important than oil price decreases on the GDP growth (Hamilton, 2003). Furthermore, increases in oil prices have significantly less predictive content if they simply correct earlier decreases. Energy production is often correlated with GDP. Generally, countries with higher GDPs have gone through some form of industrialization, and thus a large amount of their energy consumption goes towards production of goods. As well, countries that boast a higher GDP are likely also more populated (the prime examples being India, China, and the US) which also corresponds to more energy use in that country. This link between GDP and energy use can also be seen form the data of the The World Bank, where a clear positive relation is visible. The GDP per unit of energy use is increasing every year. When GDP is strongly linked with the energy use, GDP is indirectly linked with the oil prices since the demand for oil will increase in order to cope with the rise in energy demand. In some countries this relation between GDP and energy use is really high, for example Norway where the economy is dominated by the oil and gas sector. When then there is a 10% increase in oil prices, the stock returns in Norway increase with 2.5%, which indicates that the economy responds to a rise in oil prices (Bjørnland, 2009).
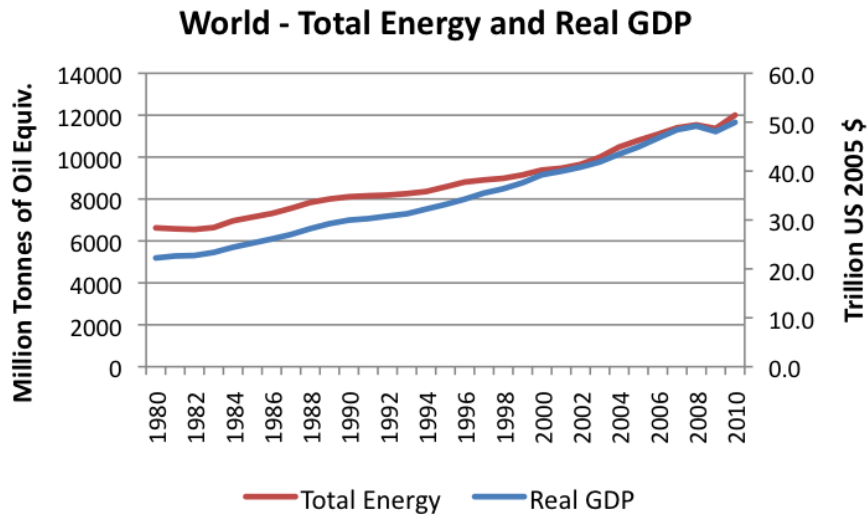
World - Total Energy and Real GDP

Figure 1. Growth in world energy consumption and growth in world real GDP

Source: Worldbank, 2021

To conclude, renewable energy is becoming more important and the strategies of company need to change if they want to succeed in the future. Sustainability reports are a good way to show their investors the commitment they make towards more environmentally sustainable investments. Also consumer behaviour is changing and having an impact on the markets for energy. This paper looks at the impact of reporting of large oil majors and the response of the investors on the share price. The following hypotheses are tested:

Hypothesis 1a: The announcement of annual report has a positive impact on the share price of large oil majors.

Hypothesis 1b: The announcement of quarterly report has a positive impact on the share price of large oil majors.

Hypothesis 1c: The announcement of sustainability report has a positive impact on the share price of large oil majors.

A positive impact is expected after the release of a report since the reports give investors a better view of the company's performance. When the reports show positive results about the performance of the company, the share price of that company will increase. McNichols and Manegold (1983) study the relation between a firm's disclosure and the stock price returns. They find that the returns are significantly greater when annual reports are published. So, greater

disclosure can have a positive impact on the returns and possibly on the share price as well. The same effect is expected for the release of quarterly and sustainability report.

In addition, the difference between the impact of various reporting of large oil majors is studied. This make is possible to investigate the effect of changing renewable energy strategy of large oil majors and if the attitude of shareholders towards supporting this transition is significant.

Hypothesis 2: The announcement of sustainability report has a greater and positive impact on the share price of large oil majors compared with the announcement of annual or quarterly report.

Companies publish their sustainability, annual and quarterly reports for their shareholders to inform them about the performance of the company and their prediction for the future. This information can then be used to estimate the share price performance in the future and make proper investment decisions. The impact of a sustainability report is expected to be greater than that of an annual or quarterly report since sustainability is becoming more important in order to meet the target of the Paris Agreement. The pressure on oil companies to invest in more environmentally sustainability activities is growing. The companies need to show the investors that they take the Paris Agreement and other environment target seriously and what their plan is to meet these targets. Therefore the release of a sustainability report will likely have a greater impact on the share price compared with release of annual or quarterly report.

3. Data

3.1 Description

This thesis will look at the large oil majors share prices and their strategies towards more renewable energy sources. The data that is used is collected from the websites of the large oil majors, New York Stock Exchange (NYSE), and Macrotrends.

