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# How financial markets react to Total's strategy of becoming a responsible energy major?

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**Abstract**

This paper investigates the market reaction to the upstream oil and gas and climate strategy of Total SA. It aims at (i) analyzing whether the market welcomes Total's climate commitment and (ii) comparing investors' reaction to both categories of announcements. By using an event study, our results highlight that the market reacts negatively to both Total's upstream oil and gas and climate strategy. However, the market reacts more negatively to its climate strategy meaning that investors may consider that Total has to do better in terms of climate commitment to mitigate the risk of climate change.

*JEL Classification*: G14; L25; Q54
*Keywords*: Energy transition; climate strategy; financial markets; event study; oil and gas companies; Total SA.

# 1 Introduction

"Environmentalism is not a fad, and corporations must respond correctly" said Lee M. Thomas (1992) former Administrator of the United States Environmental Protection Agency from 1985 to 1989. This is even more true in 2020, where climate change has become a crucial matter among political and business decisions. As a matter of fact, implementing corporate environmental initiatives (henceforth CEIs) sounds to be of great priority (Thomas, 1992). Oil and gas companies may thus play an important role in the energy transition and have already become active in low-carbon energy technology markets (Zhong and Bazilian, 2018; Pickl, 2019). Hence, analyzing the impact of diversification into clean energy seems to be of particular relevance. In this paper, we focus on Total SA (Total thereafter)—one of the biggest international oil and gas company—and investigate its business diversification as well as environmental commitments as part of its strategy to become the "responsible energy major". To this end, we analyze the impact of Total's specific announcements on stock returns, i.e., the valorization of the energy transition by financial markets. We rely on an event study, and compare the announcements linked to upstream oil and gas (core) activities, such as oil discoveries or production start-ups, and those referring to the energy transition and climate strategy of the Group. This allows us to address whether shareholders and financial markets welcome the strategy of Total to become a responsible energy major.

In 2019, more than one-third of all greenhouse gas (GhG) emissions comes from 20 fossil fuel companies.[1] The latter include (i) state-owned companies such as Gazprom, the National Iranian Oil Company (NIOC), and Saudi Aramco,[2] as well as (ii) publicly listed investor-owned companies such as BP, Chevron Corporation, ExxonMobil, Royal Dutch Shell, and Total. In this context, paying more attention to oil and gas companies is becoming urgent, especially since they have an important role to play in addressing climate change. According to Dr Faith Birol, executive director of the IEA, "the scale of the climate challenge requires a broad coalition encompassing governments, investors, companies and everyone else who is genuinely committed to reducing

[1] The Guardian ("Revealed: the 20 firms behind a third of all carbon emissions", 9/10/2019). Data are based on the Climate Accountability Institute's report which is not publicly disclosed. These companies include oil, gas and coal companies.

[2] The company has been listed on the Saudi Stock Exchange (Tadawul) in December 2019 making Saudi Aramco the world's largest listed company (1.88 USD trillion) before Apple (1.18 USD trillion) and Microsoft Corp. (1.15 USD trillion).

emissions," adding "that effort requires the oil and gas industry to be firmly and fully on board" (January, 2020).[3] Even though some of them are stepping up climate efforts to become "energy companies" instead of "fossil fuel companies" (Pickl, 2019), greater efforts have to be made to reach the Paris Agreement which aims at fighting against climate change by limiting the global temperature rise well below 2°C. The diversification of oil and gas companies to low-carbon technologies is valued by the IEA to only 1% of their capital expenditures, which represents $2.1 billion in 2019. Half of these expenditures is allocated to solar photovoltaic (PV) projects ($1.1 billion) followed by onshore wind ($0.4 billion), offshore wind ($0.4 billion), carbon capture utilization and storage ($0.1 billion), and biofuels ($0.1 billion). However, awareness about global warming emerged earlier for some oil and gas companies (BP, Shell, and Texaco[4]) as mentioned by Kolk and Levy (2001) by using different types of climate measures such as measurement and external monitoring of emissions or renewable investment in the mid-1990s.

Zhong and Bazilian (2018) and Pickl (2019) point Total (Total SA) to be the most ambitious company in terms of diversification towards clean energy technologies. Total's disclosed low-carbon investment calculated as a proportion of total capex including asset finance, mergers and acquisitions, and venture capital spend from 2010 to the third quarter of 2018 reached 4.3%, half going to solar PV projects followed by energy smart technologies (BloombergNEF, CDP[5]). Indeed, Total has invested in many strategic firms or innovative start-ups in solar PV such as SunPower in 2011, but also in wind energy (United Wind, 2016), batteries (Saft Group, 2016), energy storage (Octillion, 2019), hydrogen (Sunfire, 2019), or energy efficiency (GreenFlex, 2017). This ranked Total as the first major in terms of low-carbon investments as a proportion of total capex before BP (2.3%), Equinor (1.8%), and Shell (1.3%). Total's portfolio of low-carbon businesses could account up to 20% of its sales by 2040. However, when it comes to renewable energy investment (excluding R&D and clean energy technologies), Total ranks four after Equinor ($2.1 billion), BP ($2 billion), and Shell ($0.7 billion) according to Rystad Energy[6] (2019). The

[3]See https://www.iea.org/news/oil-and-gas-industry-needs-to-step-up-climate-efforts-now.

[4]The company merged with Chevron Corporation in February 8, 2002.

[5]"CDP Global is an international non-profit organization comprising of CDP Worldwide Group and CDP North America, Inc. It is directed by a board of trustees and board of directors respectively. As an international organization, CDP receives funding support from a wide range of source."

[6]Note that Zhong and Bazilian (2018) show different figures taken from Bloomberg (Hirtenstein, 2018) : BP ($0.2 billion), Eni ($0.2 billion), Shell ($2 billions), Total ($0.5

Group thus invested $0.5 billion in renewable energy out of $22.2 billion total spendings on all energy types in 2019. BloombergNEF estimates that major oil companies have totalized a number of 70 deals of clean energy in 2019, which includes 13 deals in the solar sector followed by 11 deals in transport and mobility technology, 10 deals in digital and efficiency, 10 deals in energy storage, and 8 deals in the wind sector.

Comparing to their US counterparts, European majors seem to do better since Bloomberg considers European oil majors having closed seven times more deals (renewable electricity and storage companies) than US majors. BP together with Shell and Total account for 40 deals out of 70 deals in 2019. Indeed, the European majors appear to be more active players in the renewable market compared to their US counterparts which are largely involved in the US shale oil. Furthermore, US majors own much larger pools of oil reserves comparing to their European counterparts (Pickl, 2019) which plays in favor of a lesser willingness to renewable energy investments. Total has particularly invested in solar technology with 1.7 GW of installed capacities in 2019, the front-runner low-carbon technology of the group. Indeed, renewable energy has become a very attractive technology for many reasons and is expected to capture two-thirds of global power plants investments by 2040 (IEA, 2017). Hydrocarbon extraction costs are getting higher due to, for instance, ultra-deep projects (Weijermars et al., 2014). Furthermore, lower oil prices (on average) since 2014 have made the unit cost per barrel produced harder to offset. Despite the rise in prices in 2016, oil prices have remained lower since 2014 than those observed during the 2010-2014 period. A third reason why renewable is an attractive business also relies on costs. By 2035, power generation costs of renewable should fall by 26% for onshore wind, 35% for offshore wind and up to 60% for solar PV confirming the decrease initiated in recent years. The lower cost of electricity is mainly driven by reductions in total installed costs. Since 2009, solar PV module prices have fallen by 80% and wind turbine prices by 40% according to IRENA (2017). However, as specified by IEA (2020a), electricity cannot be the only solution for the energy sector's transformation. Actions to reduce their environmental footprint can also (to a large extent) be taken by bringing down $CO_2$ emissions of their core activities. This can be achieved by reducing flaring and methane leaks into the atmosphere and shifting from oil to gas (IEA, 2020b).

Total hopes to become the "responsible energy major" as claimed by Patrick

billion) and Statoil ($0.6 billion). However, also note that figures for Total do not change.

