

Investments as business power. Thirty years of oil majors' renewable energy acquisitions



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The succession of fossil-fuelled technologies following steam – electricity, the internal combustion engine, the petroleum complex: cars, tankers, refineries, petrochemicals, aviation... – have all been introduced through investment decisions, sometimes with crucial input from certain governments but rarely through democratic deliberation.

– Andreas Malm, 2016.

All forms of political organization have a bias in favor of the exploitation of some kinds of conflict and the suppression of others because organization is the mobilization of bias.

– Elmer Eric Schattschneider, 1960.

Power is at its most effective when least observable.

– Steven Lukes, 2005.

Apportion of Credit

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Abstract

Investment decisions –in the form of acquisitions– are the main way incumbents access innovations in an economy. Yet, in the context of climate change and of emerging energy transitions, dominant incumbents like those in the fossil fuel industry have increased their acquisitions activity towards 'clean' emerging technologies. Using the case of European oil majors' interest in renewable energy, this thesis problematises this type of investments and shows that their study uncovers at least three sources of power dominant incumbents hold towards emerging industries. First, the ability to acquire allows incumbents access to means of decision-making towards the advancement and delay of emerging technologies. Second, through the ownership of 'clean' assets incumbents' are able to set the terms of their role in innovation and in sustainable transitions. Third, acquisitions in emerging technologies gives incumbents the ability to benefit from transition policies without being noticed and without questions. For showing this, this thesis presents a unique and original database of acquisitions manually classified by their type of technology that spans over thirty years of European oil majors' financial transactions. The thesis shows in three substantive chapters how acquisitions in 'clean' emerging technologies buy oil majors' a role in the energy transition.

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CHAPTER 1

Introduction

1. Background and motivation

For over a century oil has been the most profitable commodity, creating great wealth and finance flow towards its specialisation and growth. The carbon released in the atmosphere as the main externality, however, has changed how the oil business is viewed in relation to society, creating new patterns of behaviour in the incumbents that need to navigate this change. In this changing context, this thesis studies the role of oil incumbents, those that largely dominate the energy market, in responding and in resisting changes to their systems. Across its pages, this thesis shows that investments –in the form of business acquisitions— are a key component of incumbent’s behaviour, and one that has crucial effects in delaying as in advancing industries apt to contain and adapt to climate change. The thesis is situated in observing innovation advancement in the context of an increasingly industrialised and financialised world; one in which incumbent industries, usually formed by large publicly owned corporations, retain most of the capital produced in an economy for the extent of their geographical spread.

The energy industry, for instance, is still heavily dominated by fossil fuels. While oil incumbents can also be state-owned, state-owned companies usually follow national mandates meaning they have their purpose well defined in their industry. More importantly, their continuation in the future is not up to them to prove. In contrast, global actors, like multinational oil companies, referred to hereafter as oil majors, are at the mercy of their own strategy and their ability to remain profitable.

Climate change is a threat to our planet's biological systems that sustain life as we know it. To contain the ongoing ecological crisis, large business companies have proposed joining the shift towards economic models intended to reduce carbon levels in the atmosphere. In the energy sector, two main action courses have been rolled out as solutions. One of them is replacing fossil fuel technologies—that induce climate change—with new renewable energy technologies. The alternative option has been to complement aspects of the fossil fuel business, such as carbon capture and storage systems. It is still debated to what extent the oil industry can remain unchanged if we are to avert the worst effects of a carbon saturated atmosphere, but even the most optimistic climate models have a cap on oil and gas production (IPCC, 2022). In any scenario, navigating –if not solving— the climate crisis will rely on large economic actors and on industry incumbents' capacity to invest in solutions (Stern, 2022).

This thesis focuses on the largest oil companies in Europe, as actors that are under higher strain from their shareholders as well as their home jurisdictions to conform to climate change. The relevance of this choice is twofold. First, the oil industry sits at the core of climate change discussions and actions. Oil majors are relevant not only because their activities are the main source of historical emissions (Licker, Ekwurzel, Sideris, et al., 2019), but their combined decisions are crucial for setting what is possible for global climate mitigation (Franta, 2022). Second, European countries, as a region, have been leading on environmental regulations, emissions caps, as well as renewable energy integration. Compared to other regions in the world, companies in Europe must conform to higher environmental standards and deal with a more environmentally focused public. In turn, European oil companies have been the most advanced in creating

comprehensive climate strategies, as well as been the most active investors for renewable energy amongst their international peers.

This thesis goes further and provides evidence of the long-term intersection of oil majors with emerging energy technologies. Through tracing acquisitions over time, this thesis hints at moments when incumbents, like those in the oil industry, could decide whether to advance or to obstruct sustainable innovation. Whilst the thesis explores business acquisition behaviour as a relevant type of climate action, it also enquires its occurrence as a wider phenomenon.

Using an original database of oil companies' acquisitions in renewable energy over three decades, the thesis provides novel data on the interaction of incumbents with innovation across periods of climate discussion. This data allows the thesis to trace historical decision points that, when complemented with publicly available records, reveal patterns of behaviour. For instance, acquisitions are regular financial transactions to large companies, common to how incumbent companies expand or exchange skills.

In the specific context of climate change, acquisitions provide another type of value. Oil majors report investments in renewables as proof of climate progress and of climate affinity. More importantly, the act of investing in 'clean' technologies serve companies to position their role as financiers of the future. Beyond the expectancy of profit, acquisitions' value serves both climate goals, signalling their transition involvement, as well as non-climate goals, like positioning their role of innovation investors, both of which are yet unexplored in the literature on organisation behaviour and on climate change governance.

2. Place in the literature

This thesis makes a conceptual and theoretical contribution by linking business acquisition patterns to businesses' climate change behaviour, using the case of oil majors' acquisitions in renewable energy. The project is interdisciplinary by the nature of its questions since it sits at the observation of climate sciences and their interaction with society. Three main literatures are used. First, the overall arch of the thesis is contained in the literature of economic geography, the pioneer

scholarship that has linked the evolution of markets with their relations with the physical world, as well as the study of the materialisation of finance relations in space and time. Second, the thesis draws in subsequent disciplines, such as the literature on environmental corporate governance, to address spatial and environmental questions regarding economic actors and how organisations make decisions on climate change. Finally, the thesis draws on the literature on innovation and sustainability transitions that has sought to expand the understanding and the difficulty of changing established forms of economic value production. The literature revision unfolds in the stated manner and attempts to place the observation of acquisition patterns as a prism to understand changes in the fabric of financial relations, their actors' responses, and their organisations' dynamics in the context of new climate change expectations.

Climate change has brought great changes to our socioeconomic systems. The most important perhaps has been the increased financialisation of environmental solutions, that in the effort of being translated to market dynamics, have instead been distorted to fit larger socio-political and institutional pressures (Knox-Hayes, 2016). This thesis argues that acquisitions, as the main type of investments by large firms, have also joined this fate. Financial decisions, as acquisitions, happen in space and time and, as such, are linked to cultural geographies and their own political and social institutions. The spatiality of finance and the relations it produces contains the behaviour of agents, such as incumbents, that are embedded in the continuous effort of restructuring their organisations, their technology and their innovation in a changing world (Haberly & Wójcik, 2022). Acquisition activity, by how it helps firms accommodate to newer social expectations, do reflect new functions and takes of what modern corporations do in markets, and therefore in society. Since a firm acquires to adapt and to respond to a market, observing acquisition patterns indicate a way in which corporation's inherited configurations are constantly adapting and changing across time (Clark & Wójcik, 2007).

Acquisition activity has increased substantially in the last two decades, particularly amongst large firms, as a transaction that is predominant despite being largely unsuccessful in terms of subsequent integration, losses, and returns

produced (Amel-Zadeh & Meeks, 2020), primary because it is an essential component of entrepreneurial pursuits and venture creation (Colombo, 2021). Mergers and Acquisitions (M&A), as known widely, have been crucial to the advancement of seminal economic studies and concepts, such as the understanding of how information is exchanged and sought in a market and between agents to complete transactions. M&A in economic thinking are regarded as a type of economic transaction within many. To the granular level, accounting and finance scholars have looked at market behaviour patterns in which acquisitions, as financial transactions, serve to model and value incentives firms seek, such as the processes by which productivity and the profitability of target acquisitions are observed (Levine, 2017), as well as in how characteristics of such transactions, like potential, are signalled between targets and acquirers (Suk & Wang, 2021). Business studies, that take the firm as the focus of study, have contributed to this debate in understanding acquisitions as the product of a strategic decision aimed at boosting sales, growth and stock, but also by classifying the different aims behind acquisitions, such as those primary collaborative, when alliances are sought, from those mostly competitive, when based on market prices and risk (Dyer et al., 2004).

Within the previous observations, this thesis asks how much acquisition patterns have changed to also reflect climate change concerns, both in the strategies pursued in the market, towards other industries, and in society, to maintain reputation. Ultimately, the unfolding climate crisis also requires new research and tools to measure economic agents' patterns of alignment and resistance to sustainable emission levels. How climate incentives, and climate expectations in markets and society change the rules of what we observe in acquisition behaviour in large firms is the gap this thesis speaks to. Whereas this question is aimed at the facultative dimension of corporate action, similar questions have been raised lately focusing on the changing role investing markets with importance and contestation raising in ESG or environmental, social and governance initiatives (Clark & Dixon, 2023). Just like ESGs, whose aspiration and fast growth in the finance industry now conform the basis of the new capitalist regime of carbon-measured assets (Ibid.), new forms of corporate action aimed at readjusting and signalling carbon profiles speak to a more fundamental behaviour feature of the firm.

Corporations' decisions within an industry are affected by industry-wide pressures, yet institutional investors are between the largest forces to pressure incumbents into climate change actions (Christophers, 2019). Large corporates particularly – or incumbents—, like oil and gas companies, have increased their environmental reporting as a result. Their financial activity geared towards demonstrating carbon-measured decisions, as well as their efforts to show they have competence to invest in 'clean' projects has increased rapidly over the years. In the case of renewables, scholars have found that, although their slow progress has been blamed on their high price, past transitions were instead always based on the expectation of profit even when they were costly (Christophers, 2022; Malm, 2016). The expectation of profit as ulterior motive for acquiring and investing in assets, regardless the industry, is what shows that operations are market motivated. In turn, the absence of profit as a goal show instead that the transactions could be serving another purpose away from efficiency. Further, acquisitions usually lack any kind of governance oversight, mainly because they are embedded in regular business activities, but also because multinational corporations are themselves global governance agents that can escape national mandates (Bartley, 2018a; Clapp, 2018). While these are still overlooked, investment decisions, at least those that go after profit, are important because they contain expectations of the future. Investments and acquisitions, as the process of business decisions' capitalisation, is also how incumbents' future scenarios are materialised (DiMuzio, 2012).

Whilst these perspectives cover the implications of business actions, this thesis builds upon organisational studies to assess how decisions to acquire 'clean' innovations as well as to act on climate change are taken. The variables and mechanisms that this literature covers are very diverse, but in general, they look beyond companies' material interest and investigate the decision-making processes, resources within the company, corporate culture, managers' cognitive processes, strategic frames, governance incentives, and board composition, amongst others. Organisations have been identified to innovate in favour of greater efficiency after new environmental regulations (Hart, 1995; Porter & van der Linde, 1995). 'Greener' companies had also been found to have managers who either

aspired to lead their industries in competitive standards, pursued legitimation towards society, or had strong feelings of ecological responsibility (Bansal & Roth, 2000). Past experiences on climate strategies, rather than their own capabilities, have shown to dictate how companies subsequently engage with climate related technologies, such as renewable energies (Levy & Kolk, 2002). On the side of inaction, scholars have identified that organisations tend to capture environmental critiques; a dynamic that has often granted companies like BP a temporary pass on pressures to do more on climate change (Ferns & Amaeshi, 2019). For instance, there seems to be something systematic about how companies thin down climate change plans over time, as the same groups that proposed ambitious climate plans end up conforming to their business as usual (Wright & Nyberg, 2017).

When manager scholars have looked at the role of business leaders, they have found their attention to be relevant to explain the environmental affinity of an organisation, as well as in creating long-lasting cultures (Bansal, 2003, 2005; Stubbs & Cocklin, 2008). Short-termism has been found to be a prevalent world view in managers that deters long-term environmental decisions (Bansal & DesJardine, 2014; Slawinski et al., 2017; Slawinski & Bansal, 2015; Wright & Nyberg, 2015). Compensation governance schemes, as well as other mechanisms of corporate governance, could be to blame for the over-preference of short-term results over long-term sustainability questions (Ortiz-de-Mandojana et al., 2019). However, all in all, what organisations and management studies have found is that environmental decisions come from different drives and purposes, but that even now with a climate crisis looming, these are hard to pin down. Furthermore, since environmental strategies encompass a broad set of factors, they become easily intangible.

Within organisations' studies, this thesis is based in understanding innovation and incumbent adaptation to technical change (Eggers & Park, 2018; Furr & Eggers, 2021), to study climate actions and inactions by large companies. This choice of approach comes from reading the literature on socio-technical transitions, where incumbents are placed as the main actors resisting change to newer emerging low-carbon systems (Geels, 2014; Geels et al., 2017). Yet, as this literature sees incumbents as 'too big to change', and since its focus is on emerging

niche technologies, this thesis' aim is instead to be complementary. This work argues that studying acquisitions allows us to see the core of the dynamic of incumbents' relationship towards emerging technologies, one in which a large dominant player holds power to slow-down the future of significantly smaller, and now crucial, 'clean' start-ups at the expense of their emerging industries, and ultimately of society.