3.1.1 Companies reports

The first data source collects the data about the annual, quarterly, and sustainability reports of the large oil majors. These six companies are chosen because they are the largest publicly traded oil and gas companies in the world and have the highest 5-year returns of all the oil companies. This paper looks at only six companies because it is expected that the impact of the release of the three reports will be greater with large companies compared to smaller oil companies. Furthermore, the volatility of large oil companies is expected to be lower compared to small

companies. This means that the share price will not fluctuate greatly with every event that happens and therefore more stable stock prices are expected. The large oil majors publish once a year an annual and sustainability report and four times a quarterly report. These reports are made public for their investors and potential investors to give disclosures into the performance of the company. Annual reports provide important business and financial information to customers, investors, employees and the media (Contributor, 2020). While financial achievements are included, other achievements also are noted, such as research advances or market share gains. A quarterly report is a collection of unaudited figures, which includes information like balance sheets, cash flow statements, records of the income received and profits made over the period, and indications of what dividend payments may be to shareholders (Lill, 2020). The disclosure of quarterly reports gives investors the information they need to make informed investment decisions. A quarterly report can capture more essential information for investors since it is published four times a year in comparison with an annual report. In a 12 months period, many variables can occur or change which can influence the investment decisions of individual and institutional investors (Posner, 2018). The third report is a sustainability report or Corporate Social Responsibility (CSR) report. This report enables organizations to consider their impacts on a wide range of sustainability issues (EcoVadis, 2020). The report is also used to set goals and develop strategies in order to make the management of the organization more sustainable and efficient, and to manage change more effectively. This provides a key platform for communicating sustainability performance and impact towards their shareholders and be more transparent about the risks and opportunities they face. The dates on which the company publish their annual, quarterly, and sustainability reports in the years 2013 till 2018 are collected. This information is then used to make an explanatory variable which takes the value one when an annual, quarterly, and sustainability reports is published and value zero when no report is published on the specific date.

3.1.2. New York Stock Exchange

The New York Stock Exchange (NYSE) is the second source and is used to gain information on the share price of the large oil majors. The NYSE is an American stock exchange in New York City and it is the largest stock exchange market by market capitalization in the world (NYSE, 2020). NYSE provides a place for buyers and sellers to trade shares of stock in companies who are registered to trade publicly and is open on every working day except on holidays. The share price reflects the perception of investors that a company is able to earn and grow in the future and increase their profit (Investopedia, 2020). If the share price of a company is performing well,

the chance of receiving better press from analysts and the media is higher. When the performance of a company is going well and the press about the company is positive the demand will go up and as result the share price may increase. In conclusion, the share price reflects the opinion of investors about the performance of a company. For this thesis the close price of the share price in U.S. dollars together with the corresponding date is collected from the years 2013-2019. The year 2019 is also used since annual, sustainability and the fourth quarterly report of 2018 are published during the following year.

3.1.3. Macrotrends

Macrotrends is used to gather information on the oil prices on the New York Mercantile Exchange (NYMEX). Macrotrends is a research platform for long term investors and contains information about the stock price, inflation, dividend, and many more of the past century. The data of the oil price is coming from the NYMEX. NYMEX is where, among other things, energy carries are being bought and sold for future delivery. The price of Brent Crude Oil is used since it serves as one of the main global oil benchmarks. Oil price is important for the determination of the impact of environmentally sustainable activities on share price since oil price can influence the share price of large oil majors and hence need to be corrected for. Crude oil prices are determined by global supply and demand and one of the biggest factors affecting the oil price is economic growth (EIA, 2020). When economies grow, the use of fossil fuel increasing to drive this economic growth which results in an increasing oil price. Consumers also spend more as a result of the economic growth which also increases the use of fossil fuel. oil prices go up because they use fossil fuel to drive this economic growth and consumers spend more as a result which also increases the use of fossil fuel. Another factor that affects oil prices is inflation. Increasing inflation generally leads to a higher oil price while reducing economic growth. Prices of products that are made with petroleum are directly affected by oil price and also influenced by inflation (Federal Reserve Bank of San Francisco, 2007). Furthermore, oil prices can indirectly affect transportation, manufacturing, and heating cost. For this thesis the closing price of Brent Crude Oil from begin 2013 till end 2019 is collected. The price is connected with the corresponding date when also the share price of the company is known.

### 3.2 Descriptive statistics

3.2.1. Companies reports

Every company publishes their annual and quarterly report for their investors as mentioned above. Most companies publish their first quarterly report around the end of the fourth month. So one

month after the quarter ended. The second quarterly report is published around the end of seventh month, the third quarterly report is published around the end of the tenth month, and the fourth and final quarterly report is published around the beginning of the second month in the following year. The annual reports of the companies are often published in the fourth month in the following year and the sustainability reports are mostly published together on the same day as the annual reports.