Pouyanné,[7] chief executive officer (CEO) of the Group. The Group's ambition is notably to reduce the carbon intensity of the energy products offer to customers by 15% between 2015 and 2030 and by 40% between 2031 and 2040. Total is also committed – as part of the United Nations Sustainable Development Goals – to offer cleaner, more affordable, and more available energy for people through, among other plans, improving energy efficiency and developing profitable low-carbon electricity businesses. In 2019, Total's net investment reached $17.4 billion (splitting between $13.4 billion in organic[8] investment and $4.1 billion in net acquisitions) compared to $15.6 billion in 2018. One-third of the total net investment ($6.2 billion) is dedicated to the "Integrated Gas, Renewable and Power" segment (iGRP), the new segment implemented in 2019 to the Group's financial statement. This segment,[9] including liquefied natural gas (LNG) and low-carbon electricity businesses has confirmed the Group's strategy of diversification to non-core activities (non-oil sector). The "Exploration and Production" (E&P) segment remains first in terms of net investments accounting for $9.7 billion. In 2019, the Group's installed gross capacity of electric generation was 1.6 GW of solar (1.0 GW in 2018) and 1.3 GW of wind technologies (0.7 GW in 2018) as well as 0.1 GW of biogas and hydroelectricity. Total is targeting to install 25 GW of renewable electricity generation by 2025 thanks to the support of its subsidiaries Total Solar, Total Eren, Total Quadran and SunPower which ranks the Group has as a world leading investor in solar PV. In 2008, Total creates Total Carbon Neutrality Ventures (former Total Energy Ventures), the venture capital arm of the Group. The fund (accounting for 33 start-ups) is focused on investing in high-potential start-ups committed in carbon neutrality activities such as renewables, energy storage, or bio-plastics and recycling. In 2019, Total announces an increase in capital to a cumulative $400 million over five years for

[7]"We will remain an energy major; our goal is for Total to become the responsible energy major: by which I mean a reliable, affordable and clean energy" said P. Pouyanné in an interview for Pipeline Magazine in November 2016.

[8]Company's own investments excluding notably acquisitions and divestments.

[9]Note that the split between LNG and low-carbon electricity businesses concerning net investments and adjusted net operating income is, as far as we know, not given by Total. However, the LNG part seems to mainly drive the segment as precised in a note in the financial statements of the Group : « Driven by strong LNG sales growth, operating cash flow before working capital changes for the iGRP segment more than doubled in the fourth quarter of 2019 and increased by 81% in 2019. Adjusted net operating income was 794 M$ in the fourth quarter 2019, an increase of 17%, and 2,389 M$ in 2019, a decrease of 1%, impacted by lower gas prices in Europe and Asia as well as higher DDA expenses on new projects." ; "Net investments rose to $17.4 billion and reflect in particular the strategy to strengthen LNG and deep offshore, as shown by the acquisition of Mozambique LNG and the launching of Arctic LNG 2 in Russia and Mero 2 in Brazil"

the fund to support its ambition of being a responsible energy major. The fund has already invested more than $200 million in innovative start-ups and is ranked three among venture capital funds in terms of green energy deals signed in 2016 (BNEF).

Because oil and gas companies play a major role on climate change and some of them have already started the process of diversification, it is worthy of interest to investigate to what extent shifting from oil companies to energy companies is valued by financial markets. To address this key question, we rely on different types of announcements made by Total and we investigate how they impact Total's stock market returns. To the end, we rely on an event study to examine the market reaction to two main categories of announcements: i) upstream oil and gas strategy, and ii) energy transition and climate strategy. The first category refers to the core activities of the Group such as oil and gas discoveries, development and production start-ups, acquisitions and divestments. The second category focuses on announcements based on Total's commitment in the fight against climate change. This indeed raises the question to what extent financial markets value Total's climate-friendly actions and investments and if these actions can outperform core activities' investments. More specifically, we test if the market positively reacts to Total's strategy to become a responsible energy major. This paper contributes to the literature as it focuses on the market valuation of the climate strategy of a European oil major, i.e., Total company. Total has publicly expressed its willingness to become the first responsible energy major by investing in non-core activities such as renewable energy. By investing in non-core businesses, Total has initiated a diversification process in favor of the energy transition. This article thus analyzes if this diversification process is welcomed (or not) by financial markets.

To this end, we apply an event study over 139 announcements from 2010 to 2019 on a daily basis. Our results show that the market significantly and negatively reacts to both the upstream oil and gas strategy and climate strategy of Total. However, the market seems to react more negatively to Total's climate strategy. After an announcement linked to its climate strategy, Total's returns dropped by 44 basic points (bps), while they decrease by 12 bps following an announcement relying on its upstream oil and gas strategy. As the market may not equally react to each subcategory, we also implement the event study for each subcategory. Over the three-day event window, we find that announcements of oil and gas acquisitions and production start-ups show negative abnormal returns on average. Turning to oil and gas development

start-ups, results indicate positive average abnormal returns of 59 bps. However, the market seems to well anticipate announcements linked to oil and gas discoveries, divestments and strategic alliances as they are non-significant. Subcategories of the climate strategy also provide interesting results. The market significantly and negatively reacts to both the subcategories of climate commitment and renewable energy and low-carbon transportation. Finally, there is no sign of positive abnormal returns following an announcement linked to Total's climate strategy, whatever the subcategory of interest.

The remainder of this paper proceeds as follows. Section 2 discusses i) the background of the climate strategy of oil and gas companies before investigating ii) the relationship between social and environmental performance as well as iii) the empirical evidence of the link between environmental and financial performance. Section 3 presents the data, and Section 4 the methodology employed in our empirical investigation. Section 5 reports the results from the event study analysis, and Section 6 concludes the paper.

# 2 Background and literature review

In Section 2.1, we first analyze the background of the climate strategy of oil and gas companies as well as the context within which the oil and gas industry has integrated climate awareness and actions into its operations. As this study investigates the market reaction to specific announcements of Total with a particular emphasis on climate-friendly activities, we then focus in Section 2.2 on the theoretical literature dealing with the relationship between social responsibility and financial performance. Finally, in Section 2.3, we present empirical evidences of the link between environmental and financial performance.

## 2.1 Background of the climate strategy of oil and gas companies

Oil and gas companies face today increasing pressures from governments, stakeholders as well as citizens to strengthen their actions in order to limit their environmental footprint. Although climate change has become a very discussed topic since the Paris Agreement in December 2015, oil and gas companies have already taken part in the debate well before. They have initiated

climate strategies to address climate change in the late 1990s, but with diverse timing and different strategies. In particular, Kolk and Levy (2001) investigate the climate strategy of different oil companies, including British Petroleum (BP), ExxonMobil, Royal Dutch Shell (Shell), and Texaco. BP and Shell appear to be the first to take the first step towards climate change (May 1997 for BP followed by Shell in September 1997 and Texaco in February 2000). For instance, BP, Shell and Texaco have initiated measurements of emissions and renewable investments (in particular in solar and hydrogen). However, ExxonMobil seems to be very skeptical, raising the lack of conclusive scientific evidence. Kolk and Levy (2001) highlight different company-specific factors which can explain the divergence among the oil industry on climate change:[10] i) locational factors, ii) economic and market position, and iii) internal organizational factors. The first factors put the focus on socio-economic determinants as well as the regulatory context raising the fact that societal awareness on climate change started to be a public debated topic first in the US in 1988[11] and followed by Europe in 1992. With particular regard to the second point, which concerns economic factors, the oil industry has experienced different waves of diversification, especially in the mid-1970s. As specified by Fosse et al. (2016), main waves of mergers and acquisitions (M&A) followed important structural changes implied by, for instance, the oil shocks in 1973/74 or the Asian crisis in 1997. Indeed, the first 1973/74 oil shock leads the industry to a new economic environment marked by uncertainty and, obviously, a weaker oil demand. Grant and Cibin (1996) note that this period experienced two main changes for the oil industry: "increasing competition" and "increasing turbulence". At the time and until 1970, the "Seven Sisters[12]" dominated the petroleum industry. The 1973 oil crisis thus marked a turning point for the Major companies. Between 1973 and 1987, their global oil production share fell from 29.3% to 7.1%, and their global refinery capacity share decreased from 25.5% to 17% (Grant and Cibin, 1996; Verleger, 1991). The decline of

[10]In their book *Climate change and the oil industry – Common problem, different strategies*, Skjærseth and Skodvin (2001) highlight the three following factors : i) company-specific features, ii) the political context of corporate activity at the domestic level and iii) the international institutional context in which multinational companies operate.