3. Aim and research questions

In this setting, this thesis asks a fundamental question: how do major economic actors that are incumbent to an industry engage with new technologies for low-carbon transitions? In other words, how can we trace the relationship of incumbents and innovation to their fingerprints in finance and governance? To answer this overarching question, this thesis looks at multinational companies as large economic actors that, while subjected to market pressures, are in continuous evolution to satisfy new social expectations. For instance, the capacity of incumbents to acquire emerging businesses, means they also hold the capacity to exert power over them in influencing technological change trajectories.

To situate investments as a form of business power, this thesis covers three crucial aspects of understanding the different forms of control.

- The ability to control decision-making on advancing innovation.
- The ability to set the terms of their role in innovation.
- Their ability to benefit from transition policies without questions.

These three aspects are explored in the three substantive chapters of this thesis (Chapters 3-5). The mentioned core chapters cover the following central questions:

- What explains oil companies' support towards climate acquisitions over time? (Organisation restructuring on Chapter 3)
- How do incumbents frame their role in sustainable transitions to deal with environmental tensions? (Strategic framing on Chapter 4)

- How do companies acknowledge and use subsidies in their green acquisitions? (Subsidies and innovation on Chapter 5)

4. Outline of thesis

This is an article-based thesis divided in six chapters. The **first** chapter provided the motivation of the thesis and the place in the literature. It has emphasised the importance of understanding acquisitions in ‘clean’ technologies as key for studying incumbent businesses resistance and responses towards climate change governance. The **second** chapter describes the methodology and data used in this thesis. It introduces the choice of cases, the process towards the production of the original database of acquisitions, other sources of data and their use in the main chapters. The **third** chapter addresses the first research question by tracing the effort oil majors devote to sustaining the renewable energy companies they acquire. This chapter also presents what is problematic of this type of acquisitions. The **fourth** chapter addresses the second research question by tracing the use of their renewable energy investments in their discourse and strategy to position their role in sustainable transitions. The **fifth** chapter presents the relation between acquisitions and subsidies in renewable energy, and shows how acquisitions spread geographically, the acknowledgement of subsidies, and the relation between corporates and states in the advancement of innovation. The **sixth** and final chapter presents the summary of findings, the contributions of the thesis, the directions for future research, and the concluding remarks.

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CHAPTER 2

Methodology and data

This chapter outlines the comparative design, the process followed for building the database, other sources of data used in the thesis and their use in the following chapters. In the last section, this chapter presents an overview description of the resulting original data of mergers and acquisitions by technology.

1. Comparative design

This thesis is delimited to the study of the seven largest European oil and gas companies and their participation in renewable energy technologies and services –i.e., solar, wind and biofuel energy, as well as batteries and systems to integrate the renewable production and consumption chain. Renewable energy –according to UN’s definition— is ‘energy derived from natural sources that are replenished at a higher rate than they are consumed’. To observe large-scale transition dynamics, the classification of renewable energy acquisitions included also the system integration of renewables, that includes grid and energy storage services in electricity systems (see IRENA et al., 2018 for reference).

The period of focus spans over three decades from 1987 to 2019, that covers the year of first M&A record available to the year before the start of the global

pandemic. This period is inclusive of key moments in climate change such as 1997, the year when the first major oil company, British Petroleum Amaco (now BP), in its CEO's address publicly recognised climate change as a public issue; the Kyoto Protocol signing period from 1998 to 1999, its ratification in 2005, as well the Paris Agreement in 2015. By the end of 2018, most major European oil companies had changed to be called 'energy companies' instead of just 'oil companies. However, the majority remain focused on oil and gas, except for the National Danish Oil and Gas company (DONG, now Ørsted) that fully transitioned into the offshore wind business, although it is still listed as in the oil and gas industry in leading indexes like the Forbes list.

The choice of companies followed the logic of case selection for comparative analysis in which the variable of observation—a transition towards new energy types—even if absent, has a real chance of occurring (Seawright & Gerring, 2008). This emphasised oil European companies over their US peers, given their increasing activity in renewables and their own propaganda on being companies 'ready to transition'. In indexes qualifying oil majors low-carbon transition 'readiness' the largest European oil majors consistently scored top of the list (Fletcher et al., 2018; IEA, 2020; Pickl, 2019a). The evidence provided European policy and political attention to climate change as one of the main explanations for the divide between EU companies compared to other companies in their attention and ambition regarding environmental concerns (Ans Kolk & Pinkse, 2005). Further, Europe contained the only case of transition (DONG/Ørsted) of an oil major towards renewables. European countries while sharing similarities in their approach to environmental policy, have profound institutional, as well as cultural, differences, leveraged in academic research for the comparative study of historical economic features (Hall & Soskice, 2001).

Shell, Total, BP, Statoil, Eni, and Repsol were selected for their size as the largest European oil majors, both in sales, market value and number of employees. While DONG, once one of the largest oil companies in Europe and back then responsible of up to 30% all Denmark CO₂ emissions, was selected as an extreme case of unique and full transition towards renewable energy and was used only as a reference and not for comparison. Extreme cases in comparative analysis can lead

to complexification and to deviate from the explanatory variables, however their use can be a reference if the sample includes as well negative cases (Collier & Mahoney, 1996, 2014).

Oil companies were selected over other industries for their role as global climate actors capable of influencing climate change outcomes in three areas. First, their environmental impact has already had deep climate change consequences. Most of climate impacts and ocean acidification can be traced to investor-owned carbon producers, of most are oil producers, and the top four are major oil companies: Chevron, ExxonMobil, BP, and Shell, contributing each between 2% to 1.7% to ocean acidification, 1.8% to 1.5% to global temperature increase, and between 1.7% to 1.3% to global sea level rise from 1965 to 2015 (Licker, Ekwurzel, Sideris, et al., 2019).¹ Second, their lobbying against climate change and denial of climate science has delayed and affected climate change governance at national and global level. The top oil companies spending more on climate lobbying are BP, Shell, ExxonMobil, Chevron, and Total, spending between 2015 and 2018, \$53M to \$29M in the US alone (InfluenceMap, 2019). Third, their increasing role as ‘investors’ in emerging climate solutions has brought them to have a self-declared climate leadership, changing their name to ‘energy companies’ instead of oil (Pickl, 2019a), but keeping their business largely unchanged (J. Green et al., 2021).

1.1 Covid impact on research

The Covid pandemic impacted this project in two major ways. First, this thesis had to be redesigned away from interviews that were going to inform in depth comparisons between cases. Second, this thesis had delays for health reasons due to long covid symptoms over at least a year.

¹ The largest cumulative emissions of CO₂ have been traced to investor-owned companies in fossil fuels and cement (Heede, 2014). Of the 90 largest industrial carbon producers, 53 are oil companies, and 50 are investor-owned, 31 are majority state-owned and only 9 are full-state companies, and in total these 90 companies over a century and a half of emissions have contributed to 57% change of global atmospheric CO₂ concentrations, a 50% change in the global mean surface temperature, and to global sea level rise in 26-32% (Ekwurzel et al., 2017; Licker, Ekwurzel, Doney, et al., 2019).

2. Producing the original database of acquisitions

This thesis is based on an original database of merger and acquisition (M&A) transactions that, from conception, coding, design, categorisation, and analysis, took a year and a half to finalise. The database is unique as it was built manually from the analysis of financial records on M&A extracted from the Thomson Reuters Eikon Database, currently called Refinitiv.

To retrieve the records as far as three decades back, all the former names, subsidiaries, and parents² of the companies were included. For example, for BP, this included BP British Petroleum Co PLC, Standard Oil Co of Ohio (British Petroleum Co PLC), BP PLC, and BP America, between others already included under BP PLC parent. The period of the database was chosen as from the earliest record available (1987) on renewables, to 2019, to capture the patterns before the pandemic and to exclude the subsequent economic disruptions of 2020 and 2021. More detail of the historical aggregations of financial transactions is described under the methods on Chapter 3.

The data collection for the database of acquisitions included the following:

- Seven companies: Royal Dutch Shell (Netherlands), BP (UK), Total S.A. (France), Statoil (Norway), ENI (Italy), Repsol (Spain), and DONG (Denmark).
- M&A records retrieved: 3,540.
- M&A records listed as 'completed': 3,214.
- Time period: 1987 to 2019, with varying date of first publicly traded deal per company.

The process of building the original database of this project required manually re-categorising the 3,214 M&A deals listed as completed into new precise categories. The process of re-categorising required additional information from every single deal. Based on the manual search of publicly available news reports and press releases, each deal was identified and re-categorised by the explicit

² In financial terms a 'parent' company is the company that holds majority interests on another company and therefore its control.

mention of the type of technology of the target business, its sector, location, and the distinction of transaction type between acquisitions and sales, amongst other features.

This data is unique because it fills a gap in how financial data is reported. Usually, financial transactions data include the industry of the parent of the target companies³ to be acquired. This leads to acquisitions not being traceable by their own technology or sector, but only by its parents' industry sectors. Since renewable energy industry's businesses—as in other emerging industries—are usually small and passed along amongst different parent companies, they can get lost in a sea of data. Consequently, M&A databases have only been used limitedly to study R&D innovation. Particularly in the oil and gas industry, acquisitions are the main way oil companies access resources, from leases essential to their upstream activities, to main complements to the oil downstream, and midstream activities like refineries, fuel retail, and chemical plants. This is no exception to their entry into industries outside their core activities like renewable energy. After the coding and re-categorisation of the data, a new database was created with the following identified categories to each deal:

- Technology type
- Energy type
- Target location
- Deal type (acquisition or seller)

In addition, the coding and revision of all deals meant some errors in the Eikon database were corrected. For example, corrected deals included deals listed as pending that were completed, deals listed as completed that were cancelled, name of the target, location, percentage acquired, subsequent acquisitions or mergers that were missing, as well as deals with incomplete details.

³ 'Target' companies are the companies sought out in a merger or acquisition by a potential acquirer.

Table 1. Coding categories for type of technology

Energy type	Technology type	Description	Value chain
O&G	<i>Oil and gas Upstream</i>	Oil and gas assets. Exploration and Production. equipment, materials, construction for oil fields	Energy production
	<i>Oil midstream</i>	Fuel, refineries, lubricants, LP gas, leases, pipelines, transport for oil	
	<i>Fuel retail</i>	Fuel stations	Integrated chain
	<i>Auto parts</i>	Auto parts, e.g., Tires; adhesives resins business, etc	
	<i>Plastics</i>	Ethylene, polyethylene, polyester, vinyl, caprolactam, nylon; includes Fertilizers	
		<i>Natural gas midstream</i>	Natural gas only projects (LNG, Natural gas pipelines, storage) excl. exploration and production
Fossil Hydrogen	<i>Hydrogen from natural gas</i>	Hydrogen production from fossil fuels, natural gas to hydrogen with capture and storage of CO2 (blue hydrogen)	
Fossil Power	<i>Power with natural gas</i>	Utilities, incl. natural gas power plants, combined cycle plants	
	<i>Coal</i>	Coal mining, coal exploration, coal power, coal bed gas	
Abatement technologies	<i>Pollution solutions and energy efficiency</i>	Air pollution solutions, methane detection technologies, energy efficiency services, waste solutions, waste recycling	Support technology
	<i>Carbon capture</i>	Pilot and Technologies to capture CO2 emissions from fossil fuel projects	
Renewable energy	<i>Solar</i>	Solar infrastructure, manufacture, PV cell technology, Solar parks, polysilicon, photovoltaic	Energy production
	<i>Wind</i>	Wind facilities, Turbine technology, magnetic technology	
	Hydroelectric	Hydro generation plants	
	<i>Biomass</i>	Wood pellets	
	<i>Multiple Renewable power</i>	Utilities with renewable energy	
	<i>Biofuels</i>	Ethanol, biodiesel, cellulosic ethanol, producing plants, distribution facilities, cell-fuel development	
	<i>Hydrogen from renewables</i>	Hydrogen produced using air and renewable electricity, Electrolysis method	
Electricity systems	<i>Batteries</i>	Energy storage solutions	Support technology
	<i>Grid and smart technologies</i>	Smart grid, software for renewable energy integration, transmission services, fibre optics	
	<i>Electric vehicles</i>	Electric vehicles	Integrated chain
Power	<i>Nuclear</i>	Fusion nuclear electricity generation plants, nuclear wastewater treatment, nuclear cooling	Energy production
Offsetting	<i>Carbon credits</i>	Companies for certification GHG emission reduction projects	Other
Other	<i>Other</i>	Protein development, clinical products, drugs; convenience stores, toll service, paper, restaurants, Financials, buildings, cement, metals, CSR, Software, IT	

Table 2. Example of coding

Year of operation	Eikon deal synopsis	Eikon Target Mid Industry	Author's coding
2018	US - Ares Management LP <u>acquired wind energy business</u> of BP America Inc, a Houston-based provider of support services for oil and gas operations, ultimately owned by BP PLC.	Oil & Gas	Wind energy
2014	US - Pattern Renewables LP, a unit of Riverston Holding LLC's subsidiary Pattern Energy Group LP, acquired the 150-MW Fowler Ridge <u>4 wind project</u> of BP Wind Energy North America Inc, a unit of BP PLC.	Alternative Energy Sources	
2006	US - BP Alternative Energy, a unit of BP PLC, acquired Orion Energy LLC, <u>a provider of wind energy services</u> .	Power	

As described in Table 1 and 2, the coding and categorisation of all M&A deals for the three-decade-period distinguished all types of technology in the oil and gas business chain, including plastic units, liquified natural gas, natural gas pipelines, and new technologies in the 'clean' and renewable spectrum, such as biofuels, wind, solar, batteries, and electric systems, amongst others. Table 1 shows an in-depth description of the coding categories, and Table 2, describes the coding process using the deal description synopsis. However, in about half of the cases the deal synopsis was not enough to identify the type of technology of the business acquired. In such cases, the process included using search engines to locate the press releases and from them code the correct type of technology category. [See Appendix I on Chapter 3 for further examples of the coding].