3.2.2. New York Stock Exchange

Share price naturally fluctuates for every company. As mentioned above multiple factors play a role in the performance of the share price. These fluctuations in the share price for the six large oil majors during 2013 till 2019 is shown in Figure 2. The share price of BP has two peaks around mid-2014 and mid-2018 are visible along with a distinct decline that starts around mid-2015 and reached the lowest point around begin 2016. A possible explanation for the sharp decline is that around that time the Justice Department and Gulf coast states reached a settlement which BP has to pay for the oil spill in the Gulf of Mexico in 2010 (Uhlmann, 2020). For Chevron there is an almost stable decline in share price visible. The share price reached a peak around mid-2014 and made a sharp decline in the start of 2019. For Eni there is a clear decline in share price some month after begin 2014. This is due to the fact that Eni was the first oil major that cut dividend after the drop of oil prices (Blas, 2015). After this drop, the share price remained mostly stable. The share price of ExxonMobil fluctuates around the 120 dollar and has a single drop a few months before and after the beginning of 2016. Royal Dutch Shell has a peak around mid-2014 followed with a massive drop in share price at the beginning of 2016. The explanation of Neiland (2016) for this fall in share price is the warning of Royal Dutch Shell that earnings will fall dramatically for the full year as a result of lower oil prices. Lastly, TotalEnergies has a rising share price until mid-2014 and then followed a downward trend until January 2016. After that an upward trend followed with an all-time high in October 2018 (Trade Oil, 2021). Overall, the share price of every company was affected by the drop in oil prices around 2015. All share prices show a downward trend that begins around mid-2014 and hit an ultimate low around the beginning of 2016. After that every company recovered and the share price has shown an upward trend since that point in time.
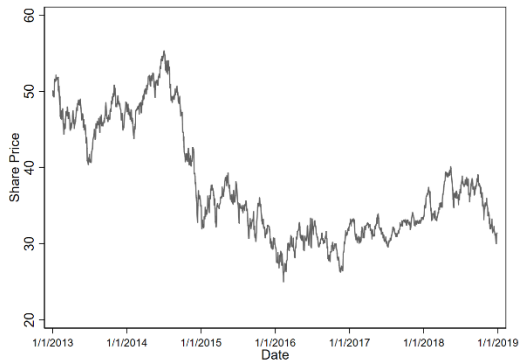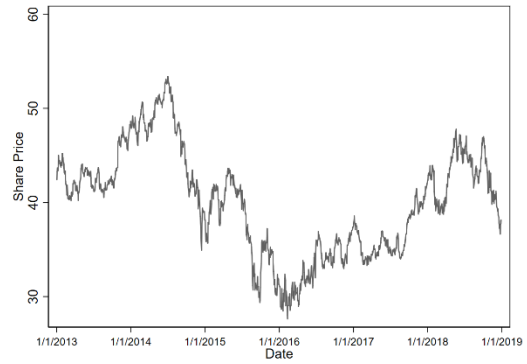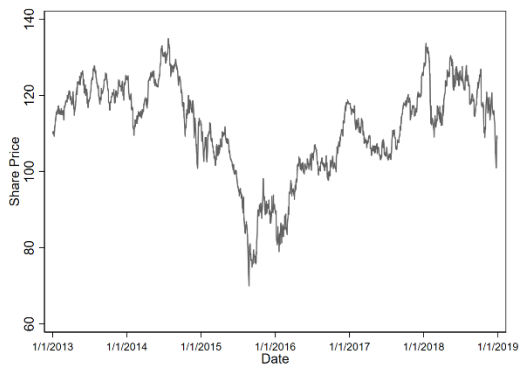
a. BP
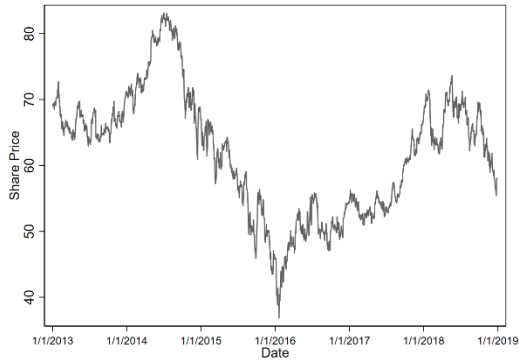
b. Chevron
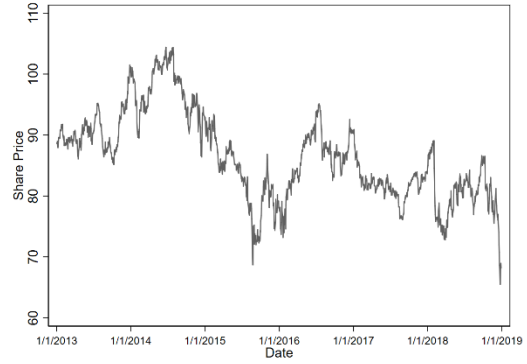
c. Eni

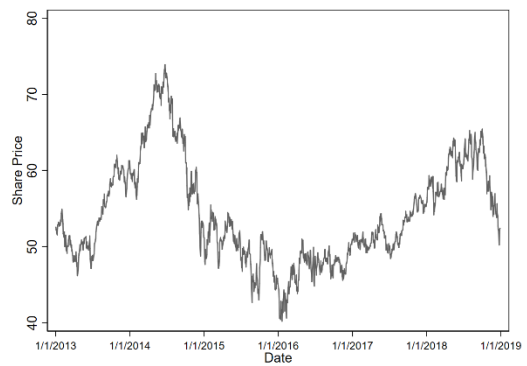d. ExxonMobil

e. Royal Dutch Shell

f. TotalEnergies

Figure 2. Share price of the six oil companies during the years 2013-2019.

Source: NYSE, 2021

Note. Share price is in US dollars.