[11]Note that the Exxon Valdez oil spill occurred in 1989, which contributed to accelerate concerns about conditions of production and extraction of oil. Following this event, environmental reports were published by Exxon and Texaco in 1990, followed by BP in 1995 and Shell in 1997.

[12]The Seven Sisters included the Anglo-Iranian Oil Company (now BP), Gulf Oil (now merged into Chevron), Royal Dutch Shell, Standard Oil Company of California (now Chevron), Standard Oil Company of New Jersey (Esso, then Exxon and now part of ExxonMobil), Standard Oil Company of New York (Socony, then Mobil and now part of ExxonMobil) and Texaco (merged into Chevron).

their dominant position was the result of massive waves of nationalization, as well as the increasing development of smaller oil companies and national oil companies. The second factor identified by the authors as an "increasing turbulence" refers to the increasing volatility of oil prices after 1980. Between 1982 and 1991, most of the oil companies experienced important restructuring plans, including divestments of non-core activities,[13] dismissals and acquisitions of core businesses. In this context of diversification and restructuring, Exxon emerges as a strong company exhibiting a return on equity of 12.7% in average during the 1990-1999 period while BP and Shell show a lower return on equity of around 9.5%. As a strong company, Exxon did not need strategy changes. ExxonMobil remains today a pure hydrocarbon focus business while BP, Eni, Equinor, Shell and Total have emerged as "energy companies" (Pickl, 2019). This wave of restructuring (until late 1990s) is part of the third component of the oil and gas companies' climate strategy and concerns internal organizational factors. The new internal organization of BP, Shell and Texaco occurs with arrivals of new top managers as precised by Kolk and Levy (2001). Important international meetings such as the Kyoto meeting (1997) and the World Economic Forum (Davos, 1998) have had an important impact on these companies' strategies and raised awareness from the oil and gas companies' CEOs.[14] Furthermore, the 1990s were marked by the rise of a new business model of the oil company, which aims at maximizing shareholder value through growing proven oil reserves and minimizing costs. For Stevens (2016) from the think tank Chatham House, this business model, which still stands as the current business model of the international oil companies,[15] is becoming "increasingly ineffective" as illustrated by the title of the article *International oil companies – The death of the old business*. In his article, Stevens raises different arguments showing that the business model of the oil industry is becoming ineffective. First, the industry has shown difficulties in increasing oil reserves, one of the main objectives of the business model since 1990. Second, oil and gas companies have exhibited weak performances on financial markets as well as inflated dividends (through share buybacks to secure the support of shareholders), creating difficulties in evaluating investors sentiment through stock value. Furthermore, the oil and gas industry exhibits a lower return on investment than the other industrial companies. In 2014, the oil and gas industry's

[13]Non-core activities corresponds to a previous wave of diversification of the industry which invested in alternative sources of energy such as solar power, nuclear energy or oil shales but also in minerals and real-estate. Here, divestments exclude coal, mining, real-estate and solar power.

[14]J. Browne (BP's CEO), C. Herkströter (Shell's CEO) and P. Bijur (Texaco's CEO).

[15]The study focuses on BP, Chevron, ExxonMobil, Shell and Total.

return on investment[16] was less than 6% while industrials' (excluding oil and gas) one was 14% (Stevens, 2016; Tomorrow Energy, 2015). Furthermore, the industry already showed a low profitability a few years before the oil prices plummet in 2014.

As the first oil and gas company to recognize climate change challenges, BP has initiated a new dynamic among the industry (Kolk and Levy, 2001). Today, the oil and gas industry is the subject of various criticisms as it represents around one-third of global GhG emissions. If social and regulatory pressures have led (a part of) the industry to take a step beyond pure hydrocarbon products, i.e., their core businesses, other factors have to be taken into account. Oil and gas companies can play a great part in the new energy landscape to address climate challenges and "no oil and gas company will be unaffected by clean energy transitions" (IEA, 2020b). According to the IEA, renewable energy is expected to be the fastest-growing primary energy source, led by solar PV. Between 2019 and 2024, renewable energy is expected to grow by 50%, consisting of an increase of 1200 GW. Thanks to cost reductions and digital technology improvements, renewable energy offers great opportunities for investments. In its Sustainable Development Scenario, the IEA considers the share of renewables to reach two-thirds of electricity generation output and 37% of final energy consumption by 2040. The growth potential of the renewable energy sector seems to offer a double opportunity for the industry: a way to show that they are taking some actions in favor of the energy transition, but also a way to make profit and diversify their activities. This is even more true in a context of rising costs of hydrocarbon extraction (Weijermars et al., 2014) and lower oil prices since 2014. As a result of more offshore and deep-water projects as well as unconventional resources, extraction costs have increased. In 2018, P. Pouyanné said "oil is no longer a source of long-term growth". Furthermore, increasing upstream capital expenditure (capex) since 2000 have been supported by rising of oil prices, especially between 2011 and 2014 when oil prices were above $100/barrel (Weijermars et al., 2014). Lastly, oil companies will also face a decrease in demand growth for gasoline[17] and diesel between 2019 and 2025 due to implemented policies together with a rise in the popularity of electric vehicles (IEA, 2020a). With regard to this new energy environment, oil and gas companies have initiated a transition from oil companies to energy companies (Pickl, 2019). In a recent study, Pickl (2019) ranks Shell to be the first oil company in terms of renewable strategy. Different

[16] Average of US SP500 oil and gas companies and SP500 industrials excluding oil and gas (Tomorrow Energy, 2015).

[17] Gasoline demand growth represents 2.5 mb/d over the period 2013-19 but is expected to reach 0.5 mb/d over 2019-25.

assessment criteria are presented and weighted depending on their importance. Shell obtained a total weighted score of 90% followed by Total (70%). The main difference between the two companies remains in the "capital investment into renewables" section[18] as Shell's renewable investment reaches $1 billion per year while Total invests $0.5 billion per year. The analysis also shows that five out of eight oil majors have explicitly formulated a renewable energy strategy and have created dedicated renewable energy teams. Furthermore, six of them have created a venture capital arm. Finally, the author highlights that oil majors' renewable strategy seems to mainly depend on proven oil reserves. Indeed, oil majors with important proven oil reserves such as Petrobras and ExxonMobil exhibit a very low activity in renewable energy comparing to Shell, Total, Eni or Equinor.

However, investment made by oil and gas companies in low-carbon businesses remains very low as it represents less than 1% of their capital expenditures, which corresponds to around $2 billion (IEA, 2020b). In a report of May 2019, the IEA estimated the global upstream oil and gas investment to reach $497 billion in 2019. As indicated by the report, "there are few signs of a major change in company investment spending". If the popularity of renewables is increasing, the oil and gas industry can take other actions among its core businesses to bring down GhG emissions. This can be done through methane reductions as well as reducing flaring and venting $CO_2$ but also shifting from oil to gas. Reducing methane leaks to the atmosphere appears to be the most effective action to take. In its Sustainable Development Scenario, the IEA estimates global emissions intensity of oil and natural gas operations to decrease by 40% in 2030 with methane reductions accounting for around half of the decrease. Methane is indeed considered to be the largest component of the total GhG emissions (IEA, 2020). In 2019, the IEA estimates methane emissions coming from oil and gas operations to be 82 million tones (Mt) and total indirect GhG emissions (from oil and gas operations) to reach 5 200Mt of carbon-dioxide equivalent ($CO_2$-eq) accounting for 15% of total energy sector GhG emissions.[19]

[18]This section has a weight of 50%. Other sections have a 5% weight with no exception. Note that this analysis includes hydro, solar, wind energy technologies as well as biofuels, carbon capture and energy storage.

[19]Energy related $CO_2$ emissions reached 33Gt in 2019.