The in-depth coding of this database resulted in the identification of 211 transaction deals in renewable energy, which form the core of the data used in this thesis. The resulting data was then analysed using Excel, Tableau, and R.

3. Other main sources of data

Alongside the main original database of acquisitions, two additional complementary databases were built. First, from coding the first database, a side database containing all the press releases of the renewable energy deals was stored, containing a total of 527 archival digital notes. The press releases used four languages: English, French, Spanish, and Italian. While most of the recent press releases are available in English, for earlier periods of two to three decades back,

companies referred to the language of their home country only. The exceptions were DONG and Statoil, in which their early press releases are listed and available also in English. Second, to trace the acquisition deals in the strategy of the companies, a database on all the historical annual reports was also produced. The annual reports database included a total of 164 annual reports for the seven companies in the sample. Similar to the press releases, early annual reports were in French, Spanish and Italian for Total SA, Repsol and ENI.

To manage and analyse these extensive text data, this project used the software for qualitative coding NVivo, and assigned a node to each document per year of issue and another for the company. Each document was classified in separate folders for the three main technologies analysed: solar, wind, and biofuels.

4. Description of data used per chapter

The original database produced for this thesis and the two subsequent databases of text documents were used in the subsequent chapters in the following manner.

Chapter 3, that studies the companies' decision-making in retaining acquisitions over time, uses the original database in two ways.

- First, to identify the patterns of innovation acquisition, such as the presence of subsequent supporting acquisitions.
- Second, it served both as a datapoint and as a reference to the historical tracing of the deals and subsequent organisation decisions. This latter point was also complemented with the press release of each deal as well as newspaper notes along the timeline of study.

Chapter 4, which studies the companies' strategic framing of their role in the energy transition, used the annual reports as the main source of data, and using textual coding it identified the strategic frames associated to their involvement in renewable energy over time. In this chapter the original acquisition database is not discussed, however it served as a reference for the timeline to observe business decisions.

Chapter 5, that traces the use and acknowledgement of subsidies for renewable energy, uses the original database to identify the location of the acquired renewable assets and then to trace their subsidy context. As well, this chapter uses the press release of each acquisition to observe when companies mention or not the support from subsidies.

5. Data overview and descriptive analysis

The original database on acquisitions provided rich data to observe oil majors' acquisition transactions through a new prism, that of their acquisitions activity by technology type. Before using this new data to answer the research questions, an exploratory and descriptive analysis was conducted. The next pages show the results from that exercise, divided in three subsections: 6.1 the description of the whole database in oil and renewable technologies, 6.2 the analysis of the renewable energy acquisition deals, and 6.3 the comparison between renewable and oil and gas acquisitions.

5.1 Overview and description of produced database

Of all the acquisitions recorded for the European oil majors, over the thirty-year period most have been in oil and gas technologies and assets, only between 3.5% to 2% in fossil power, and between 13% to 3.3% in renewable energy technologies (see Table 3). DONG as expected is an outlier. Yet, it was interesting to find that DONG's transition to wind energy was supported through acquisitions, first by acquiring utilities and later by acquiring wind energy businesses.

Table 3. Proportion of acquisitions by Energy type (1987-2019)

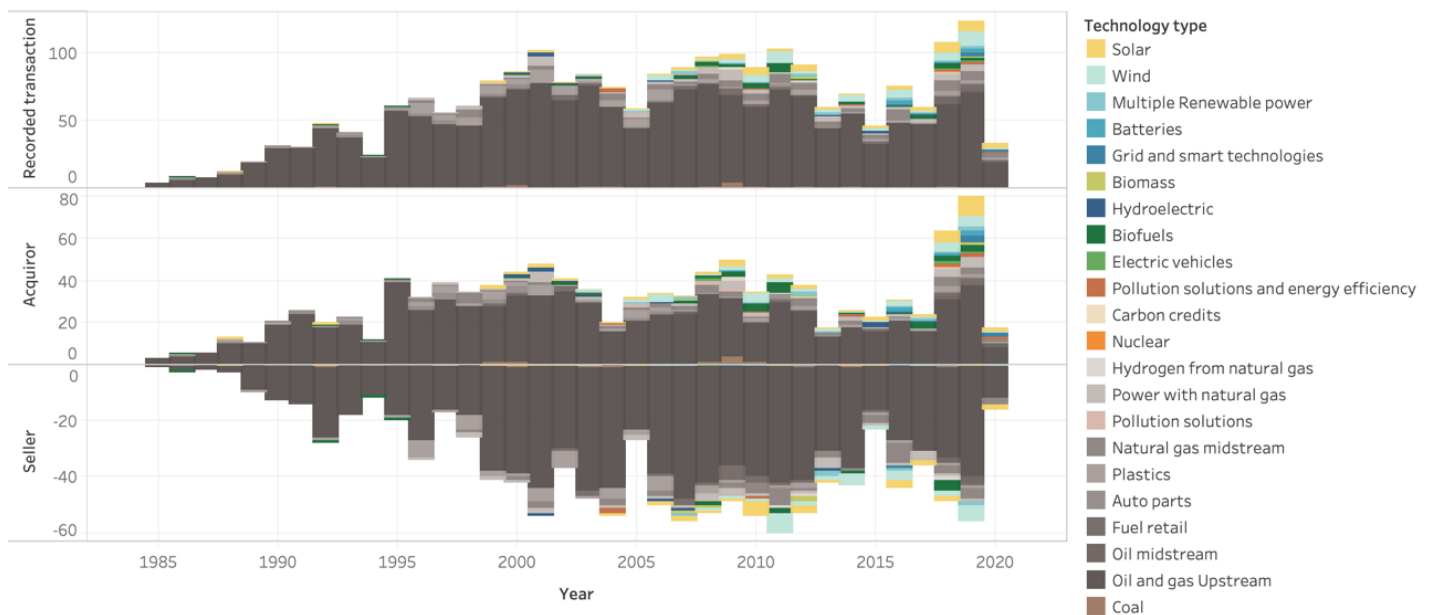
Company	O&G	Fossil Power	Fossil Hydrogen	Electricity systems	Renewable energy	Abatement technologies	Offsetting
R D Shell	90.13%	2.71%	0.16%	0.96%	5.89%	0.16%	
BP plc	85.39%	3.53%	0.50%	0.50%	9.57%	0.25%	0.25%
Total SA	89.70%	1.98%		0.40%	7.52%	0.40%	
Eni SpA	91.82%	2.97%		0.37%	3.35%	1.12%	
Repsol	89.12%	3.63%		1.04%	5.70%	0.52%	
Statoil	81.82%	1.95%	0.65%	1.95%	12.99%	0.65%	
DONG	26.83%	20.73%		2.44%	50.00%		

The data also has a longitudinal dimension and the number of acquisitions recorded per year are shown in a timeline. Figure 1 shows the complete database of all acquisitions and all technologies per year. The darker colours show the

acquisitions in the oil business, and the brighter show the different technologies in renewables, electricity systems, and power.

Figure 1. Longitudinal description of acquisitions for all companies

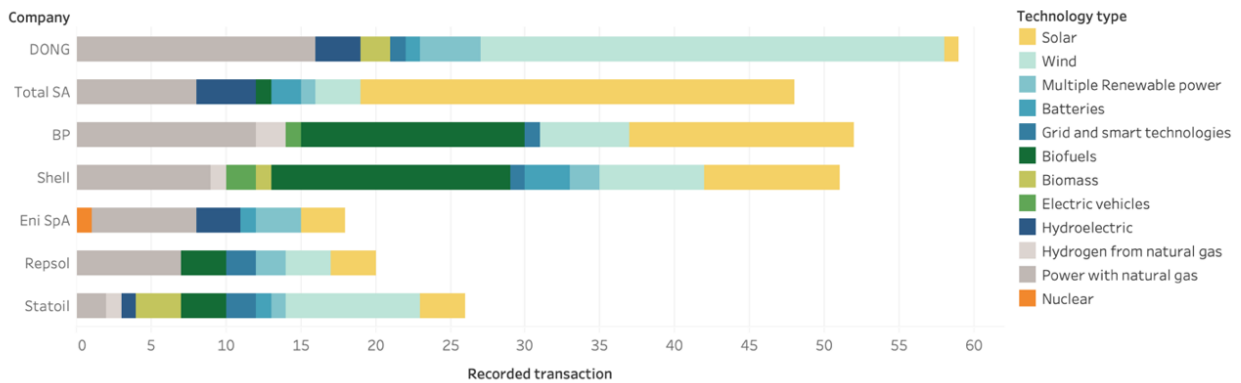
All company deals by Technology type



The plots of sum of Recorded transaction, sum of Acquiror and sum of Seller for Year. Colour shows details about Technology type. The data is filtered on Company and Year. The Company filter keeps 7 of 7 companies. The Year filter excludes Null. The view is filtered on Technology type, which excludes Null and Other.

Figure 1 also shows the M&A waves, of years of higher number of deals, and shows that the number and proportion of renewable energy acquisitions has increased since 2015, the year of the Paris Agreement.

Figure 2 describes the accumulated acquisitions in power and renewable technologies and assets and shows that the combined proportion of renewable energy acquisitions is larger than acquisitions of power with natural gas assets. Of all companies, DONG registered most acquisition transactions in renewable but BP, Total and Shell follow not far behind. Both Total and DONG registered the most accumulated acquisitions in a single technology, for solar and wind respectively.

Figure 2. Renewables and Power technology acquisitions

Sum of Recorded transaction for each Technology type broken down by Company. Colour shows details about Technology type. The view is filtered on Technology type, which keeps 12 (low-carbon only) out of 24 coded technologies.

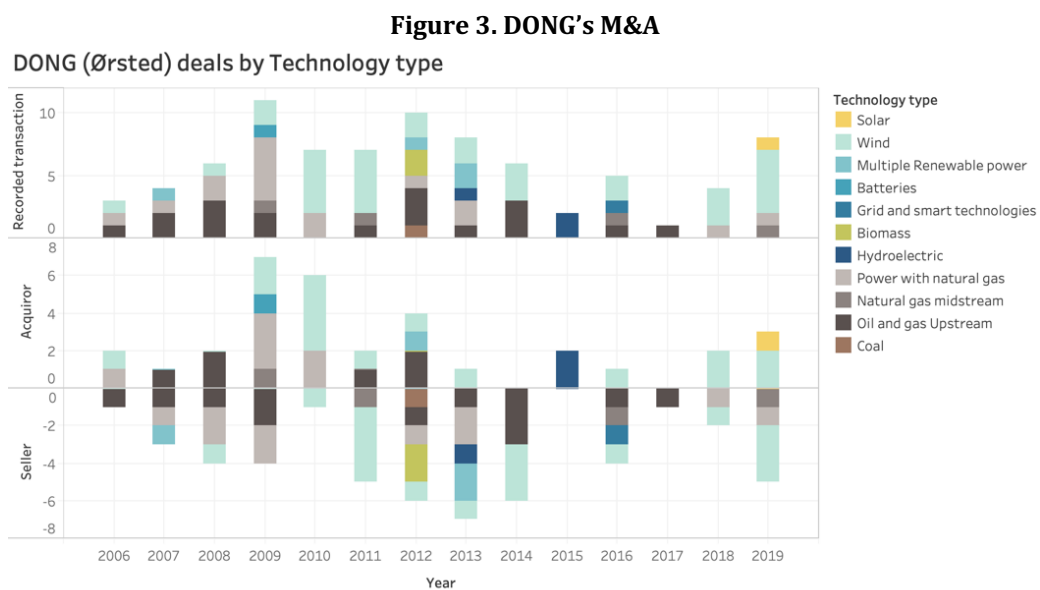
Acquisitions of renewable energy deals across companies show differentiated proportions of technology types. Biofuel deals seem largely present in BP and Shell activity, whereas Total shows a similar level of spread in solar to that of DONG in wind. This might show how companies specialise in technology types, while the smaller proportions might indicate instead a venturing behaviour. In terms of geography, each company has a different home-country which can determine the ecological conditions of closer access for companies. For example, DONG and Statoil show fewer acquisitions in solar energy systems, yet they focus mostly on wind which is aligned to the resources available in their home countries, Denmark and Norway. BP and Shell, for instance, are companies historically more tied to the US. Despite their headquarters in Europe, BP and Shell's US subsidiaries are almost of equal relevance to the size of the rest of their business. In this case, US mandate for biofuels content in gasoline might explain why these two specific companies stand out in their biofuel acquisition activity. Interestingly, more than half of the biofuels acquired are based in Brazil –another country with a strong biofuel mandate and the World largest sugarcane producer. This later point also shows that these oil majors are also able to seek relevant resources in countries outside their direct influence if there is an opportunity; just like in the rest of their oil business.

Some of the renewable energy types shown in the acquisition distribution were relevant two decades ago. This is the case for the deals in hydroelectric plants, which were usually acquired out of state control and in as part of a policy plan.

Hydroelectricity is a very mature sector with very limited new activity as result of environmental regulation, social opposition, and the fact that major reservoirs have been developed and are under control of state or private legacy electricity companies. The companies that show deals in this sector, usually did so as an arm of the state a two to three decades ago, such as DONG, Total, ENI and Statoil.