3.2.3. Macrotrends

The oil price is important because it influences the share price as is shown above with for example Eni and Royal Dutch Shell. They experienced a decline in share price when the oil prices dropped in 2014. Figure 8 gives an overall view of the oil prices from 201 till 2019. A possible explanation for the major shock to oil price is the contribution of positive oil supply after June 2014 (Arezki & Blanchard, 2015). Also a shock to oil price expectations occurred when Organization of the Petroleum Exporting Countries (OPEC) in late November 2014 announced that it would maintain current production levels despite the increase in oil production in some non-OPEC countries. After 2014 the oil price rose but never returned to the prices before 2014. In the last quarter of 2018 the oil price fell again after an upward trend was shown from 2016. Saudi Arabia largely increased production and investors abandoned risky assets which lead to the fall in the oil price at the end of 2018 (DiChristopher, 2019).
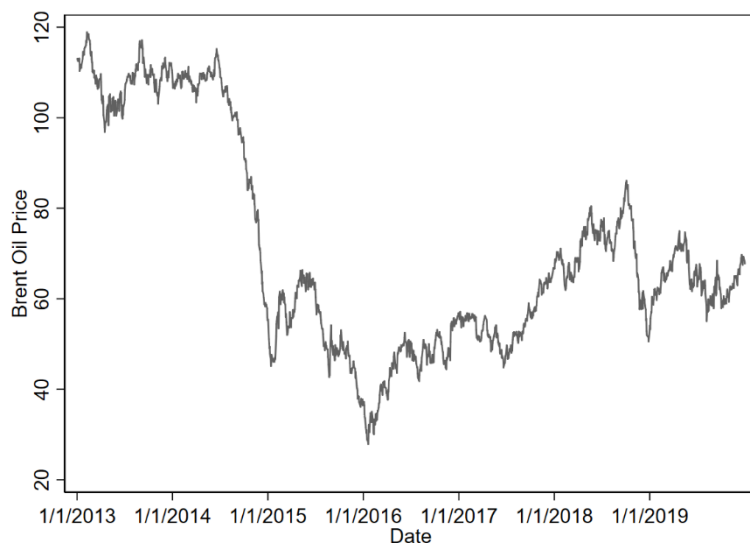

Figure 8. Brent Oil Price during the years 2013-2019.

Source: Macrotrends, 2021

Note. Oil price is in US dollars.

4. Method

As already mentioned, one of the purposes of this work is to assess to which extent the impact on share price varies between the announcement of annual or quarterly reports in comparison

with the sustainability report. This thesis uses a couple of different datasets which contain information about share price, dates on scheduled announcements, and oil prices.

First of all, as can be seen in Figure 2, the share price of the six oil companies differs. Chevron is clearly the company with the highest overall share price followed by ExxonMobil, with an average share price of 112.61 and 84.65 dollar. The share price of Shell is the third highest, with an average of 61.62 dollar, followed by TotalEnergies, with an average of 54.18 dollar. BP comes then with an average of 40.01 dollar and at last Eni with an average of 36.89 dollar. A time series analysis is also conducted to analyse each company separately.

4.1 Hypotheses 1a, 1b, and 1c

In order to investigate if scheduled announcement will affect the share price of a company, several regressions are run. The regressions use panel analysis, which can control for individual heterogeneity and help catch differences between companies. The analysis, as explained above, is based on a dataset of the six large oil majors for the period from 2013 till 2019. After the panel analysis, time series analysis is conducted to test the effect of the report on the share price for each company separately. First, a regression model is used to examine if publishing annual, quarterly, or sustainability reports will have an impact on the share price, and if so to what extent, when no control variables are added.

Control variables are added separately to test whether the statistical significance of the variable of interest (share price of the company) stays more or less the same. The first control variable is oil price and is added in the regression to account for any fluctuations in the share price due to the rise or fall of oil prices. As demonstrated above a fall in oil prices influenced the share price in 2014-2016 greatly. At last, the share price of a company one day before the publications of the reports is used as guideline on how the price has evolved during that time. These control variables need to be added to enhance the internal validity of a study by limiting the influence of confounding and other extraneous variables. The added control variables will help establish a correlational or causal relationship between share price and announcement of reports.

$$R_{i,t} = \alpha_i + \beta_1 \, Annual \, report_{i,t} + \beta_2 \, Oil \, Price_t + R_{m,t} + \varepsilon_i$$

$$R_{i,t} = \alpha_i + \beta_1 \, Quarterly \, Report_{i,t} + \beta_2 \, Oil \, Price_t + R_{m,t} + \varepsilon_I$$

$$R_{i,t} = \alpha_i + \beta_1 \, Sustainability \, Report_{i,t} + \beta_2 \, Oil \, Price_t + R_{m,t} + \varepsilon_I$$

Here, the dependent variable $R_{i,t}$ stands for the share price of company i on day t. The independent variable of regression *Annual report$_{i,t}$,* is a dummy variable which equals 1 if

16

company *i* publish an annual report on that day. The independent variable *Quarterly report$_{i,t,}$* is a dummy variable which equals 1 if company *i* publish a quarterly report on that day. The independent variable *Sustainability report$_{i,t,}$* is a dummy variable which equals 1 if company *i* publish a sustainability report on that day. Furthermore, the control variable, *$R_{m,t}$*, stands for the share price of the company 1 day before period *t*. The variable *Oil Price$_i$* stands for the oil price of company *i* on that day. ε is the random error of company *i*.