## 2.2 Background of the link between social responsibility and financial performance

"*There is one and only one social responsibility of business — to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud*". Originally taken from his book Capitalism and Freedom (1962) and then quoted in the New York Times Magazine in September 1970, Milton Friedman raised an important debate on the social responsibility of business and inspired many corporate governance theories. For Friedman, the firm's purpose is to increase profits and reduce other expenditures including corporate social responsibility[20] (CSR) that are not necessary as they induce costs and reduce profitability. Since the mid-1970s, particular theoretical and empirical attention has been paid to CSR and several theoretical frameworks have emerged[21]. In this spirit, Ackerman and Bauer (1976) develop a research program called Corporate Social Responsiveness at the Harvard Business School, considered as the first to analyze different tools and approaches of corporates to manage social responsibility. Salzmann et al. (2005) survey the literature[22] on the theoretical link between environmental and social performance (ESP) and financial performance (FP). Interestingly, they highlight different frameworks based on the typology of Preston and O'bannon (1997). While Friedman (1962, trade-off hypothesis) shows the negative impact of ESP on FP, Preston and O'bannon (1997, managerial opportunism hypothesis and negative synergy) highlight the reverse causality that FP negatively causes ESP. According to McWilliams and Siegel (2001, supply and demand theory of the firm), there is no relationship between ESP and FP. In 1984, Freeman detailed the stakeholder theory opposed to Friedman's theory and argues that a firm has to create value for every stakeholder and not only shareholders. A positive link from ESP to FP is also found by Cornell and Shapiro (1987, social impact hypothesis) as well as Waddock and Graves (1997a,b, available funds hypothesis or slake resource theory and the "virtuous circle").

[20] McWilliams and Siegel (2001) have defined CSR as "actions that appear to further some social good, beyond the interest of the firm and that which is required by law". However, note that there is no very clear and unified definition of CSR in the literature.

[21] Other authors of the 70s and the 80s have studied this relationship. Among others, we can cite Carroll (1979), Davis (1973), Frederick (1978), Freeman (1984), Miles (1986), Preston and Post (1975) and Wartick and Cochran (1985).

[22] For another literature review on the link between social responsibility and financial performance see Allouche and Laroche (2005)

Turning to empirical studies, Vance (1975) and Posner and Schmidt (1992) find a negative link between CSR and CSP, whereas Pava and Krausz (1996), Preston and O'bannon (1997), McGuire et al. (1990) and Moore (2001) raised evidence of a positive link between these variables. Anderson and Frankle (1980) and Aupperle (1982) highlight neutral empirical evidence. More recently, Lin et al. (2019) investigate the causality link between CSR and corporate financial performance (CFP). Their main results show that better CFP leads to better CSR, but the reciprocal is not necessarily true. These findings are in line with the trade-off theory,[23] according to which firms socially responsive tend to have weaker financial performance measures. However, a majority of analyses[24] in the last decades claim for a positive relationship. Orlitzky et al. (2003) conduct a meta-analysis including 52 studies over 30 years and show a positive impact of social investment on profitability. Rettab et al. (2009) use survey data from 280 firms in Dubai and find a positive relationship on three measures of organizational performance, i.e., financial performance, employee commitment and corporate reputation.

Different mechanisms are at stake to explain that social responsibility, including environmental management, can impact firm value. In the spirit of Arlow and Gannon (1985), Klassen and McLaughlin (1996) argue that CSR (including environmental management[25]) is part of corporate duty. McGuire et al. (1988) raise different theoretical arguments in favor of a link between CSR and financial performance. Although environmental performance implies higher costs, several benefits are at stake: companies can improve the morale and productivity of their employees but also reduce other costs and increase revenues by minimizing their environmental footprint. Klassen and McLaughlin (1996) show that environmental performance can thus influences financial performance through market gains and cost reductions. Indeed, a firm can realize revenues gains through environmental performance by i) extending its position in existing market as it can eliminate competitors who fail in setting up environmental management, and ii) entering new markets as costumers tend to show preferences for firms taking environmental initiatives and providing eco-friendly products. As shown by Dowell et al. (2000), the recognition of

[23]Modigliani and Miller (1963).

[24]See Van Beurden and Gössling (2008), Galbreath and Shum (2012), Margolis et al. (2007), Shen and Chang (2009), Alafi and Hasoneh (2012), Galbreath and Shum (2012) and Saeidi et al. (2015).

[25]Klassen and McLaughlin (1996) show in a figure that environmental management (as part of corporate strategy) leads to environmental performance which then leads to financial performance.

environmental performance can positively influence firm value through positive reputation effects. Looking to the cost side and as mentioned by Klassen and McLaughlin (1996), investing in environmental management can have significant financial advantages: i) preventing potential spills or environmental liabilities which can avoid costs or penalties, ii) reducing material and energy consumption which can lead to a greater productivity, and iii) setting up industry-wide standards for technology and management practices which can create a strong competitive positioning.

## 2.3 Empirical evidence of the relationship between environmental and financial performance

The impact of environmental performance on financial performance emerges today to be of great interest to companies. Even though the hypothesis whereby environmental performance positively impacts financial returns seems to prevail today, this relationship appears to be relatively complex (Wood and Jones, 1995; Corbett and Klassen, 2006). The empirical evidence of the relationship between environmental and financial performance has been analyzed in different ways, but studies highlighted in the literature, however, do not seem to have reached a consensus.

As mentioned above, Friedman (1962) reminds us that a firm's purpose is to be profitable. In other words, investors can value corporate environmental initiatives (CEIs thereafter), but they have to remain profitable. However, many studies seem to support the hypothesis that CEIs have positive effects on financial performance. Stevens (1984) studies manufacturing firms and highlights that firms with low pollution control costs experience higher returns than those with high pollution control costs. Hamilton (1995) investigates the impact of Toxics Release Inventory[26] (TRI) data releases on TRI covered firms' returns by using an event study methodology. The day of the first release of the TRI report seems to result in negative abnormal returns for firms covered by the program. The average loss is estimated to be $4.1 million in stock value. Capelle-Blancard and Laguna (2010) show, by testing the market reaction to chemical disasters (using an event study methodology), that polluting accidents are more sanctioned by the markets than non-polluting ones for the

[26] As defined by the US Environmental Protection Agency, « The Toxics Release Inventory (TRI) is a resource for learning about toxic chemical releases and pollution prevention activities reported by industrial and federal facilities ». The TRI is a mandatory program.

petrochemical industry. Looking at the particular relationship between emission reductions and financial performance, Hart and Ahuja (1996) examine a sample of 127 SP500 firms, especially manufacturing and mining industries. In their empirical investigation, they measure financial performance using return on equity (ROE). In their multiple regression analysis, they also add control variables such as R&D intensity, capital intensity, advertising intensity and leverage. Their results show that "it does indeed pay to be green". In particular, firms need to wait about two years to benefit from improvements in financial performance (ROE) after engaging emission reduction efforts. A recent study of Gonenc and Scholtens (2017), also using regression analyses, investigates the interaction between environmental and financial performance of fossil fuel firms (oil, gas, coal and chemicals) from 2002 to 2013. They analyze a large international sample of firms and test the causality between the two variables as the stakeholder theory suggests that social performance is positively linked to profitability. They find a significant relationship between the two variables for fossil fuel companies, especially for Tobin's Q. Turning to the direction of causality, environmental performance positively impacts Tobin's Q which gives support to the stakeholder hypothesis. Looking to the relationship where environmental performance is the dependent variable, a negative relationship is found, in line with the trade-off hypothesis. They also find that industry-specifics, i.e., chemicals, coal or oil and gas companies matter, and highlight some heterogeneity regarding the results. When investigating the relationship where financial performance is the dependent variable, no relationship is evidenced for chemical companies at all levels. For coal companies, there is a very little negative and significant effect on Tobin's Q and return on equity. However, for oil and gas industries, the results differ from those of the previous industries. There is positive impact on Tobin's Q which holds in favor of the stakeholder hypothesis, but a negative impact on stock returns (which stands for the trade-off hypothesis). Besides, oil and gas companies seem to be associated with lower risk. Finally, the study shows that financial performance has a negative impact on environmental performance whatever firms' industry-specifics as it implies more emissions.

The literature relies on different methodologies to analyze the relationship between environmental and financial performance such as regression analyses,[27] portfolios analyses[28] and event studies. In this article, we focus on the third methodology i.e. the event study methodology which is widely used in

[27]For positive relationship see Cormier et al. (2011), Hart and Ahuja (1996), Russo and Fouts (1997), Kolk and Levy (2001). For negative relationship, see Jaggi and Freedman (1992), Clarkson et al. (2004) and Molloy et al. (2002).