5.2 Acquisitions shown for three companies: DONG, Shell, and BP

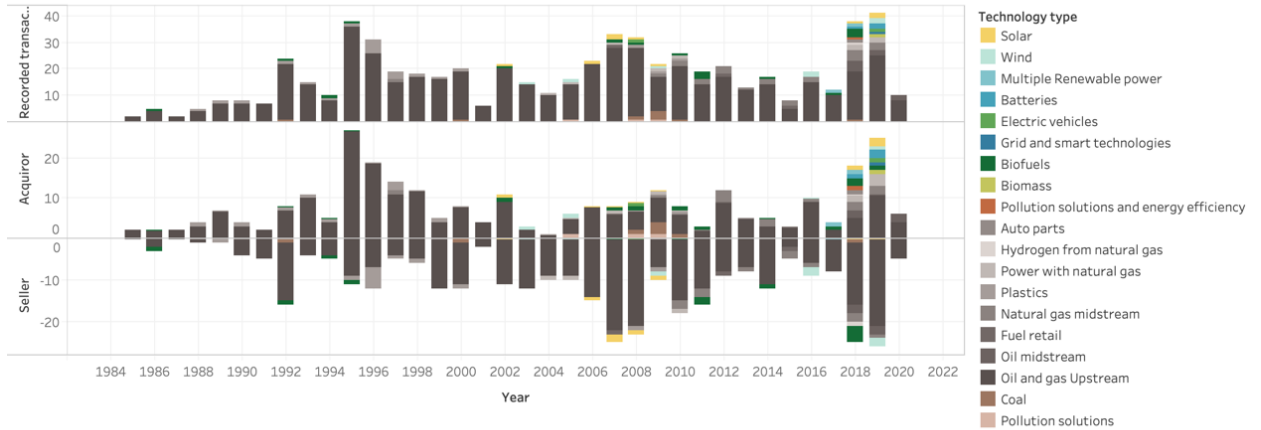
From the individual examples of acquisitions per each company the most interesting was DONG's business shift towards wind industry through incremental wind acquisitions. DONG announced formally a transition towards offshore wind in 2009, which was formally completed in 2017.



The plots of sum of Recorded transaction, sum of Acquiror and sum of Seller for Year. Colour shows details about Technology type. The data is filtered on Company and Year. The Company filter keeps 7 of 7 members. The Year filter excludes Null. The view is filtered on Technology type, which excludes Null and Other.

Figure 4. Shell's M&A

Royal Dutch Shell deals by Technology type by Energy type

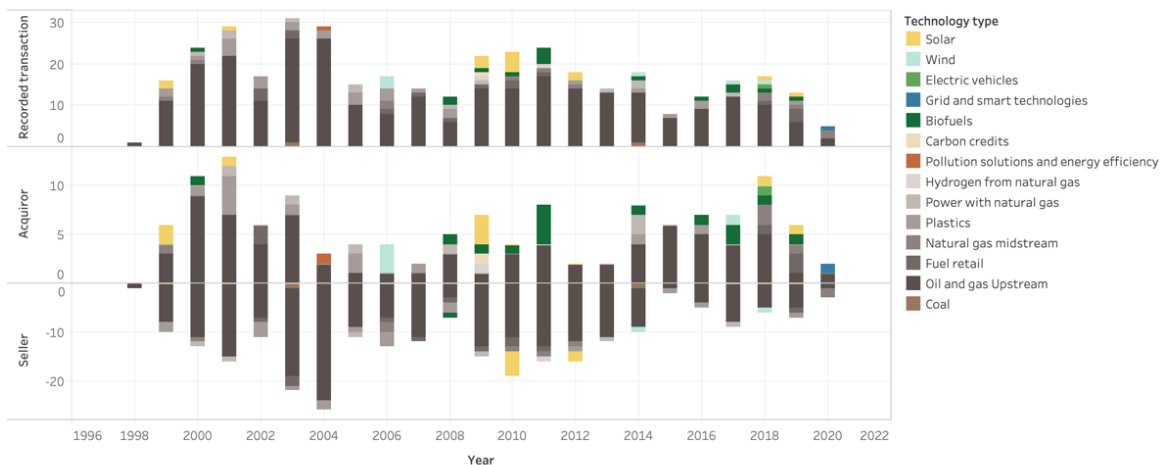


The plots of sum of Recorded transaction, sum of Acquirer and sum of Seller for Year. Colour shows details about Technology type. The data is filtered on Company, which keeps Shell. The view is filtered on Technology type, which excludes Null and Other.

Figure 3 and Figure 4 show the examples of Shell and BP and show that they follow slightly different peaks of acquisitions. BP for example had years with larger proportion of renewable acquisitions than oil and gas acquisitions.

Figure 5. BP's M&A

BP plc deals by Technology type

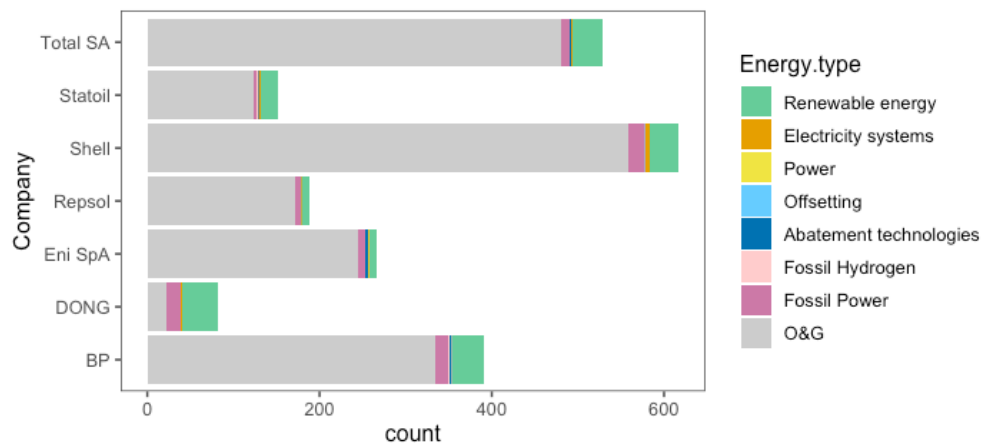


The plots of sum of Recorded transaction, sum of Acquirer and sum of Seller for Year. Colour shows details about Technology type. The data is filtered on Company, which keeps BP. The view is filtered on Technology type, which excludes Null and Other.

5.3 Analysis of renewable energy acquisition deals

Comparing between technologies acquired, the total number of renewable energy acquisitions is small compared to the total number of acquisitions in oil and gas business (Figure 6). However, this comparison also shows that renewable energy acquisitions have been the second most relevant energy acquired after oil and gas deals. Oil majors rely heavily in acquisitions for their business. For example, along mining, oil and gas acquisitions have represented up to 27% of the global trading market value like in 2011, yet commonly oscillates greatly per year to reach lows of 4% like in 2015 (Reddy & Xie, 2017).

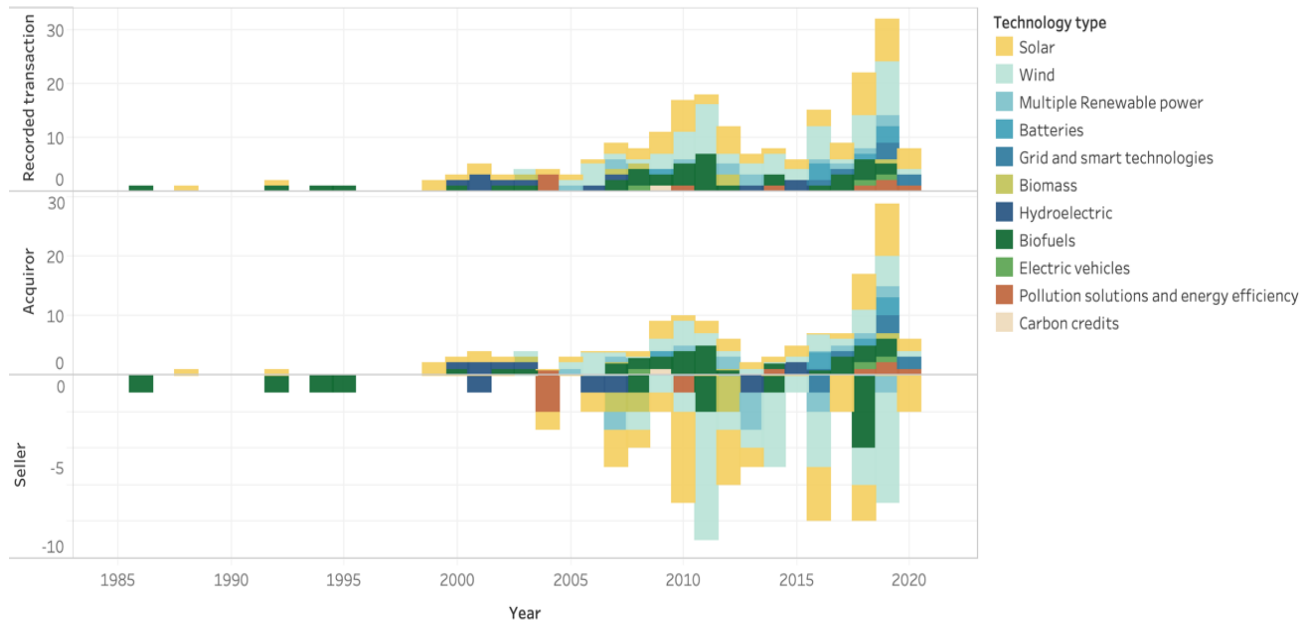
Figure 6. Oil major's total investment per energy type (1987-2019)



Longitudinally, in Figure 7, there are three observable stages of oil majors' renewable acquisitions. The first stage covers from 1985-1997, in which acquisitions in solar began, mostly for BP, Total and Shell. In this moment solar energy was both seen already as a clean technology for the future and as an opportunity for countries to depend less on OPEP's control of the oil market. The second stage from 1998 to 2009 starts after BP recognises in 1997 in a public speech that climate change as a global issue caused from the burning of fossil fuels, a statement to which most companies in our sample later joined. This is the stage when solar and later biofuels were developed in the context of 'alternatives' to oil energies. This period is also when natural gas grew most in the oil business, as it was presented as a cleaner alternative to oil. The stage ends with the start of the disposal of BP's solar business, later followed by Shell's solar exit. The third stage covers from 2010 to 2019 and is the densest in acquisitions and the most

diversified in types of energies acquired. This stage contains most acquisitions in biofuels and saw the acquisitions in wind increase considerably.

Figure 7. Frequencies of renewables acquisitions and sales by all companies



The plots of sum of Recorded transaction, sum of Acquiror and sum of Seller for Year. Colour shows details about Technology type. The data is filtered on Company and Year. The Company filter keeps 7 of 7 companies. The Year filter excludes Null. The view is filtered on Technology type, which excludes O&G, Natural gas power, Natural gas hydrogen, Nuclear, Coal, Null and Other.

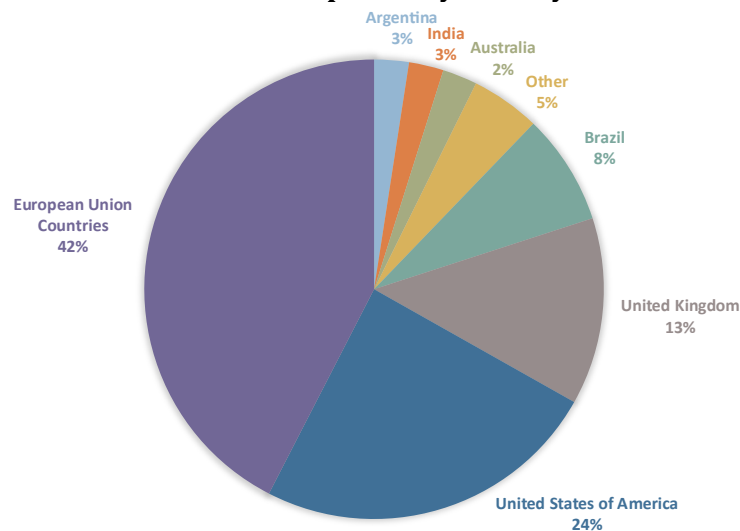
erratum: seller axis proportion

In the whole period of study (1987-2019) European oil majors have acquired a diverse number of renewable energies. Solar, biofuels, and wind dominate acquisitions, above biomass and hydroelectric. In proportion to their own acquisitions in renewables and electricity systems, 72.5% of Total deals have been in solar, followed by BP with 42.5%. Biofuels dominate in Shell, with 42% of deals coming from biofuels, then in BP with 37.5%. As well, in proportion to their other deals in renewables, wind is more dominant in DONG with 72% and in Statoil with 39%, followed by Repsol and Eni with 30.7% and 27% respectively. [See Figure 5 reviewed above].

In terms of geographical spread, European oil majors have acquired businesses in more than 116 countries. Of their total acquisitions, 47% are in Europe and 17% in the United States. Their renewable acquisitions are more concentrated in comparison, spreading just to 56 countries, but 55% concentrated in Europe and 24% in the United States (Figure 8). When investing in renewables,

European oil majors seem to specialize in specific countries outside their home jurisdiction, like Brazil, but they acquire businesses mostly in western developed economies. In fact, when acquiring renewable energy businesses, oil majors are focused mostly on high and upper middle-income countries.