In addition, $R_{m,t}$ is included in the regression as control variable and is used to help predict the current share price. Share prices reflect all current available information and the price chances due to newly released information. Therefore, the past share price is an important base for the current share price. In order to determine the optimal lag length, so how many days before the current share price, this thesis looks at the Akaike information criterion (AIC). This model can capture the link between multiple variables as these variables can change over time, in this case the share price. The share price one day prior the share price on the date of the release of the report is used.

<u>4.2 Hypothesis 2</u>

Besides investigating whether the publication of annual, quarterly, or sustainability report has an impact on the share price of the company, this paper also examines whether there is a significant difference between the publication of an annual or quarterly report compared with a sustainable report. The regression will be done separately for each company since the mean share price of the companies are very different and thus when combining these data this will give incorrectly assumptions about the impact of the reports. The control variables as in regression (1), (2), and (3) are also included. To examine whether the effects of publishing an annual, quarterly, or sustainability report is different for each company, the dummy variables for this are added to the final regressions:

$R_{i,t}$ = α_i + β_1 *Annual report$_i$* + β_2 *Quarterly Report$_i$* + β_3 *Sustainability Report$_i$* + β_4 *Oil Price$_i$* + $R_{m,t}$ + ε_I

5. Results

The next section discusses the results of the regressions highlighted in the Method section. As pointed out in the Data section, this paper only focuses on the six large oil majors. First a panel analysis is run and then a time series analysis so each company is analysed separately.

First, panel analysis is conducted to test whether publishing an annual, quarterly, and sustainability report has an impact on the share price. Firm and time fixed effects are added in order to analyse the average effect of the report across all the firms. The impact of publishing an annual, quarterly, or sustainability report is analysed separately and then in the last model analysed together. The amount of days before the share price that is used in the regressions is one day. Also, three, five, seven, and fourteen days is used in the regression to see if the results changed because of this. The coefficient of the variable when increasing the days before the share price on the date the reports are published changed minimum. However, the coefficient became less significant and therefore one day before is the best number of days prior.

The results of the panel analyses are shown in Table 1. First, model 1 shows that *Annual* has a positive but not significant effect on the share price of the six companies. *Quarterly* has a negative but not significant effect on the share price. *Sustainability* has a positive but not significant effect on the share price of the companies. As last, in model 4 all the three reports are included. *Annual, Quarterly*, and *Sustainability* is not significant on the share price. *Oil Price* and *Share Price_1* are positive and significant on the share price for all four models.

Table 1.

Results of share price of each of the six large oil majors on publishing annual, quarterly, and sustainability report

Variable	Model 1	Model 2	Model 3	Model 4
Annual	0.170			0.164
	(0.125)			(0.119)
Quarterly		-0.018		-0.024
		(0.168)		(0.166)
Sustainability			0.3667	0.356
			(0.351)	(0.352)
Oil Price	0.014**	0.014**	0.014**	0.014**
	(0.004)	(0.004)	(0.004)	(0.004)
Share Price_1	0.947***	0.947***	0.947***	0.947***
	(0.016)	(0.016)	(0.016)	(0.016)
Constant	2.448**	2.449**	2.448**	2.447**
	(0.758)	(0.758)	(0.759)	(0.758)
Observations	10,559	10,559	10,559	10,559

Note. This table displays the results of the dependent variable *Share Price* depending on the variables *Annual, Quarterly, Sustainability*, *Oil Price,* and *Share Price_1*, which is the share price 1 day before, for the six large oil companies. *Annual, Quarterly, Sustainability* are dummy variables which equals 1 is a report is published on that date and 0 if not. *Oil Price* and *Share Price_1* are both continuous variables and measured in US dollars. The sample contains 10,559 observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

5.2 Time series analysis

This paper uses besides panel analysis also time series analysis. First, the regressions are run to test the first hypotheses which state that annual, quarterly or sustainable reports have an impact on the share price of large oil majors. Table A1 in Appendix A shows the results of publishing an annual report on the share price for each of the six large oil majors. These regressions did not account for other control variables besides the dummy variable which equals 1 if an annual report is published. The results show that *Annual* is not significant for the share price of each of the six large oil majors. Second, the effect of publishing a quarterly report on the share price for each of

the six large oil majors is analysed (Table A2, Appendix A). Comparable with the regression above, these regressions did not account for other control variables besides the dummy variable which equals 1 if a quarterly report is published. The results show that *Quarterly* is not significant for the share price of each of the six large oil majors. Table A3 in Appendix A also did not account for other control variables besides the dummy variable which equals 1 if a sustainability report is published. The results of publishing a sustainability report on the share price for each of the six large oil majors is shown. These results also show that *Sustainability* is not significant for the share price of each of the six large oil majors.