[28]See White (1996), Geczy et al. (2005), Ziegler and Nogareda (2009).

the literature to analyze the market reaction following a specific environmental initiative announcement. In this methodology, financial performance is proxied by stock market returns as they are supposed to reflect all the available and public information, in line with the semi-strong form of the efficient capital market hypothesis. This methodology is particularly relevant in our study since we want to investigate how financial markets react following Total's specific announcements i.e. upstream oil and gas activities (core activities) and climate-friendly businesses (non-core activities).

Klassen and McLaughlin (1996) use this methodology to investigate the impact of environmental performance awards (especially investments in environmentally friendly products and processes) between 1985 and 1991, as well as environmental crises (spills, explosions, leaks for oil, gas, and chemical industries) from 1898 to 1990 for both manufacturing and service industries. Firms' environmental awards seem to be most welcome by the market as they result in positive abnormal returns. Unsurprisingly, significant and negative abnormal returns are reported following environmental crises. Gilley et al. (2000) worked on a database of 71 announcements of CEIs splitting into 39 process-driven and 32 product-driven environmental initiatives. They also apply an event study methodology and find no significant relationship between environmental initiatives and anticipated economic performance. However, after proceeding to a more detailed analysis of the sample, they found that announcements of process-driven environmental initiatives result in negative market reaction. As mentioned by the authors, one explanation for this negative result is the punitive character induced by this type of initiative because greening processes are often mandated by governments' agencies. In other words, those processes are not based on a voluntary step, which seems not to be supported by investors. Turning to product-driven environmental initiatives, the market reacts positively. By introducing environmental-friendly new products, firms improve their environmental perceived reputation and benefit from a kind of "virtuous circle". The introduction of environmental-friendly new products has positive implications for process-driven environmental initiatives, which will, in turn, marginally supports the firm reputation. Halme and Niskanen (2001) focus on environmental investments made by all Finnish forest industries listed on the Helsinki Stock Exchange. They find that the market immediately reacts negatively following the announcement. However, they also find stock prices to recover very quickly after exhibiting negative behavior. Jacobs et al. (2010) worked on the market reaction after two categories of environmental announcements from 2004 to 2006: CEI[29] (417 announcements) and Environmental

[29]Self-reported corporates efforts to reduce their environmental footprint. They split the

Awards and Certifications[30] (EACs, 363 announcements). They investigate the market reaction to the full sample, but also analyze subcategories of CEIs and EACs. Even though they conclude CEIs and EACs (full sample) to be not significant, they find two subcategories - voluntary GhG reductions and environmental philanthropy - to be significant. Voluntary emission reductions are associated with negative returns, which, according to the authors, is a result of shareholders' uncertainty about the positive impact on revenues. However, environmental philanthropy results in positive effects as it can improve the firm's reputation, thereby leading to higher gains. Turning to EACs, ISO 14001 certification (international standard of environmental commitment) appears to be positively significant, while non-government awards are negatively significant. The market does not react to other subcategories. Another study of Fisher-Vanden and Thorburn (2011) investigates through an event study the effects of voluntary CEIs referring to both EPA's Climate Leader and Ceres programs on shareholders wealth. They study companies' announcements of being new members in the EPA's Climate Leaders program (commitment to reducing greenhouse gas emissions) and find negative abnormal returns for firms entering this program. However, for those concerning the Ceres program more focused on general environmental commitments, abnormal returns are non-significant. Thus, firms' announcements of committing in GhG emissions reduction tend to reveal negative effects on their stocks.

# 3 Sample and data description

As stressed above, we aim at analyzing the stock market reaction to specific events coming from two main categories that rely on Total's strategy. In particular, we focus on its upstream oil and gas strategy, as well as its climate strategy in the scope of the energy transition. Analyzing both Total's upstream oil and gas and climate strategy allows us to investigate whether the market is more sensitive to core or non-core activities. In particular, we want to examine if the market positively reacts to Total's climate strategy to

sample of EICs into 7 subcategories: environmental business strategies, environmental philanthropy, voluntary emission reductions, eco-friendly products, renewable energy, recycling and miscellaneous.

[30]Environmental efforts reported by a third-party. The EACs subcategories are: ISO 14001 certifications, Leadership in Energy and Environmental Design (LEED, a certification for high environmental norms for building processes) certifications, federal awards, state/local government awards and non-governmental awards.

become the responsible energy major.

Announcements are extracted from Total press releases[31] from 2009 to 2019. Each announcement is identified and classified in a subcategory belonging to one of the two general categories mentioned above. In Table 1 we provide a definition for each subcategory together with the sub-sample size denoted as $N$. One interesting feature regarding Total press releases' headlines is the special wording used by the press team which allows (with only a few exceptions) an easy classification of each event. Our final sample consists of 139 announcements splitting into (i) 90 announcements for the upstream oil and gas strategy (Panel A), and (ii) 49 announcements for the climate strategy (Panel B). As an illustration, Table 2 provides some examples of announcements for each subcategory.

To manage confounding events, we remove from the sample announcements occurring at the same time, one trading day before or one trading after any other public announcement.[32] In other words, if an announcement of interest is disclosed together with another event (for instance, a dividend announcement) the same day or one day before or after, then the announcement of interest is removed from the sample.

To analyze the market reaction to Total's strategy, we run an event study using the CAC 40 as the market portfolio. Total and CAC 40 stock prices are extracted from Yahoo Finance on a daily basis from 2009 to 2019. Then, returns are calculated for each day as the growth rate of prices. For stock prices, we use the adjusted closed prices for both Total and the CAC 40.

# 4 Methodology

To investigate the impact of each category of announcements (together with their respective subcategories) on Total's stock returns we perform an event study methodology. Around the event date, stock returns can be abnormally high depending on investors' behavior. Abnormal returns, defined as the difference between the observed returns and the estimated expected

[31] Note that using announcements from Total press release avoids to capture any feeling that can be created by news papers. Analyzing investor sentiment is not the objective of this paper.

[32] See Gilley et al. (2000) and McWilliams and Siegel (1997).

Table 1: Subcategory description

**Panel A: Upstream Oil and Gas Strategy subcategories (90 announcements)**

| | ***N*** | **Description** |
|---|---|---|
| Acquisitions | 27 | Acquisition of stakes in exploration licenses / concession licenses / competitor's assets |
| Discoveries | 15 | Discovery of new oil and gas plants |
| Development start-ups | 11 | Launch of the development phase |
| Production start-ups | 17 | Launch of the production phase |
| Strategic Alliances | 10 | Memorandum / Agreements signed with competitors |
| Divestments | 10 | Sale of licence interests / operatorship sale / equity sale |

**Panel B: Climate Strategy subcategories (49 announcements)**

| | | |
|---|---|---|
| Acquisitions of innovative start-ups or strategic companies | 10 | Acquisition of innovative start-ups through Total Carbon Neutrality Venture. Strategic companies are other companies which do not belong to TCNV. |
| Renewable energy and transportation | 13 | Activities relying on renewable energy and low-carbon transportation. |
| Climate change commitments | 26 | Other announcements excluding acquisitions of innovative start-ups and strategic companies as well as renewable energy and transportation activities. This section more specifically includes CEO's speeches, conferences, international projects and Total's positioning on climate change. |

Table 2: Examples of announcements by subcategory

**Panel A**

| | |
|---|---|
| Acquisitions | « Total obtains a 30% interest in the giant Al-Shaheen field concession for 25 years » ; « Philippines - Total acquires a 75% interest in offshore Block SC56 » |
| Discoveries | "Total discovers oil in deep offshore Ivory Coast » ; « USA: Total announces major deep-water discovery in the Gulf of Mexico » |
| Development start-ups | "Russia: launch of the giant Artic LNG 2 development » ; « Total launches Tempa Rossa field development in Italy » |
| Production start-ups | "Total starts up production from Dalia Phase 1A on deep offshore Block 17 » ; « Bolivia - Start-up of production from Itaú Phase 2 » |
| Strategic Alliances | "Total and China National Petroleum sign a strategic cooperation agreement » ; « Total signs a memorandum of understanding with the state of Papua New Guinea on the key terms of the gas agreement of the Papua LNG project and launches engineering studies » |
| Divestments | "Total sells equity in India's Hazira terminal and signs LNG sales agreement with Shell » ; « Nigeria - Total announces the sale of its participating interest in the offshore OML 138 » |