Figure 8. Distribution of total number of acquisitions for all companies by country

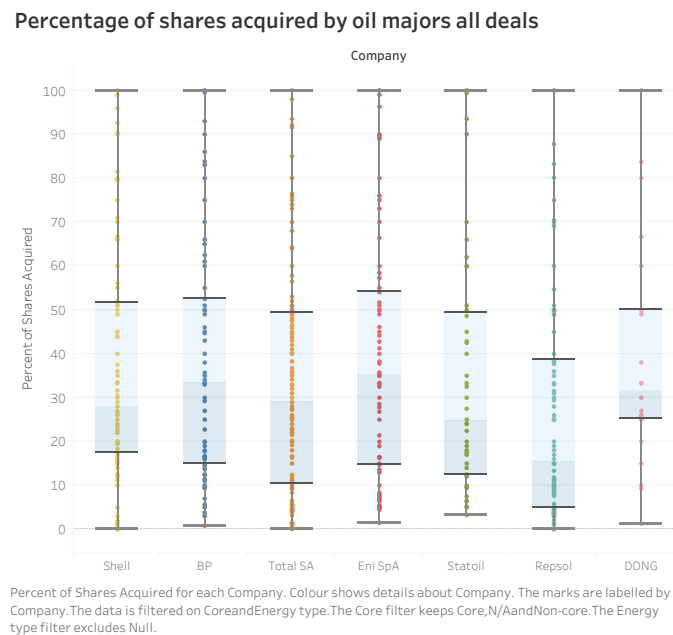


5.4 Differences between renewable and oil and gas acquisitions.

A main area of interest of this thesis is the change of acquisition behaviour features between types of technologies, those in the main business of the company and those in emerging markets. This section explores differences in acquisitions towards oil and gas assets and renewable energy assets.

5.4.1 Acquisition styles

Given the acquisition records obtained from Refinitiv Eikon contain the description of the percentage of shares acquired, the analysis used this to compare 'acquisition styles' and explore in practice what is different among oil and renewable deals. On a first step, comparing the percentage of the shares acquired showed no relevant difference between companies when observing all their acquisition deals, renewable, oil or else (see Figure 9). All the companies in the sample tend to acquire in the same manner, with a similar wide variation on the percentage of total shares acquired.

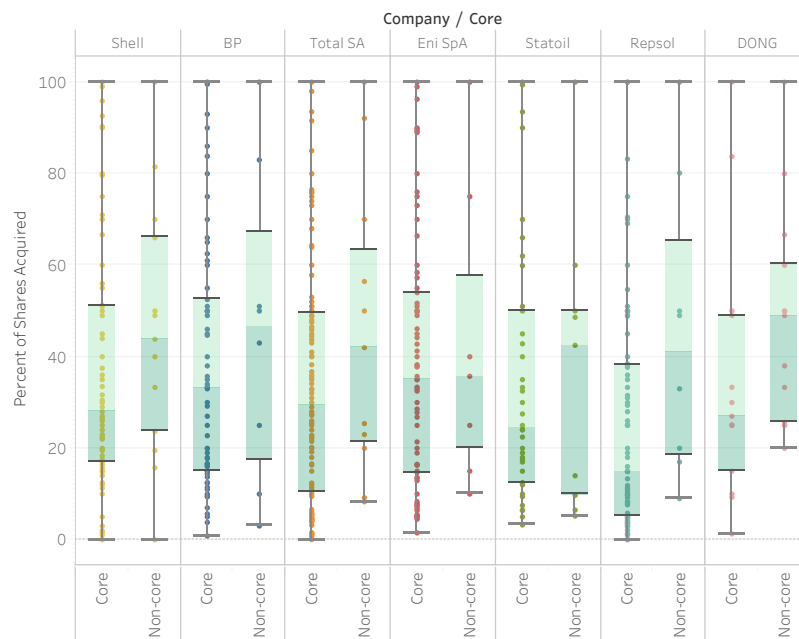
Figure 9. Percentage of shares acquired by company

However, the technology categorisation of the database allowed to compare the acquisition styles between deals in their core business –i.e., oil and gas related— and non-core–i.e., renewable energies and clean technologies (see Figure 10). Interestingly, this comparison brought a clear divide between the tendencies of percentage of shares acquired. Core businesses show lower percent of shares acquired compared to non-core businesses.

This pattern becomes more evident when comparing only oil and gas acquisitions with renewable energy acquisitions. Figure 11 shows that acquisitions seeking purely oil and gas deals usually tend towards lower share ownership, and that deals in renewables tend towards more than 50% ownership.

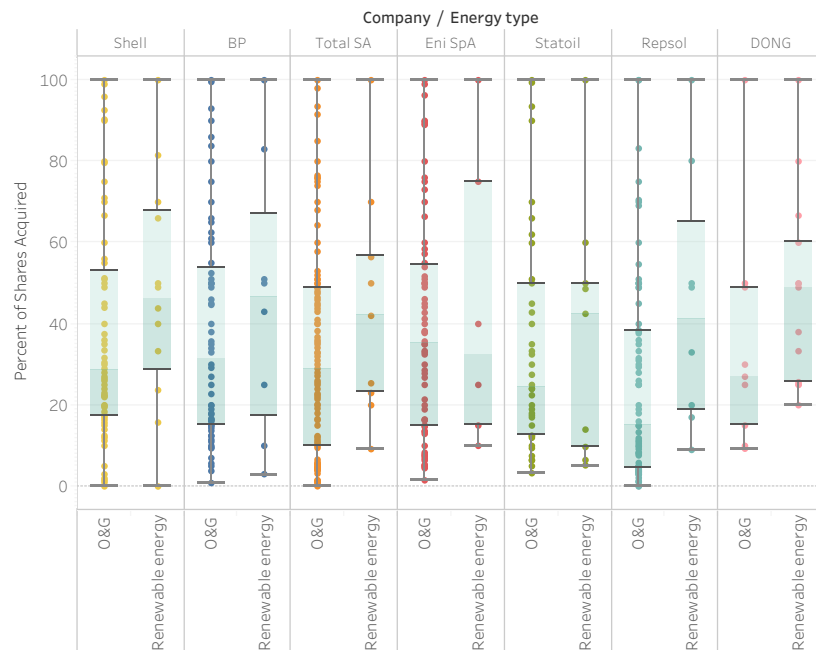
Between the reasons that might explain this pattern of acquisitions is that oil and gas acquisitions tend to be developed jointly with other contractors, while renewable tend to be fully owned by the oil majors. This might be useful for thinking the different approaches towards renewable energy where projects are substantially smaller. An alternative explanation might be that the nature of oil and gas contracts (Upstream) requires different percentages of countries participation, however this pattern is also observed in other parts of the oil and gas chain like oil midstream and natural gas midstream, therefore is less plausible.

Figure 10. Percentage of shares acquired core vs. non-core
 Percentage of shares acquired by oil majors all deals



Percent of Shares Acquired for each Core broken down by Company. Colour shows details about Company. The marks are labelled by Company. The view is filtered on Core, which keeps Core and Non-core.

Figure 11. Percentage of shares acquired O&G vs. renewables
 Percentage of shares acquired by oil majors



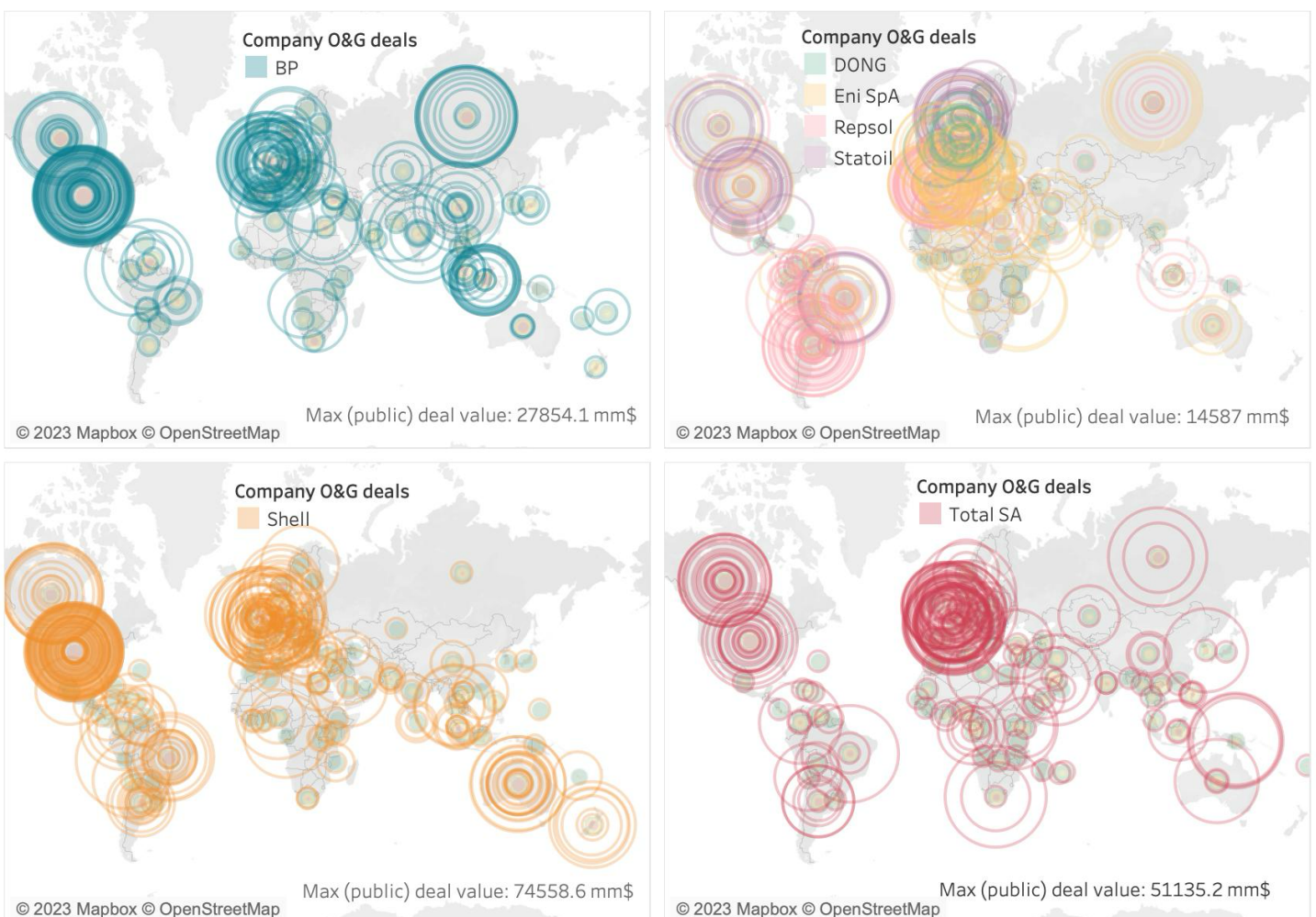
Percent of Shares Acquired for each Energy type broken down by Company. Colour shows details about Company. The marks are labelled by Company. The data is filtered on Core, which keeps Core and Non-core. The view is filtered on Energy type, which keeps O&G and Renewable energy.

5.4.1 Geographical distribution

Finally, the deal records from Refinitiv (Eikon) usually include description of the country of the target (acquired business) and the country of the ultimate parent of the acquiror (oil majors' headquarters or subsidiaries). These records were used to see the geographical spread of the financial transactions in oil deals and then in renewable energy deals.

Figure 12 shows how spread oil and gas have been across geographies, and how deals have targeted areas of vast oil resources. It also shows that most of the value has been concentrated in Europe (place of companies' headquarters) and the US (of known large oil industry and place of companies' main subsidiaries).

Figure 12. Location of acquisitions in Upstream and Midstream per size of value
Upstream and Midstream M&A per deal value (1988-2020)



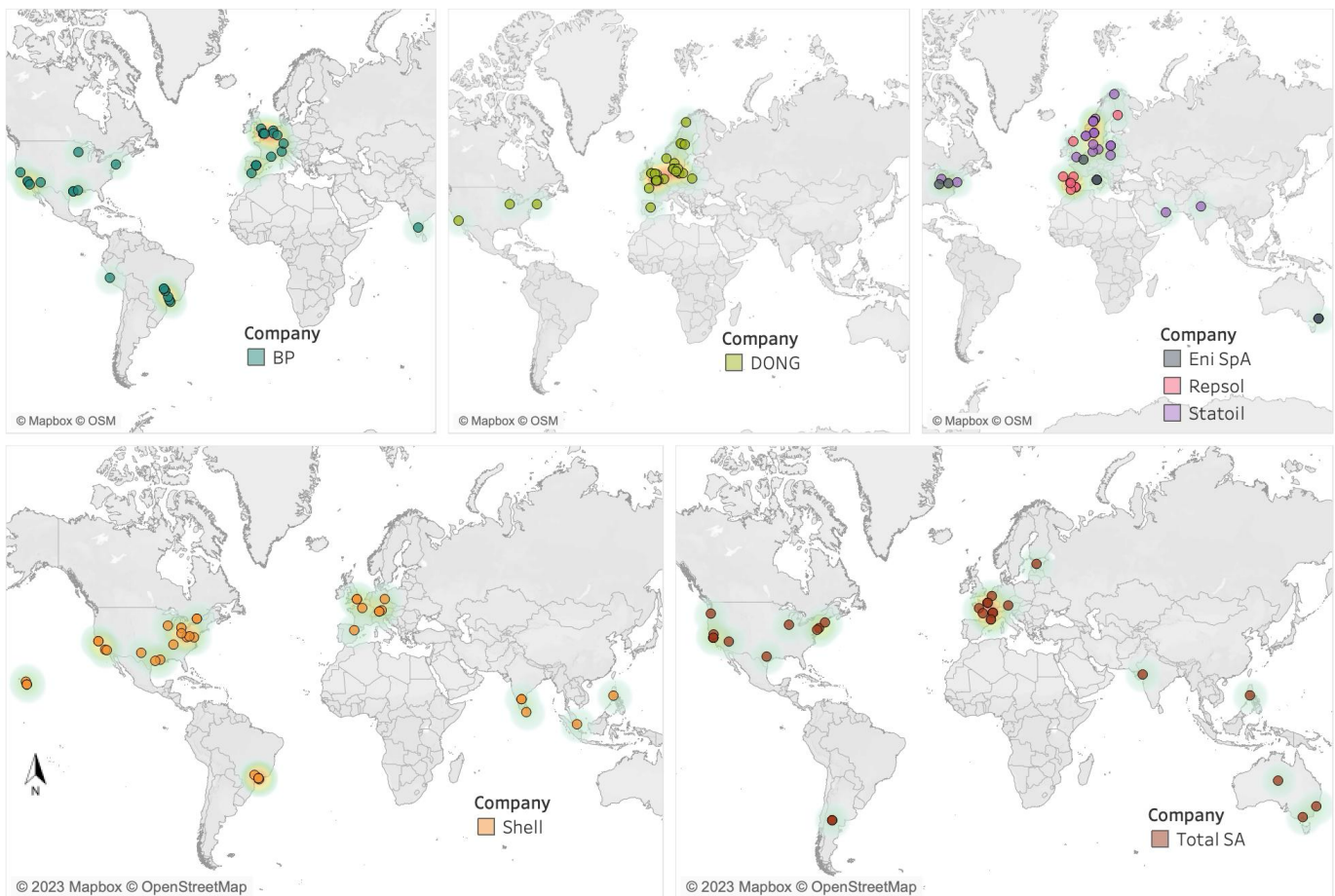
Author with data from Refinitiv Eikon. Colour shows details per Company. Size shows details about Deal Value. Density is shown for number of deals per Target Nation. The context is filtered per Company. The view is filtered on Technology type (author coding), which keeps Coal, Natural gas midstream, Oil and gas Upstream and Oil midstream.