Furthermore, control variables are added to enhance the internal validity of a study and help establish a causal relation between share price and the announcement of reports. This is done for the announcement of an annual, quarterly, or sustainability report for each of the six large oil majors separately. Table 2 shows the results for publishing an annual report after adding control variables. The results show that *Annual* is positively significant for the companies BP (p = 0.012) and Eni (p = 0.000). For the remaining companies, Chevron, Exxon, Shell, and Total, *Annual* is not significant for the share price. This can be interpreted that the share price on a date when an annual report is published for BP and Eni is significantly higher compared to when no annual report is published. As mentioned in the Theoretical framework, oil prices and share price one day before the date influence the share price. This is visible in Table 2 where *Oil Price* and *Share Price_1* have a positively significant impact on the share price of the companies. The number of observations differs with one compared to tables A1, A2, and A3 in Appendix A because of *Share Price_1*. The first day of 2013 has no share price one day before and therefore the number of observations is now 1,759.

Table 3 shows the results for publishing a quarterly report after adding control variables. The results show that *Quarterly* is positively significant for Eni (p = 0.043). The impact of *Quarterly* on the share price of Exxon is negatively significant (p = 0.053). For the remaining companies, BP, Chevron, Shell, and Total, Q*uarterly* has no significant effect on the share price. This can be interpreted that the share price on a date when a quarterly report is published for Eni is significantly higher compared to when no quarterly report is published and significant lower for Exxon when a quarterly report is published. Again, *Oil Price* and *Share Price_1* are positively significant for every company.

As last, Table 4 shows the results for publishing a sustainability report after adding control variables for each of the companies separately. The results show that *Sustainability* is positively significant for Shell (p = 0.026). For the remaining companies, BP, Chevron, Eni, Exxon and Total,

Sustainability has not a significant effect on the share price. This can be interpreted that the share price on a date when a sustainability report is published for Shell is significantly higher compared to when no sustainability report is published.

Table 2.

OLS regression results of share price on publishing annual report and several control for each of the six large oil majors

Variable	BP	Chevron	Eni	ExxonMobil	Shell	TotalEnergies
Annual	0.325**	-0.171	0.483***	-0.093	-0.278	0.161
	(0.130)	(0.449)	(0.107)	(0.214)	(0.282)	(0.300)
Oil Price	0.004***	0.005***	0.009***	0.003***	0.005***	0.003***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Share Price_1	0.982***	0.987***	0.968***	0.990***	0.984***	0.987***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Constant	0.473***	1.103***	0.515***	0.669***	0.610***	0.528***
	(0.125)	(0.420)	(0.095)	(0.263)	(0.175)	(0.171)
Observations	1,759	1,759	1,759	1,759	1,759	1,759

Note. This table displays the OLS regression results of the dependent variable *Share Price* depending on the variables *Annual, Oil Price,* and *Share Price_1*, which is the share price 1 day before, for the six large oil companies. *Annual* is a dummy variable which equals 1 is an annual report is published on that date and 0 if not. *Oil Price* and *Share Price_1* are both continuous variables and measured in US dollars. The sample contains for every company 1,759 observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table 3.

OLS regression results of publishing quarterly report on the share price for each of the six large oil majors

Variable	BP	Chevron	Eni	ExxonMobil	Shell	TotalEnergies
Quarterly	0.336	-0.280	0.261**	-0.759**	0.003	0.202
	(0.247)	(0.595)	(0.129)	(0.392)	(0.341)	(0.173)
Oil Price	0.004***	0.005***	0.009***	0.003***	0.005***	0.003***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Share Price_1	0.982***	0.987***	0.968***	0.990***	0.984***	0.987***
	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)
Constant	0.468***	1.106***	0.516***	0.639***	0.607***	0.529***
	(0.125)	(0.420)	(0.095)	(0.262)	(0.175)	(0.171)
Observations	1,759	1,759	1,759	1,759	1,759	1,759

Note. This table displays the OLS regressions results of the dependent variable *Share Price* depending on the variables *Quarterly, Oil Price,* and *Share Price_1*, which is the share price 1 day before, for the six large oil companies. *Quarterly* is a dummy variable which equals 1 is an quarterly report is published on that date and 0 if not. *Oil Price* and *Share Price_1* are both continuous variables and measured in US dollars. The sample contains for every company 1,759 observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table 4.

OLS regression results of publishing sustainability report on the share price for each of the six large oil majors

Variable	BP	Chevron	Eni	ExxonMobil	Shell	TotalEnergies
Sustainability	0.365	0.331	0.058	-0.032	0.358**	0.187
	(0.258)	(0.646)	(0.234)	(0.454)	(0.160)	(0.233)
Oil Price	0.004***	0.005***	0.009***	0.003**	0.005***	0.003***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Share Price_1	0.982***	0.987***	0.968***	0.990***	0.984***	0.987***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Constant	0.473***	1.099***	0.515***	0.670**	0.607***	0.531***
	(0.125)	(0.420)	(0.095)	(0.263)	(0.175)	(0.170)
Observations	1,759	1,759	1,759	1,759	1,759	1,759

Note. This table displays the OLS regressions results of the dependent variable *Share Price* depending on the variables *Sustainability, Oil Price,* and *Share Price_1*, which is the share price 1 day before, for the six large oil companies. *Sustainability* is a dummy variable which equals 1 is an sustainability report is published on that date and 0 if not. *Oil Price* and *Share Price_1* are both continuous variables and measured in US dollars. The sample contains for every company 1,759 observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Next, the last regression is run to test whether the effect on publishing an annual, quarterly, and sustainability report has an impact on the share price. This is again done for each of the companies separately since every company has a different average share price. As mentioned in the Method section, oil prices and the share price one day before is also included in this regression.