**Panel B**

| | |
|---|---|
| Acquisitions of innovative start-ups or strategic companies | "Total Energy Venture invests in smart grids with Autogrid » ; « Total and SunPower partner to create a new global leader in solar industry (success of Total's all-cash tender on SunPower) » |
| Renewable energy and transportation | "Total starts up its second solar power plant in Japan » ; « Total and Amyris renewable jet fuel ready for use in commercial aviation » ; |
| Climate change commitments | "United Nations climate summit: Total partners with five major oil companies to launch the oil and gas climate initiative » ; « Total presents proposed new organization to achieve its ambition to become the responsible energy major » |

returns, provide us useful information about the market reaction to specific announcements. In particular, this methodology allows answering the question about the way financial markets respond to Total's climate strategy. The expected returns can be estimated through different models, among which the most popular are the market model (Fama et al., 1969) and the Capital Asset Pricing Model (CAPM) introduced by Sharpe (1964), Lintner (1965) and Black (1992). Consistent with the literature, expected returns are estimated through the market model, commonly used for short event windows.

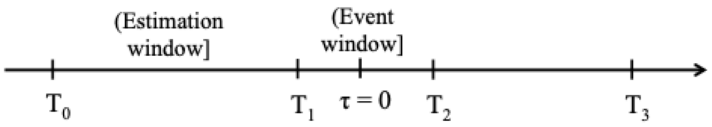
The principle of this method consists in determining i) the announcements of interest, ii) the period during which we analyze the potential abnormal returns called the event window, and iii) the estimation window to estimate the predicted returns. Turning to the event window, it is common to use a short event window in order to capture as precisely as possible the effects of the event of interest and control for potential confounding events. To this end, we choose a three-day event window (day -1, day 0 and day +1 where day 0 is the event day) since it can be hard to identify the precise trading day of the market's reaction.[33] Using a three-day event window allows us to screen for potential persisting effects after the event day, but also early warning signs the day before the announcement. Indeed, the announcement effect can be persisting around the event day, which means that the market needs time to adjust. However, if there is no effect on the event day, then the market has well anticipated the announcement (in line with the efficient market hypothesis). As a matter of fact, an analysis of daily stock returns implies to check whether the day of the event is a trading day or not and occurs during the opening of the stock exchange market.[34] The impact of an announcement occurring after the closing of the market must be analyzed on the trading day after (day +1). On the one hand, extending the event window to one day prior to the event allows us to capture potential information linkage. On the other hand, extending the event window to one day after is necessary as the event can occur after the closing of the market. Note that using a short event window also limits the problem of overlapping event windows. The absence of any overlap in the calendar time allows assuming that abnormal returns will be independent across securities (MacKinlay, 1997).

Consistent with Capelle-Blancard and Laguna (2010), Gilley et al. (2000)

[33]The solution would have been to use time-stamped announcements and intraday stock prices. Unfortunately, access to such data has not been possible. Furthermore, stock returns using intraday data are more willing to contain market noise.

[34]Opening of Euronext (CAC 40): 9am – 5:30pm from Monday to Friday with the exception of banking holidays.

Figure 1: Timeline for an event study (Mackinlay, 1997)




and Jacobs et al. (2010) the estimation window is set over days – 211 to – 11 prior to the announcement day (i.e., day 0). Ending the estimation window several days, i.e., ten days prior to the event avoids capturing any effect of the announcement (Jacobs et al., 2010; Capelle-Blancard and Laguna, 2010). Before estimating abnormal returns, some precisions about the notations are given. As in MacKinlay (1997), we define $\tau = 0$ as the event day. Thus, $\tau = T_1 + 1$ to $\tau = T_2$ corresponds to the event window and $\tau = T_0 + 1$ to $\tau = T_1$ corresponds to the estimation window where $T_0$ is the first day of the estimation window. We also define the length of the estimation window as $L_1 = T_1 - T_0$ and the length of the event window as $L_2 = T_2 - T_1$ (see Figure 1 for an illustrated timeline). Once the announcements, the event and estimation windows defined, we can identify the existence or not of abnormal returns. For this purpose, expected returns are estimated through the market model in line with the literature. In our study, market portfolio's returns refer to the CAC 40 and securities' returns to Total's returns. Thus, the market model (that links firms' stock returns with the market portfolio's returns) is defined as follows:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \epsilon_{i,t} \tag{1}$$

Where $R_{i,t}$ is the return of stock $i$ (Total) at time $t$, $R_{m,t}$ is the market return (proxied by CAC 40) at time $t$, $\alpha_i$ is the intercept, $\beta_i$ is the slope parameter and $\beta_i R_{m,t}$ is the proportion of stock $i$'s returns attributable to the market movements. Finally, $\epsilon_{i,t}$ is the error term which contains information that cannot be explained by the market movements, i.e., which captures the potential effects of the announcements of interest. $\alpha_i$, $\beta_i$ and the variance of the error term $\epsilon_{i,t}$ are estimated using Ordinary Least Squares (OLS). Thus, abnormal returns are obtained as the difference between the observed returns $R_{i,\tau}$ and the expected returns $\widehat{\alpha}_i + \widehat{\beta}_i R_{m,\tau}$ :

$$AR_{i,\tau} = R_{i,\tau} - (\widehat{\alpha}_i + \widehat{\beta}_i R_{m,\tau}) \tag{2}$$

Where $AR_{i,\tau}$ are the abnormal returns for firm $i$ in the event window. The cumulative abnormal returns ($CAR_i$) from $\tau_1$ to $\tau_2$ where $T_1 < \tau_1 \leq \tau_2 \leq T_2$ corresponds to the sum of abnormal returns for security $i$ :

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i,\tau} \tag{3}$$

We also calculate the average abnormal returns ($AAR_\tau$) for day $\tau$ in the event window:

$$AAR_\tau = \frac{1}{N} \sum_{i=1}^{I} AR_{i,\tau} \tag{4}$$

Where $N$ is the number of announcements and $I$ the number of firms. After calculating $AAR_\tau$ for each day in the event window, it is possible to aggregate the $AAR_\tau$ over the event window, i.e., from $\tau_1$ to $\tau_2$ where $T_1 < \tau_1 \leq \tau_2 \leq T_2$. We thus obtained the aggregated average abnormal return ($AAR_{[\tau_1;\tau_{2]}}$) for security $i$:

$$AAR_{[\tau_1;\tau_{2]}} = \sum_{\tau=\tau_1}^{\tau_2} AR_\tau \tag{5}$$

Then, we calculate the significance of $AAR_\tau$ for day -1, day 0 and day 1, as well as the significance of the $AAR_{[\tau_1;\tau_{2]}}$ from $\tau_1 = -1$ to $\tau_2 = 1$. The test statistics are calculated as follows:

$$TEST_\tau = \frac{\sum AR_\tau}{\sigma_{\epsilon i}} \frac{1}{\sqrt{K}} \tag{6}$$

$$TEST_{[\tau_1;\tau_{2]}} = \frac{\sum_{\tau=\tau_1}^{\tau_2} AR_\tau}{\sigma_{\epsilon i}} \frac{1}{\sqrt{K}} \tag{7}$$

where $K$ is the number of days in the event window[35] and $\sigma_{\epsilon i}$ the standard deviation of abnormal returns in the sample of interest.

For the sake of completeness, we also run a non-parametric $t$-test which does not rely on the Normal distribution, namely the Wilcoxon signed-rank test. This test uses ranked data, and tests for the statistical significance of the median abnormal return. In particular, the test statistic takes into account both the sign and the magnitude of abnormal returns (Brown and Warner, 1980). It is worth mentioning that the number of abnormal returns being always higher than 30, the distribution of the Wilcoxon statistics tends to be

[35]For more details about the calculation of test statistics, see https://dss.princeton.edu. The event study is running under Stata using the code from Princeton.