The previous Figure on oil deals by size could not be replicated for renewable deals since the value of the deal is only available for public transactions. While most of oil acquisitions are public, renewable acquisitions are held privately, and the deal value is not made publicly available.

To show the spread of renewable acquisitions for renewables, the city of the target had to be identified first, because otherwise the map did not show the density of acquisitions. The city of the target acquisition was obtained from the manual coding of the deal description and press releases. Figure 13 shows the result of the location per city divided by company. The most spread companies in terms of location are Total and Shell. The most concentrated in Europe and the US are Statoil, Eni and Repsol.

Figure 13. Location of renewable energy acquisitions for all period and companies

Renewable energy acquisitions per city of target (1988-2020). Buffer on density.



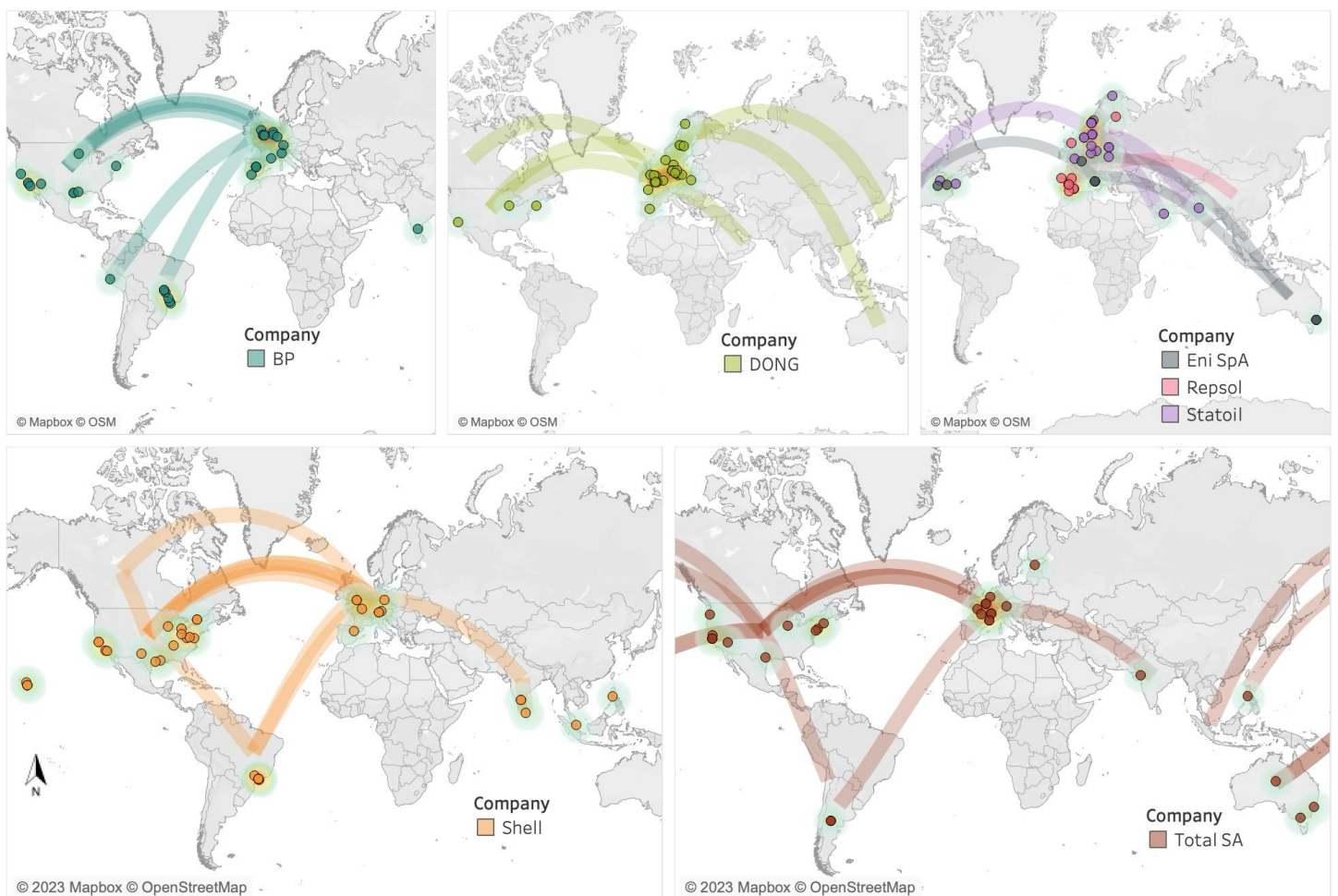
Author with data from Refinitiv Eikon. Map based on own data on Target City, Longitude (generated) and Latitude (generated). For marks layer TARGET CITY: Colour shows details about Company. Details are shown for Technology type (author categories). The Company filter keeps 7 of 7 members. The Year filter ranges from 1988 to 2020.

Finally, to indicate the direction of acquisitions, Figure 14 created a link between the country of the acquiror company and the subsidiary of the acquired target. This link showed that Shell and Total use subsidiaries responsible of acquiring renewable companies in the rest of the world.

This points to differences in the structure of the companies, delegation, and their venture capital practices, and therefore the concentration of their decisions in renewables. In turn, BP shows to be more concentrated in their headquarters for decisions to acquire renewable energy companies, like the smaller companies in the group, i.e., Statoil, Eni, Repsol and DONG.

Figure 14. Link between country of acquiror and city of the acquired target

Renewable energy acquisitions per city of target (1988-2020). Buffer on density.



Author with data from Refinitiv Eikon. Map based on own data on Target City, Longitude (generated) and Latitude (generated). For marks layer TARGET CITY: Colour shows details about Company. Details are shown for Technology type (author categories). The Company filter keeps 7 of 7 members. The Year filter ranges from 1988 to 2020.

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CHAPTER 3

Acquisitions and innovation: How incumbents retain clean innovations within system transitions

This chapter addresses the second research question: *What explains companies' support towards climate acquisitions over time?* This chapter studies the means organisations have for deciding over the support or neglect of climate acquisitions. And this chapter discusses the purpose of clean acquisitions to enquire the value they provide if the interest is not their maturation for profit.

Abstract

While acquisitions are a common way for incumbents to capture new technologies, most research focuses on studying acquisitions that are related to the incumbents' main technology. Firms' venturing behaviour towards new 'clean' industries are usually deemed either as normal market exploration or as common cases of greenwashing, without research being able to tell apart the patterns of the two. Taking the case of oil incumbents in Europe, this paper develops the definition of innovation retention to compare longitudinally companies' acquiring behaviour in renewable energy, relevant as a type of sustainable investment at the core of system transitions. Organisational restructuring and sustaining acquisitions are two dimensions this paper proposes as central to observe organisational effort over time, and a precondition for innovation retention. When using these dimensions to study differences in company ownership, this paper finds that oil majors have provided little effort into the development and maturation of clean technologies. Equally, the paper identifies moments of innovation retention that are telling of organisations' ability to support their clean technology acquisitions.

1. Introduction

In the last 30 years oil companies have acquired more renewable energy businesses than any other non-oil technology. These companies explain their acquisitions both as investments in innovation and for mitigating climate change. For example, BP committed in 2020 to step up its renewable capacity as it aims to cut 40% of its oil business by 2050. BP has made scant progress in this domain, but twenty years ago, BP was one of the largest solar businesses in the world, and shortly after so was Shell, followed by Total SA. Although the three oil companies' positions were earned through acquisitions, only Total kept its solar business. With climate change, the big oil multinationals –oil majors from here on— are urged to speed up their acquisitions in the same renewable energy technologies that they failed to retain in the past. Their engagement and success in renewable technologies has been different, but their acquisition retention patterns are still understudied. Renewable energy or 'clean' acquisitions will continue increasing as green investments have been called to be central to both maintaining the planet within a liveable threshold and to further ensure the stability of economic systems (Stern, 2022).

This paper sheds new into understanding global firms' challenges and contributions towards their success in innovation development —also called innovation retention— focusing particularly on innovations for sustainability and 'green' or 'clean' concerns. Innovation retention is defined as an innovation that post acquisition has become part of the acquiror organisation and has reached the stage of generating profit. Taking a closer look at the patterns of oil majors' renewable energy acquisitions, the paper asks how firms —particularly, incumbents to an industry—fail to support and to retain 'clean' acquisitions over time. The aim of this paper is to study how companies —particularly, incumbents to an industry— retain, as well as fail to retain, their clean acquisitions over time, taking a closer look at the patterns of oil majors' renewable energy acquisitions. The paper builds on the literature that describes the role of organisations in succeeding or maturing their acquisitions into profitable businesses (Arikan &

Stulz, 2016; Barkema & Schijven, 2008; Furr & Eggers, 2021) by discussing organisational behaviour and acquisitions in the context of energy transitions.

‘Greenwashing’ practices are widely extended across corporate actors in general – not only across oil majors— with pernicious widely recognised consequences of halting collective efforts, such as sustainable development goals (Nelson et al. 2014; van den Broek 2022). However, beyond unfair practices towards common challenges’ solutions, ‘greenwashing’ is often forgotten as a market practice and as an active set of decisions inside organisations with the potential of interfering with the development of both sustainable innovations and their emerging industries. By studying acquisitions in sustainable/clean technologies, this paper uncovers an understudied dimension of incumbent behaviour vis-à-vis climate change and energy transitions.

Acquisitions are a crucial dimension of business decisions in the value chain structure evolution, as they allow companies to learn and develop advantages in a competitive environment. Most commonly, companies use acquisitions strategically to absorb new technology, either by merging with or fully acquiring an existing company. Mergers are defined as an agreement between two or multiple companies to ‘pool resources under a common entity’; acquisitions refer to the company gaining economic and management control over other company (González-Torres et al., 2020). In this article, both processes are described as acquisitions.

This article studies the largest oil majors in Europe as the epitomal case of climate change transition tensions. The sample consists of seven companies in the oil and gas business that have variation in their renewable acquisitions’ innovation retention over a 30-year period, comprising the six largest oil majors in Europe plus Ørsted as an extreme case. The observations for each oil company cover their three most acquired renewable energy technologies: biofuels, wind energy, and solar energy. Given the large presence of clean acquisitions, and the politicised dimension of oil endeavours in climate change, the article provides a framework to understand the decision-making involved in clean technology acquisitions. The

paper also questions the use of acquisitions for other purposes that are not seeking profit. By analysing this aspect of incumbent behaviour, this paper sets the conditions to study when do incumbents seek other types of value from clean technology acquisitions beyond market entry and technology development.

This paper takes a longitudinal look at the acquisition behaviour of incumbents with new technologies that have significantly lower-emissions advantages but that simultaneously disrupt the incumbent's main business. The research does not focus on whether sustainability is central to the company decisions, but rather how incumbents to an industry act towards the clean innovations developed in their environments. Since incumbents in large industries hold a considerable amount of revenue, studying them helps understand the concepts of power and control in moments of change.

The paper is divided in three sections. First, it sets the context and the research strategy to understand incumbents' behaviour regarding clean technologies. Second, the article presents the relation between innovation retention and organisational effort and explains the methodological approach to construct indices to measure organisational effort. Third, the paper presents the results and the overall description of oil majors' acquisitions in renewables in aggregate, as well as two specific historical cases. Finally, the article concludes with the discussion of the findings.

2. Setting the context: acquisitions for a time of climate change

The literature review, as interdisciplinary, covers three aspects of innovation retention. First, it discusses the literature on acquisitions and corporate finance to situate innovation retention as a facet of company behaviour. Second, by drawing on the discussion on innovation and value in economic agents, this research situates the relevance of defining innovation retention in the study of acquisitions. Third, in the literature that studies climate actions in organisations and system

transitions this article situates the study of innovation retention as relevant to understand the gap on incumbent behaviour towards clean innovation acquisition.

2.1 Organisation behaviour and innovation retention

Companies' search for knowledge and innovation are at the centre of the theory of organisational behaviour. The observation that organisations search for new knowledge and innovations to adapt to changing environment situations opened the view of the firm as a complex entity capable of its own organisation decisions beyond market forces (Cyert & March, 1963). Understanding how organisations learn to adapt is central to both how organisations react to new rules set in their environment, but also to the way they learn to modify those rules (Levinthal & March, 1981). Organisations, upon the analysis of their environments and stakeholders, decide their own action paths, as well as the resource allocation between units and groups of the organisation. This analysis process is the main driver of organisations' behaviour.