The results for each of the large oil majors are shown in Table 5. First, *Annual* is positive and significant on the share price for the companies BP (p = 0.077) and Eni (p = 0.000). However, the coefficient of BP in Table 5 (p = 0.077) is less significant compared with the results of Table 1 (p = 0.012). *Annual* is not significant for the remaining companies, Chevron, ExxonMobil, Shell, and TotalEnergies. This means that when an annual report is published the share price of BP or Eni is significantly higher on that date compared to when no annual report is published. Second, *Quarterly* is positive and significant on the share price for Eni (p = 0.042) and negative and

significant on the share price for ExxonMobil (p = 0.053). The significance did not change for Exxon and increased with 0.001 for Eni. *Quarterly* has no significant effect on BP, Chevron, Shell, and TotalEnergies. The conclusion that can be drawn from this is that when a quarterly report is published the share price of Eni on that date is significantly higher compared with the situation where no quarterly report is published. For ExxonMobil this is significantly lower on that date when a quarterly report is issued. As last, *Sustainability* is positive and significant on the share price of Shell (p = 0.0260). This can be interpreted as that when a sustainability report is published on a date the share price of Shell is significantly higher compared to when no sustainability report is published. Publishing a sustainability report has no significant effect on the share price of BP, Chevron, Eni, ExxonMobil, and TotalEnergies.

Table 5.

OLS regression results of publishing annual, quarterly, and sustainability report on the share price for each of the six large oil majors

Variable	BP	Chevron	Eni	ExxonMobil	Shell	TotalEnergies
Annual	0.227*	-0.173	0.487***	-0.104	-0.277	-0.051
	(0.156)	(0.450)	(0.107)	(0.214)	(0.282)	(0.364)
Quarterly	0.338	-0.280	0.263**	-0.760*	0.004	0.216
	(0.247)	(0.595)	(0.129)	(0.393)	(0.341)	(0.208)
Sustainability	0.324	0.327	0.063	-0.042	0.357**	0.190
	(0.274)	(0.647)	(0.235)	(0.454)	(0.161)	(0.233)
Oil Price	0.004***	0.005***	0.009***	0.003**	0.005***	0.003***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Share Price_1	0.982***	0.987***	0.968***	0.990***	0.984***	0.987***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Constant	0.468***	1.108***	0.515***	0.639**	0.610***	0.530***
	(0.125)	(0.421)	(0.095)	(0.262)	(0.175)	(0.171)
Observations	1,759	1,759	1,759	1,759	1,759	1,759

Note. This table displays the OLS regressions results of the dependent variable *Share Price* depending on the variables *Annual, Quarterly, Sustainability*, *Oil Price,* and *Share Price_1*, which is the share price 1 day before, for the six large oil companies. *Annual, Quarterly, Sustainability* are dummy variables which equals 1 is a report is published on that date and 0 if not. *Oil Price* and *Share Price_1* are both continuous variables and measured in US dollars. The sample contains for every company 1,759

observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

6. Conclusion and discussion

The aim of this study is to formulate an answer to the following question: What is the impact of the announcement of environmentally sustainable activities on share price of large oil majors? Several OLS regression are run with data from the large oil majors websites, NYSE, and Macrotrends in order to test several hypotheses.

Hypotheses 1a, 1b, and 1c state that publishing an annual, quarterly, or sustainability report has an impact on the share price of large oil majors. First, for the panel analysis no significant effect is found of publishing an annual, quarterly, or sustainability report on the share price. Second, the results of the time series analysis suggest that the share price of BP and Eni is significantly higher when an annual report is published on that date compared to the situation that no annual report is published. Second, the results show when a quarterly report is issued the share price of Eni is significantly higher compared to when no report is issued, while the share price of ExxonMobil significantly lower is when a quarterly report is issued. As last, only the share price of Shell is significantly higher when a sustainability report is issued on that date compared with no sustainability report. However, the null hypotheses for all three hypotheses cannot be rejected due to lack of evidence of a significant effect on the share price of large oil companies. Annual and sustainability reports are published only once a year and quarterly report four times a year. In a one year period, a lot of factors that influence the share price can change besides the oil price. For example, an oil spill can happen and the company responsible for this could be subject to fines. This reduces the performance of the company and therefore effect the share price.

Hypothesis 2 states that the announcement of sustainability report has a greater and positive impact on the share price of large oil majors compared with the announcement of annual or quarterly report. The null hypothesis cannot be rejected since non on the companies had significant results for annual, quarterly, and sustainability report. BP, ExxonMobil, and Shell had only significant results for one type of report and therefore no conclusion can be drawn from this. Eni has significant results for both annual and quarterly results. Publishing an annual report has a slightly bigger impact on the share price of Eni compared with a quarterly report. However, this

has nothing to do with sustainability activities since the results for publishing a sustainability report was insignificant.