Normal and test values can be then converted into a z-score. Furthermore, note that for all tests we report one-tailed $p$-value since we hypothesize that abnormal returns are negative for the upstream oil and gas category and positive for Total's climate strategy. For core-activities, negative returns may be expected since hydrocarbon businesses play a significant role in GhG emissions. For non-core activities, we expect positive abnormal returns because these activities are part of the energy transition process and can improve Total's reputation.

# 5 Results and discussion

In this section, we analyze the market reaction to Total's upstream oil and gas strategy (Section 5.1), and to Total's climate strategy (Section 5.2). We examine overall results as well as results for each subcategory as the market can value the subcategories differently.

## 5.1 Market reaction to Total's upstream oil and gas strategy

Let us investigate the market reaction to Total's upstream oil and gas strategy, which corresponds to 90 announcements. For the overall category, results are presented for the day before the announcement (day -1), the day of the announcement (day 0), and the day after the announcement (day 1), but also over the three-day event window from day -1 to day 1.

The results are presented in Table 3. Note that for each category and subcategory in Section 5, $\beta_i$ is significant at the 1% level. The average abnormal returns over the three-day event window ($AAR_{[\tau_1;\tau_2]}$) amount to -0.12% and significant at the 1% level. Turning to the average abnormal returns for each day in the event window ($AAR_\tau$) for $\tau = -1, 0, 1$, the results indicate that they are all significant at the 1% level. Especially, we notice that average abnormal returns for the first day in the event window are different from zero and negative. The day preceding an announcement of upstream oil and gas activities, Total's returns dropped by 28 basic points (bps), which corresponds to a significant negative reaction of the market. Furthermore, for day 0 and day 1, average abnormal returns increase and become marginally positive to 0.11% and 0.06%, respectively. From day -1 to day +1, the significance of

average abnormal returns significantly decreases, but they remain significant at the 1% level, which means that the market progressively integrates the information.

The persistence of the announcement around the event day can be the result of the high volatility and uncertainty on the oil market. Since 2008, the oil market has indeed experienced a "recurring volatility" which has been "extreme" in 2018 according to D. Houssin, former president of IFP Énergies nouvelles. As mentioned by Pindyck (1990), higher oil price volatility can affect investment decisions as it creates uncertainty about energy input. Furthermore, Favero et al. (1992) and Mohn and Misund (2009) have shown a negative impact of oil price volatility on investments in oil and gas companies.

As mentioned in Section 2.1, the oil and gas companies' business model closely depends on oil and gas market conditions: for instance, the 1998 oil price collapse has led to a wave of mergers and acquisitions among the industry, and the 2014 oil price plummeting to major cuts in spending as well as a more selective investment to increase margins. A recent study of the Boston Consulting Group (*Winning back investors' trust - Value Creation in Oil and Gas 2019)* shows that the oil and gas sector has outperformed over the five-year period (from January 2014 to December 2018) in terms of total shareholder return[36] (TSR), raising a lack in investors' confidence. The oil and gas industry exhibits the worst median five-year TSR among fifteen industries including retail, technology, chemicals, insurance or banks. As a matter of fact, the consulting company highlights the oil price uncertainty to be the first factor of low TSR. The oil price uncertainty is mainly driven by US unconventional oil production as well as a potential change in oil demand (in a context of global warming highly associated with oil consumption). Another argument raised by the consulting company is the geopolitical uncertainty sustained by tensions between China and the US which have created uncertainty about the long-term economic growth and global trade. Finally, the BCG raises doubts among investors about the way the oil and gas industry manages costs (a lack of "capital-discipline rigor") and maximizes shareholder returns, highlighting a lack in the industry's credibility.

Turning to the non-parametric test for the three-day event period, the results are non-significant, meaning that median abnormal returns are not different from zero. However, the median abnormal returns in day -1 (0.17%) and

[36]A measure of the total return generated by a stock to investors including capital gains and dividends.

day 0 (0.26%) are statistically different from zero at the 5% and 10% level, respectively. The results of the non-parametric test give thus support to the $t$-test for day -1 and day 0. Initially used to address the issue of misspecification of the $t$-test, Brown and Warner (1980) show that non-parametric tests may also suffer from such a problem because they assume the distribution of a security-specific performance measure to be symmetric. However, the literature (Fama et al., 1969) has demonstrated that abnormal returns (estimated through the market model) are skewed to the right, meaning that negative performance measures are more willing to happen than positives ones. Brown and Warner (1980) also precise that even a small degree of asymmetry can lead to a problem of misspecification, adding that "it is not obvious that the (non-parametric) tests would be more powerful (against alternative hypotheses) than the $t$-tests, particularly since the $t$-tests, with their additional restrictions, seem reasonably specified".

Table 3: Results for the upstream oil and gas strategy

| **Upstream oil and gas strategy category** | | | | |
|---|---|---|---|---|
| | **Day -1** | **Day 0** | **Day 1** | **Day -1 to Day 1** |
| Average abnormal returns | -0.28% | 0.11% | 0.06% | -0.12% |
| $t$-statistics | $-18.92^{***}$ | $7.24^{***}$ | $3.80^{***}$ | $-4.55^{***}$ |
| Median abnormal returns | -0.17% | 0.26% | 0.01% | -0.04% |
| Wilcoxon signed-rank Z statistics | $-2.09^{**}$ | -1.36 | -0.20 | -0.32 |

| **Upstream oil and gas subcategories from Day -1 to Day 1** | | | | |
|---|---|---|---|---|
| | **Average abnormal returns** | ***t*-statistics** | **Median abnormal returns** | **Wilcoxon signed-rank Z statistics** |
| Acquisitions | -0.30% | $-4.93^{***}$ | -0.03% | -0.32 |
| Discoveries | 0.20% | 1.47 | 0.00% | -0.15 |
| Development start-ups | 0.59% | $2.79^{***}$ | 0.05% | -0.74 |
| Production start-ups | -0.65% | $-4.65^{***}$ | -0.04% | -0.44 |
| Divestments | 0.20% | 0.57 | -0.20% | -0.36 |
| Strategic alliances | -0.05% | -0.22 | -0.08% | -0.11 |

Note: *** (resp. **, *) denotes significance at the 1% (resp. 5% and 10%) level.

Let us now check for potential differences among the subcategories as it can be possible that some subcategories are not equally valued by the market. Re-

sults by subcategory are presented in Table 3 for the three-day event window only (because there are less than 30 observations by subcategory). Results indicate that only three subcategories out of six exhibit significant average abnormal returns: acquisitions (-0.30%), development start-ups (0.59%), and production start-ups (-0.65%). The negative reaction to upstream oil and gas acquisitions and production start-ups is significant at the 1% level. However, financial markets seem to positively react by 59 bps (significant at the 1% level), following an oil and gas development start-up. This step in the oil and gas exploration and production process is essential as it determines the funding of the field production. The development start-up of an oil or gas field sends thus positive signals to investors because it implies a potential future oil or gas production. This is obviously a very expected announcement for shareholders to know whether the project will be funded or not, as it can be the result of long discussions between the different actors involved in the drilling. The negative reaction of the market by 65 bps to the production start-ups subcategory could rely on costs. In our dataset, production start-ups often concern offshore and deep-water plants, such as the Kaombo deep offshore project in Angola or the Moho deep offshore project[37] in Congo. Deep offshore projects are well-known to require higher extraction costs. However, the negative market reaction to oil and gas acquisitions may be closely linked to the explanations we gave in light of the overall results we obtain for the oil and gas upstream category. Turning to the last three subcategories, our results indicate there is no reaction of the market to oil and gas discoveries, divestments and strategic alliances, meaning that they are well anticipated. Oil research projects led by oil companies are more willing to be well anticipated as the geological composition and data collected are analyzed in detail before drilling. Exploration licenses also gave early warning signals about the oil production potential of the field. Furthermore, our results highlight that the market does not react to strategic alliances. Those alliances are often based on a former relationship or just represent an acknowledgment of partnership, which can be thus well anticipated by the financial markets. Finally, divestments can also be well anticipated since figures in financial statements are publicly available, and they can be expected as a result of internal strategy.