Acquisitions are one of the main ways the search for external knowledge and innovation is materialised in companies' decisions. The success of acquisitions, i.e., the capacity of the acquiror organisation to produce profit, has been central to understanding learning and adaptation processes of large organisations. As organisations are indeed structured around a technology and its associated products, the successful development of innovations also requires the transformation of the organisation itself with the innovation. Transforming the organisation based on innovations involves organisational effort, whether those are developed internally or acquired (Furr & Eggers, 2021). Through acquisitions companies access new assets, skills, knowledge, broaden current capacities, increase managerial specialisation and influence, expand their geographical distribution, and enter new markets (Leon-Gonzalez and Tole 2015). More recently, acquisitions have also been used by large companies to prove their commitment towards climate change initiatives and low-carbon transitions.

The study of acquisitions first gained attention to understand firms' behaviour in markets. In the first wave of research on acquisitions, firms were found to acquire motivated by value creation, i.e., to secure market power or for efficiency, by managerial self-interest, i.e., as managers are compensated by equity of transactions rather than performance, by environmental uncertainty, i.e., as acquisitions replacing collaboration, by the firm's past performance and size, and by acquisitions' waves (Haleblian et al., 2009). Research has also focused on the difficulty of post-merger integration (Graebner et al., 2017). Acquisitions were found to have implications both for the acquiring and acquired firms, like the social and cultural issues involved for successful integration. For example, studies covered how trust and identity within the organisation create value after acquisitions, as well as the confluence between national and organisational cultures in international acquisitions (Graebner et al., 2017; Tienari & Vaara, 2012). Other features in literature of acquisitions include the role of CEO decisions, the board composition and experience, the organisational governance as well as the institutional conditions, in determining either motivations or the performance of acquisitions (Devers et al., 2020).

One of the major findings on the acquisition literature remains the relationship between acquisitions and organisation restructuring, in which in order for an acquisition to be successful, or to be made profitable, action and learning in the acquirer organisation needs to be observed. Barkema and Schijven (2008) propose in their seminal article that the success of acquisitions, in the form of synergies, reside not only in having a resonance with the organisations' strategy, such as an alignment to the organisation's mission and activities, but also it must fit within the organisation itself. A fit within the organisation, more than structural compatibility, is proposed to reside in the organisational ability—or decision—to restructure post acquisition (ibid). This view complements strategy scholars' arguments on synergies being possible only in the form of similarity and complementarity of acquisitions to the acquirer (Barkema & Schijven, 2008; Harrison et al., 1991; S. N. Kaplan & Weisbach, 1992; Zaheer et al., 2013).

Acquisitions that share compatibility with the acquiror tend to be more successful, however, making this the sole condition for success would rule out innovations that are divergent to the acquiror technological trajectories, such as most technologies from emerging industries. Yet, the disparity between different technology trajectories is inherent to innovation dynamics in acquisitions, where often two innovation trajectories overlap, that of the acquiror on incumbent technologies, and that of the acquired on new technologies. Cases of success do exist —although scant— and not only organisations are able to learn to develop successful acquisitions and diversify (Pennings et al., 1994), it also takes them organisational effort, and therefore ability and willingness, to make acquisitions succeed (Barkema & Schijven, 2008). Although often acquisitions are presented as mostly financial, extraordinary events, acquisitions are the materialisation of a company's strategy (Meglio & Schriber, 2020). Ultimately, it has been observed that acquisitions kept closer to the central decision team receive more organisational attention and integration, which guarantees higher chances of success even after repeated failures (Kim et al., 2022). In successful technological change, management structures and models have to change alongside the adoption of innovations (Bodrožić & Adler, 2018). Not only new technologies require new paradigms, but precisely because organisation practices are formed around solving the prevalent technology technicalities and conforming to its socioeconomic institutions, a new technology necessarily implies tensions and reorganisation (ibid).

Given that incumbents access new technologies mostly through acquisitions, this paper then proposes that innovation retention is key to understanding incumbents' role in clean transitions. This dynamic also infers incumbents' agency towards new technologies. Taking innovation as an evolutionary process, organisational behaviour theorists have proposed three steps for how organisations innovate: first, organisations pursue a motivated search of innovations, second, they rely on multiple layers of feedback and inner politics to select innovations, and, third, they retain the innovation through constant effort and by providing sustenance of the chosen innovation (Furr & Eggers, 2021).

Several conditions impact the success of acquisitions or, said in other words, acquisitions' chances of profitability. Examples include the differences in organisational culture between the two companies (Rottig et al., 2013; Weber & Camerer, 2003), the cognitive impediments to change to a new technology or market segment (S. Kaplan & Tripsas, 2008), power and resistance dynamics such as legitimation and discursive struggles (Tienari & Vaara, 2012).

The literature on organisation behaviour and acquisitions points towards the study of innovation retention, as the last step of the innovation evolutionary process, as an empirical subject that requires attention. This article goes further and argues that fully understanding organisations' innovation retention is of crucial relevance in the context of climate change and in the need for full scale clean technology adoption. Understanding the particularities of clean technologies requires complementary theoretical perspectives on the creation and reproduction of value and the socioeconomic dynamics that influence firm behaviour, as well as acquisitions, in specific market contexts, and the role of incumbents in resisting and advancing technological change.

2.2 The price, profit, and value of innovation

In a purely economic sense, acquisitions are set to be determined by the expectation of future profit to be extracted from new innovative rent extraction configurations. However, when it comes to clean innovations there has been an overfocus on the high price of the technologies instead of mining the advantages they provide (Christophers, 2022). The blame on price used to justify the lack of synergies created from new technologies also obscures the cases in which profit as an end goal was really pursued.

Climate change has set the financial market spinning towards a boom of green labels and the need to tick environmental performance in corporate earning calls (Clark and Dixon, forthcoming). The appetite for green has as well created other sources of value out of environmentally labelled financial products. What is

apparent is how out of tangible assets —i.e., acquisitions— corporations and mostly incumbents are creating and obtaining what is intangible to the market (Pistor, 2020). In other words, clean acquisitions contain another source of value incumbents' extract.

Financial infrastructures, and the networks they coproduce, have been an underlying source of power across history and geographies (Haberly & Wójcik, 2022). Multinational companies like oil firms have an incredible geographical spread but rely on concentrated sources of funding and therefore on their reputation. Particularly if they cannot provide another useful role aside from oil, the divestment commitments have actually already dented the sources of funding oil majors get (Cojoianu et al., 2021). The problem is, in the process by which major players become part of 'the solution' to climate change and of low-carbon transitions as the investors of the technologies of the future, large firms are also creating an innovation grab by acquiring innovation businesses and doing little with them.

Major oil companies' acquisitions in renewable energies and alternatives to oil are a key feature of climate change multilateral discussion because oil majors are relevant climate actors (Clapp & Meckling, 2013; J. F. Green et al., 2020). Oil majors' had early knowledge of their business climate impact (Franta, 2018), and therefore of their capacity to develop cleaner technologies (Christophers, 2022). However, the most common story observed is that oil majors have displayed over the years a repeated decision to continue their core business unchanged (Frumhoff et al., 2015). Oil majors have used and still use their investments in renewables to advertise their commitment to both climate change and to advancing renewable energies, there is a need for research to understand oil majors' behaviour. Defining how innovation retention happens helps uncover patterns of incumbents' behaviour in their climate change actions to identify real efforts for their retention.

The point of tension between incumbents and new technologies with regards to their acquisitions as a fast route to include innovations has been overlooked

despite it being widely used by incumbents. In fact, many non-academic reports take acquisitions as the building blocks leading to the possibility of incumbents transitioning to low carbon/clean technologies.⁴ While scholars have found that, in many cases, incumbents engage in clean acquisitions as part of the same process that intends to buffer change, we know little on the conditions that explain when profit is achieved, as well as the incumbents own agency in the construction of the profitability of clean technologies (Christophers, 2022). Incumbents' resistance to change is often disguised in the incumbents' extended practice of acquiring the new technologies associated to the demands of institutional change that puts at ease shareholders and policymakers, despite their low success in retaining acquisitions; let alone fully developing them. Most research and theory in acquisitions consider acquisitions that belong to the same business area than the acquiror organisation, leaving aside the acquisitions that challenge the incumbent's main technology. This research seeks to address this later type of acquisitions by asking in which conditions clean investments are retained. Answering this question will serve in turn to identify those investments that perhaps serve other purposes, mostly regarding external pressures such as shareholders and environmental groups that work to counteract resistance to change.

2.3 Innovation studies within system transitions

A phenomenon widely observed in the context of climate change and system transitions is the resistance to change of incumbents in an industry. Studies in organisations have long demonstrated that incumbents in an economy tend to protect their established practices, routines, and the systems created around them from disruptive change. Since incumbents are not the main innovators in an economy, they usually rely on their capacity to capture and acquire technological innovations from their environment (Ahuja & Katila, 2001; Lee & Kim, 2016; Makri et al., 2009). What provides the established industry with most value is in fact the

⁴ For example, Bloomberg Transition Scores (Rooze et al., 2020) sets three stages for business model adaptation of which acquisitions are a key component to achieve 'Scalable transition strategies'.⁴ IRENA's report on oil companies and the energy transition uses the companies' investment in renewable energy and electricity as one of the main measures to understand companies' change, along renewable energy targets (Asmelash & Gorini, 2021).

continuity of their practices and the similarity between incumbents in an industry or field, for which they recur to normative, coercive, and mimetic resources to prevent change (Dimaggio and Powell, 1983; Greenwood & Suddaby, 2006).

Aside from the general resistance to change towards sustainable technologies (Ferns et al., 2019; Wright & Nyberg, 2017), research has yet to address the decisions of incumbents to retain sustainable acquisitions, characterised by confrontation processes in the interests between incumbents' main business trajectory and those of the new technologies acquired (S. Ansari & Krop, 2012; S. S. Ansari et al., 2016; Furr & Eggers, 2021). This is a process that has been observed in other instances such as the organisation's legitimisation of one technology over another (Patala et al., 2019).

Incumbents deal in different ways with institutional pressures to change. For example, they use legitimisation mechanisms such as 'clean' rhetoric appropriation (Patala et al., 2019). As well, they use their resources to impose framing contests in 'clean' technologies that will obstruct innovation and social movements (Guérard et al., 2013). As well, organisations have been found to portray the hegemonisation of both the new and old, by claiming to have included change in order to evade stakeholder critique (Ferns & Amaeshi, 2019).

Incumbent behaviour in the context of climate change has been studied regarding the strategies of companies (S. Ansari et al., 2013; Levy & Kolk, 2002; Pinkse & Kolk, 2012), their use of time (Slawinski et al., 2017; Slawinski & Bansal, 2012, 2015), and their interaction and interference with policies, reputation, and inertia (Ferns et al., 2019; Ferns & Amaeshi, 2019; Wright & Nyberg, 2017). Across this literature, resistance to change, external and internal, has been the currency of organisational responses to climate change.

To summarise, this research builds on the acquisition literature to add insights from the study of value creation and of system transitions. From this literature it

has been covered that what explains the fate of acquisitions within organisations is the organisations' effort provided.

3. The components of organisational effort for innovation

This paper discussed what conditions at an organisational level correspond to innovation retention. This will help define when retention happens, when it does not happen, and when there is change from retention to no retention or vice versa. The resulting observations will provide evidence of the factors contributing to incumbents retaining their innovations and to inform the features of their behaviour, as well as, at a later stage, their relation to the system.

Retention of innovations is proposed to be observed as a result sustained organisational effort. Lack of organisational effort after the initial acquisition of a clean technology is translated as an innovation retention failure. The measurement of organisational effort requires the operationalisation of two types of actions observed in time: restructuring, on the one hand, and a combination of acquisitions or development of projects, on the other. Therefore, this research proposes to define organisational effort as a function of observing both the restructuring of the unit receiving the innovation acquired and simultaneously one or two conditions, sustaining acquisitions or development of new assets of the same clean technology. Using sets notation, this definition can be expressed as:

Innovation retention is a function of sustained organisational effort, in which,
organisational effort requires both restructuring and (sustaining acquisitions or
development of assets)

Noted as follows:

$$\text{Innovation retention} = f(\text{org. effort})$$

$$\text{Org. effort} = \text{Restr.} \cap (\text{Acq.} \cup \text{Dev.})$$

3.1 Definitions

Organisational effort is the main condition that needs to be observed in an innovation retained within an organisation. Furr and Eggers (2021, 294) describe this as the continuous process of further developing the innovation and of providing further maintenance, such as ‘decisions on the continuance of an innovation and/or the innovators who created in the first place’.

Restructuring is a causal condition observed as the fit in the organisational structure provided by the incumbent. This is observed as whereas the clean technology is included (or not) in the business segments of the organisation. However, this is not a binary condition. Equally relevant is how is the technology included in a business segment. The questions that inform the characteristics of this condition are: Is it part of the main oil business or as a separate business? Is it listed under CSR actions or under a new market segment? Is it competing with other non-clean technologies or given independence in the segment? The literature has also referred to this dimension as “organisational fit” (Barkema & Schijven, 2008).