This research has some limitations. First, internal validity is threatened by omitted variable bias. It is possible that the regressions did not control for all variables that are correlated with the dependent variable and that have an effect on the explanatory variable. For example, expected growth is not included in the regression but it influences the share price directly and has an impact on the content of the reports. The reason why not all variables are included in the regression is that most of the variables are very hard to measure. This omitted variable bias is therefore the reason no causal effects, but only correlations can be established on the basis of the results. The second threat to the internal validity of this study is measurement errors. The data on the reports is coming from the websites of the large oil majors. However, the information in the report that is released can be partly old news and therefore not affect the share price of the company. Now that a statement has been made about the internal validity, the external validity of this study will also be examined. To test the hypotheses, data from the company's website, Macrotrends, and NYSE was used. The sample contains information about the six largest oil companies in the world, BP, Chevron, Eni, ExxonMobil, Shell, and TotalEnergies. As a result, the sample of oil companies is not very representative of the total population of oil companies. The external validity can be increased by collecting the information from more large oil companies, for example China Petroleum & Chemical and Saudi Aramco. The small amount of observation means that the results with regard to the effect of environmentally sustainable activities on the share price are more difficult to generalize. Some companies do not mention when a report is published and therefore it was not possible to include all the energy companies. For the six large oil majors all the data was available and therefore these six have been used in this paper. Also, the data is from 2013 till 2018 since before 2013 not all data was available and after 2018 the data can be influenced by the current pandemic. However the trend of more renewable energy has intensified in the last few and hence real impact is likely to be seen from 2020 onwards. In the regression the effect of the release of the reports is measured on the day of the release. However, the effect of the reports on the share price can show up after some days. Also due to rumours of the content of the reports the effect on the share price is observable before the day of publishing. Both options are not analysed. This study did not examine whether investment in environmentally sustainable activities has a larger impact on the share price than investment in traditional fossil fuel based activities. Therefore, it is not clear whether a rise of share price is linked to publishing a report or other external factors like investment decisions. For that reason, the possible factors which influence the share price of large oil majors and the increasing attention towards renewable

energy need further investigation, before any suggestions for policy or investors can be made. In addition, this study did not examine whether policy laws and restriction have an impact on the large oil majors over time. Further research could look for long term time trends by examining the effect of introducing laws and restrictions on the decisions of large oil majors to investment in more environmentally sustainable activities.

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Appendix A

Table A1.

Results of share price of each of the six large oil majors on publishing annual report

Variable	BP	Chevron	Eni	ExxonMobil	Shell	TotalEnergies
Annual	0.106	-5.450	-0.519	1.446	-2.740	-1.739
	(2,364)	(8.303)	(2.673)	(3.191)	(3.192)	(2.435)
Constant	40.006***	112.623***	36.894***	84.643***	61.626***	54.189***
	(0.126)	(0.285)	(0.172)	(0.195)	(0.209)	(0.151)
Observations	1,760	1,760	1,760	1,760	1,760	1,760

Note. This table displays the OLS regression results of the dependent variable *Share Price* depending on the variable *Annual* for the six large oil companies. *Annual* is a dummy variable which equals 1 if an annual report is published on that date and 0 if not. The sample contains for every company 1,760 observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table A2.

Results of share price of each of the six large oil majors on publishing quarterly report

Variable	BP	Chevron	Eni	ExxonMobil	Shell	TotalEnergies
Quarterly	0.293	-0.097	0.738	1.629	0.768	0.573
	(1.124)	(2.411)	(1.463)	(1.438)	(1.882)	(1.398)
Constant	40.003***	112.620***	36.882***	84.625***	61.607***	54.175***
	(0.127)	(0.287)	(0.173)	(0.197)	(0.210)	(0.152)
Observations	1,760	1,760	1,760	1,760	1,760	1,760

Note. This table displays the OLS regression results of the dependent variable *Share Price* depending on the variable *Quarterly* for the six large oil companies. *Quarterly* is a dummy variable which equals 1 if an quarterly report is published on that date and 0 if not. The sample contains for every company 1,760 observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table A3.

Results of share price of each of the six large oil majors on publishing sustainability report

Variable	BP	Chevron	Eni	ExxonMobil	Shell	TotalEnergies
Sustainability	-0.062	-0.261	-1.059	-1.713	-0.021	1.895
	(2.389)	(4.043)	(2.462)	(4.586)	(3.161)	(3.196)
Constant	40.007***	112.608***	36.896***	84.653***	61.617***	54.176***
	(0.126)	(0.285)	(0.172)	(0.195)	(0.209)	(0.151)
Observations	1,760	1,760	1,760	1,760	1,760	1,760

Note. This table displays the OLS regression results of the dependent variable *Share Price* depending on the variable *Sustainability* for the six large oil companies. *Sustainability* is a dummy variable which equals 1 if an sustainability report is published on that date and 0 if not. The sample contains for every company 1,760 observations and the standard errors are reported in parentheses. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.