## 5.2 Market reaction to Total's climate strategy

As in Section 5.1, results for the overall category are presented in Table 4

[37]Note that Total operates in four important deep-water offshore projects: Egina (Nigeria), Moho Nord (Congo), Kaombo (Angola) and West of Shetland (UK).

for day -1, day 0, day 1, as well as for the whole event window from day -1 to day 1. Results for each subcategory are also displayed in Table 3 for the three-day event window only. The climate strategy of Total seems to be unwelcome by shareholders as we find a significant and negative overall effect of Total's climate strategy on stock returns. Over the three-day event window, abnormal returns decrease on average by 44 bps and are significant at the 1% level. The median abnormal return of -0.11% is also significant, but at the 10% level. Furthermore, with a particular look to each day in the event window, results indicate a certain persistence of negative average abnormal returns around the event date. For day -1, day 0 and day 1, abnormal returns are respectively -0.12%, -0.18% and -0.15%, all significant at the 1% level. It is possible that the market partially anticipates climate strategy linked to announcements and, therefore, takes time to adjust around the event day. As this type of news relies on non-core activities, the market may need time to integrate the information which is quite different from the usual activities of a pure oil major. Furthermore, for each day in the event window, all average abnormal returns are negative and significant, whatever the day in the event window, meaning that investors do not welcome Total's climate strategy at all. As a result, the market does not seem to support the overall climate strategy of Total. However, one may say that the negative reaction of the market may be more the result of a sanction rather than an "unwanted" strategy. The current situation of global warming has raised awareness among financial markets and an increasing number of investors is now pushing the oil industry to act in favor of the energy transition. Traditional business models do not stand anymore, and shifts in corporate strategy are required. ExxonMobil, the US supermajor known to have maintained strong lobbying against climate change, is now facing growing pressure from investors to take climate actions. Last but not least, some investors may want the oil industry to go further in terms of low-carbon investments. As stressed above, low-carbon energy investments remain very low even though some majors, especially European majors, stand out. This negative result can also be interpreted as a manner for investors to express their request for Total to strengthen its actions in favor of the energy transition.

When it comes to subcategories of Total's climate strategy, results (see Table 4) show that two subcategories out of three are significant at the 1% level. In particular, announcements of climate commitment, as well as renewable energy and low-carbon transportation, lead to negative average abnormal returns statistically significant at the 1% level. In the subcategory of renewable energy

Table 4: Results for the climate strategy

| **Climate strategy category** | | | | |
|---|---|---|---|---|
| | **Day -1** | **Day 0** | **Day 1** | **Day -1 to Day 1** |
| Average abnormal returns | -0.12% | -0.18% | -0.15% | -0.44% |
| $t$-statistics | $-4.66^{***}$ | $-7.16^{***}$ | $-5.97^{***}$ | $-10.27^{***}$ |
| Median abnormal returns | -0.07% | -0.19% | -0.13% | -0.11% |
| Wilcoxon signed-rank Z statistics | -0.73 | -0.94 | -0.79 | $-1.36^{*}$ |

| **Climate strategy subcategories from Day -1 to Day 1** | | | | |
|---|---|---|---|---|
| | **Average abnormal returns** | ***t*-statistics** | **Median abnormal returns** | **Wilcoxon signed-rank Z statistics** |
| Climate commitment | -0.38% | $-4.85^{***}$ | -0.10% | -0.69 |
| Green acquisitions | -0.04% | -0.13 | 0.11% | -0.07 |
| RE & Transportation | -0.87% | $-6.38^{***}$ | -0.38% | $-1.97^{**}$ |

Note: *** (resp. **, *) denotes significance at the 1% (resp. 5% and 10%) level.

and transportation, we highlight a strong and negative reaction of the market of 87 bps. A deeper analysis of our data shows that Total, one of the biggest investor in solar energy, seems to have prioritized solar potential rather than fiscal incentives since solar (photovoltaic and concentrated solar) power plants are mainly located in countries[38] where there is no public policy to support the development of renewable energy for large scale projects (with the exception of the U.S and Japan). Nevertheless, public policies are known to play a major role in supporting renewable energy development. It is then possible that the absence of any fiscal incentive has hampered the potential support of shareholders, generating costs that could have been avoided. Furthermore, this result may also give support to the fact that Total has to go further in terms of investments in low-carbon energy to reduce GhG emissions. Turning to the market reaction to the climate commitment subcategory, which mainly concerns speeches and Total's attendance at conferences, the market also seems to react negatively. This negative reaction could rely on the fact that investors may want more tangible actions about climate change. The third subcategory, which concerns green acquisitions, emphasizes the lack of market reaction to

[38]Total operates several solar power plants in the U.S through SunPower (700 MW), in the United Arab Emirates (100 MW) and through Total Solar International in South Africa (75 MW), Chile (70 MW) and Japan (27 MW). With Total Eren, Total intends to operate in emerging countries.

such acquisitions of innovative start-ups or strategic companies dedicated to low-carbon technologies. This may result in a better-anchored activity of Total in M&A as Total Neutrality Carbon Ventures was created in 2008. Finally, we found no sign of positive returns linked to the climate strategy of Total to become the responsible energy major, whatever the kind of green activities. Total's initiatives in favor of the energy transition are not positively valued by financial markets.

# 6 Conclusion

This paper investigates the market reaction to announcements linked to core and non-core activities of Total. In particular, we examine how financial markets react to the climate strategy of the Group as well as its upstream oil and gas strategy. To this end, we built a dataset made up of 139 announcements from 2009 to 2019 extracted from Total press release, and perform an event study to analyze the market reaction to such announcements.

Our results show that over the three-day event-window, the market reaction to announcements relying on Total's climate strategy as well as its upstream oil and gas strategy is significant and negative. Furthermore, our findings highlight that the market reacts more negatively to announcements of Total's climate strategy. In average, abnormal returns decrease by 12 bps following an announcement based on the upstream oil and gas sector, and dropped by 44 bps when it comes to an announcement linked to non-core activities such as investments in low-carbon technologies. This finding shows no positive valuation of Total's commitment in terms of the energy transition. On the contrary, those actions seem to be not welcome by shareholders at all.

Consistent with the trade-off hypothesis of Friedman (1962), we found that environmental-friendly actions do not lead to positive financial performance. As mentioned by Friedman, investments in eco-friendly activities such as low-carbon activities may lead to additional costs. However, one may say that with a particular look at the current climate situation, investors should be more sensitive to climate commitment. One possibility for this negative reaction is the very recent diversification of the Group. Indeed, the "take off" of the energy transition among the oil industry is slow and, perhaps, has to be stronger and better anchored among the public opinion to be positively valued by the financial markets. If Hart and Ahuja (1996) showed that "it pays to be green", they also specify that it takes time before benefiting from improve-

ments in financial performance. It is also possible that Total's environmental actions are perceived as not enough by investors as investments in low-carbon activities remain very low compared to oil and gas activities. Those actions are considered to be too weak and do not generate enough returns of scale for the Group. The BCG considers investors to worry about environmental actions that do not go far enough to mitigate risks of climate change. To this end, it should be interesting to investigate if this negative reaction will continue in the coming years or, on the contrary, will turn positive. Another interpretation of these results may stand for the possible investors' lack of interest in low carbon energy. In this spirit, it should be possible that two classes of investors emerge: pro-environmental investors and those who don't care about environment and the energy transition. Furthermore, our results indicate that green acquisitions are not significant, meaning that the market does not react so such announcements. In other words, this kind of announcement may be well anticipated by the market as they are closely linked to financial figures. Those activities seem to be better anchored in the non-core business since Total has invested in low-carbon businesses through Total Carbon Neutrality Ventures (created in 2008).

This paper can be extended in various ways. First, it would be interesting to consider all majors. For instance, clusters of majors, i.e., energy majors versus pure hydrocarbon focus majors - such as ExxonMobil and Chevron - could be examined. Extending the panel of companies could indeed provide further information about the financial valorization of the climate strategy of oil majors. Second, a promising extension would be to investigate whether the US market reacts differently from the European market. To this end, the CAC 40 should be replaced by the Nasdaq, and the US quotation of Total should be used. Third, it may be interesting to extend the methodology using a Fama-French three-factor model. These extensions are left for future researches.

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