Sustaining acquisitions and *Development of assets* are also causal conditions observed as a component of the strategic alignment provided by the incumbent. Sustaining acquisitions are observed as the sequential presence of acquisitions following the initial or main acquisition of the clean technology with the purpose of sustaining the innovation in terms of resources, business chain integration, R&D, and capacity. This condition also looks at the level of dispersion and concentration of the sustaining investments. Concentration rather than dispersion, geographically or by business/purpose type, would better define a sustaining acquisition. Development of assets are observed as the new assets that are developed by the incumbent and its former acquisitions, in opposition to new production capacity being acquired. The development of assets is observed as the change in total assets and production capacity change in the clean technology, to determine growth or contraction.

3.2 Operationalisation of organisational effort

The fundamental research challenge is to operationalise organisational effort which is a continuous sequence of activities. If organisational effort diminishes or disappears, for instance, by abandoning a technology or when it is not given attention or independence in the business segments, then innovation retention does not occur from a research perspective.

For research purposes it is necessary to recognise the usefulness of a single indicator that describes the company's relation to a technology across time, but also its limitations and the importance to complement this with historical analysis. When summarizing the organization history into single index, as in this research, it is not possible to separate the outcome —innovation retention— from the immediate cause –organisational effort. Thus, this paper does not propose an independent measurement for both. Instead, the measurement organisational effort is stylised. In this way, innovation retention can be readily used to compare cases, but also to test potential explanatory causes for variance, for instance, from different ranges of state-owned shareholding.

The drawback of a single index requires historical case analyses to present nuance on how organisational effort changes over time. Organisations might reverse strategic choices, that merit their own more immediate explanations. By combining both approaches, first through the synthesis of organisational history in an index, and then a historical analysis, we can leverage the advantages of both comparative analysis and historical analyses. In the following paragraphs we explain the rational and operationalisation of the dimensions of organisational effort in the measurement of organisations providing an organisational restructuring and sustaining acquisitions.

First, organisational restructuring has been identified as the most relevant aspect of organisational effort regarding the development of acquisitions and therefore innovations. Research has found that only in cases where a restructuration process

happens after the acquisition, the acquired organisation can provide synergies, or more tangibly, create value within the acquiror (Barkema & Schijven, 2008). The Index for organisation restructuring was coded based on the units where the acquisitions are located according to Table 1 in a range between 0 and 1. This variable is not measured by the number of moments of restructuring as this would not provide a clear indication of the effort to provide an organisational fit to the innovation. Instead, organisational restructuring is measured by the qualitative observation of the relevance and space provided to the innovation across time. In the index the highest and most recent restructuring is the one scored. However, the observation of all the restructuring moments in the timeline served to build the index.

Table1. Organisational restructuring index

Score	Level	Description
0	null	No independent category, listed under other activities
0.2	very low	Shares with gas, and/or listed under other activities or marketing
0.4	low	Alternative energy/ solar division, but under other non-return activities
0.6	medium	Renewable Energy division, solar division, Listed under core activities
0.8	high	Own space into the company, own division, under return activities
1	very high	One of the main streams or the core stream of the company

Second, sustaining acquisitions is a condition usually understood as in the context of the company's strategy, as how different the acquisition and the acquirer are, or how complementary is their vision. While usually an alignment in the strategy is thought to be provided simultaneously by both parts (Harrison et al., 1991; Pennings et al., 1994; Zaheer et al., 2013), this research places the agency in the acquiring organisation as the one needing to provide a sustaining vision for the technology within their organisation. Ideally, this dimension would need to be multidimensional, as it entails the vision of the organisation been compatible with the technology acquired as well as its vision for the future. Instead of an analysis of the changes and provisions of this alignment, this research has focused on observable facets of behaviour, that is the results of the sustaining of strategic effort. This paper measured the level of sustaining acquisitions provided by the acquiror after their first entry into the technology. This is perhaps particular or

outmost relevant for the cases of study that rely heavily in acquisitions. However, this paper has left out, for now, the analysis of the assets developed internally. In a score of 0 to 1, the number of sustaining acquisitions as provided by the acquiror organisation have been proposed as an index in Table 2.

Table 2. Sustaining acquisitions index

Score	Level	Description
0	null	2 or less acquisitions
0.2	very low	at least 2
0.4	low	more than 4
0.6	medium	more than 9
0.8	high	more than 15
1	very high	20 or more

Third, organisational effort is the combination of the sustaining acquisitions and the organisational restructuring as provided by the organisation. In a measure scale this is simply the mean between the score of sustaining acquisitions and of restructuring over the period of study. Therefore, is measured in a scale from 0 to 1.

Finally, the retention score is measure in terms of a sustained organisational effort, but it requires a high level of it. For this the score 0 to 1 of organisational effort is transformed in a scale of -5, as zero effort and null retention, to 5 as the maximum effort and complete innovation retention.

4. Research strategy

This research focuses on events in organisations' history that are comparable across cases. To use the proposed definition of organisational effort and innovation retention, this research uses a qualitative longitudinal analysis based in a small n sample, with the aim to study causal relations in cases considered to be representative of a general phenomenon (Seawright and Gerring 2008). The comparisons to identify differences among cases will be made both by company and technology, and within the same companies in different periods.

4.1 Case selection

The sample of companies was selected in cases where the outcome of interest, even if absent, had a real possibility of occurring (Mahoney and Goertz 2004). For this, we selected companies within the same industry in function of their size and by ensuring the companies in the sample met two conditions of theoretical relevance: to all share a similar institutional environment that has favoured the development of clean technologies and to all have made their way into clean technologies through acquisitions. To meet these conditions, first, we selected companies in the oil industry because this industry is under increasing climate pressure, has invested for a long time in clean technologies, has a large capacity to innovate, and their investments receive great media attention and coverage. The last point was relevant to be able to trace acquisitions over time.

Second, within large oil and gas companies, also known as oil majors, the research covers those headquartered in Europe to study differences in their approach on towards clean acquisitions. The reason of choice of this industry is that oil majors have been central to studies on climate change and corporate responses. A classic comparison has been to study strategies to climate change in US and European companies, finding European companies as more prone to an 'environmental culture environment' and to advancing their environmental strategies for precaution (Ans Kolk & Pinkse, 2005; Skjaereth & Skodvin, 2012). Similarly, studies have found that US oil majors use more lobbying resources compared to their European peers, aside from lagging behind in their climate strategies (J. F. Green et al., 2020). What studies in oil majors have lacked is a way to compare in a substantial manner company types against their climate actions. This lack comes from overlooking the differences present between European oil majors. In fact, European oil majors, as European countries, hold a distinct history and trajectory of their own (G.L Clark & Wójcik, 2007; Whittington & Mayer, 2002).

In their historical names the seven companies studied are: Royal Dutch Shell, BP, Statoil, ENI, Total, Repsol, and DONG. These companies are current the biggest

European oil producers or were in recent past, except for the case of DONG. This later case is included as an example of an extreme case to be used as a reference point, where the retained innovation, i.e., offshore wind, was fully developed to become the main business of the company. The period covered extends from the first investment in renewables recorded in 1985 to 2019. The period covers to 2019 because after 2019 the landscape is different due to the global pandemic; a crisis we cannot say has finished to observe full behaviour cycles.

Controlling for a similar institutional environment that has high pressure on climate change was relevant to observe how similar companies retain clean technologies under similar conditions, and thus to be able to observe differences at the organisational level. The distinction on institutional environment is relevant in this sector in which European companies are set apart by having higher (although still insufficient) ambition than the rest in terms of climate strategies (A Kolk & Pinkse, 2004). Furthermore, in terms of our choice of clean technology, European oil majors account for 70% of the current renewable capacity between worldwide major oil companies (CDP, 2018). Additionally, acquisitions in renewable energy are set to increase in the next years in Europe (Rack & Dholakia, 2021).

Our sample companies as of 2019 had on average 60,966 employees, 26.9 billion dollars in sales, and 35.3 billion dollars of market value. The largest companies by number of employees are Total SA, Shell, and BP, and are the three companies that are publicly traded (see Table 1). And to present they all have pledged to achieve Net zero emissions to 2050, except for DONG, now Ørsted, that has pledged Net zero to 2025. Per year, they undertook in average 8.5 acquisitions in renewables and electricity systems, out of a total of 67 acquisitions. Within the 30-year period of analysis, this sample of companies engaged collectively in 211 acquisitions in renewables and electricity systems, out of a total of 2334 completed transactions.

Table 1. Description of cases

Oil majors in Europe	Type	Size by number of employees (2020)	1st renewable energy acquisition	Name change and year
BP	Public	70,100	1981	Beyond Petroleum, 2000; BP, 2008
Total SA	Public	105,480	1988	TotalEnergies, 2021
R D Shell	Public	87,000	2002	Shell and creation of Shell Energy brand, 2021
Eni	Listed; 30% State owned	31,495	2008	N/A
Repsol	Public, Limited	24,506	2007	N/A
Statoil	Listed; 67% State owned	20,200	2001	Equinor, 2018
DONG	Listed; 50.1% State owned	6,429	2006	Ørsted, 2017

4.2 Data collection

We collected data on acquisitions for the period 1985-2019, the associated press release to each renewable acquisition deal, and annual reports of all the companies in our sample. (See Appendix I for a description of the full coding process).

The main data source for the guiding timeline comes from merger and acquisitions records, referred in this article as acquisitions, that were retrieved from the Revinitiv database, formerly called Thomson Reuters Eikon. The 3,540 retrieved records for the seven companies included the historical names of the companies and their historical mergers from the year they each started publicly trading (see Table 2 for detail per company). This initial data required manual re-categorisation of the 3,214 deals listed as completed into new categories. Re-categorising each deal required additional information. Based on publicly available news reports and press releases each deal was categorised according to their explicit technology of the target business, the type of transaction, and the industry sector of the technology. This resulted in a database containing the companies' acquisitions in oil and gas business as well as on clean technologies, i.e., renewable energies (such as solar, wind, hydroelectric and biomass) and electricity systems (such as batteries, grid and smart technologies and electric vehicles). The resulting

database contained 211 renewables deals to observe longitudinally the types of renewable technologies acquired or abandoned through acquisitions and sales.

Table 2. Description of acquisitions data per company

	Total deals	Year start (first publicly traded date)
BP	1108	1987
R D Shell	821	1986
Total SA	728	1985
Eni	382	1995
Repsol	187	1989
Statoil	178	2001
DONG	136	1999
Count	3,540	

Alongside the acquisition database, this paper used an additional database on annual reports to observe the organisation changes and strategy (see Table 3). This database consisted in a total of 182 annual reports and provided three main purposes. First, annual reports inform the changes in the reorganisation of the company. Some companies list even organigrams of the company per year which were useful for direct comparison, but in most cases, this was observed on description changes in the chief executives' composition and changes in the naming and grouping of business segments. Second, since annual reports are documents intended to report business outcomes to shareholders, they provided information on progress on the renewables business segments, renewable projects, plans and changes of strategy. Third, annual reports also serve to communicate the strategy of the company and the areas of priority, including their investment and development of clean technologies.

Table 3. Description of main data sources

	Annual reports		Acquisitions	
	Number of documents	Period	Number of total deals	Period
BP	30	1985-2019	1,108	1987-2019
Eni	22	1997-2019	382	1995-2019
Repsol	15	2005-2019	187	1989-2019
R D Shell	25	1997-2019	821	1986-2019

Total SA	23	1998-2019	728	1985-2019
Statoil	34	1984-2019	178	2001-2019
DONG	15	2005-2019	136	1999-2019
Sum	164		3,540	

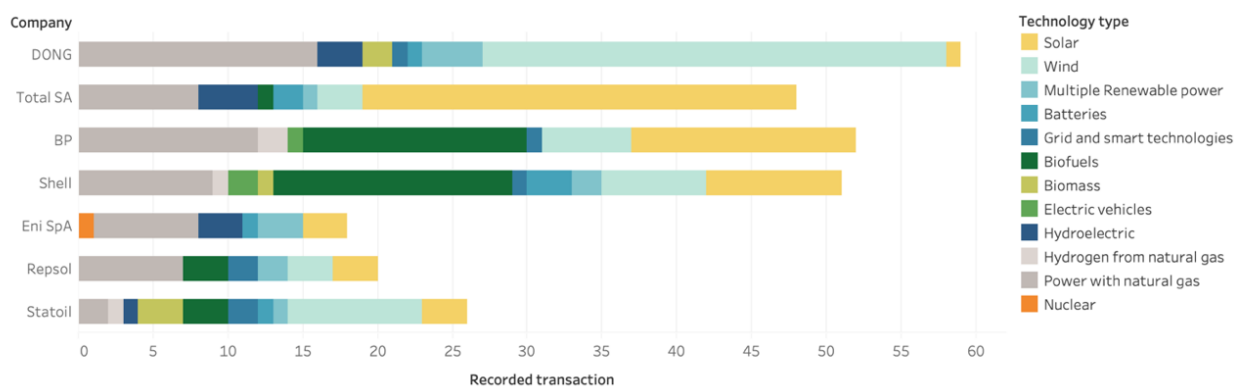
Finally, this paper describes in detail two historical cases. Reconstructing historical events required using both the acquisition database and the annual reports, as well as complementing with historical press releases and news reports from the country jurisdictions of the companies and global sources. The acquisition database served to indicate the activity on the technology in the timeline of study. Annual reports allowed to observe the stated strategy by the companies as well as the organisations structural changes. However, the historical news and press releases provided a major indicator of the intentions or direction change in the companies, essential for constructing their technology innovation timelines.

5. Results

5.1 Measurements of organisational effort and innovation retention

The acquisitions in renewable energy of oil majors were focused amongst three types of technologies: solar energy, wind energy, and biofuels. The coding of the M&A deals also showed that companies had invested in other technologies, like blue and green hydrogen, hydroelectricity, batteries, electric vehicles, biomass fuel, grid technologies, between the most relevant, see Figure 1.

Figure 1. Renewables and Power technology acquisitions



Sum of Recorded transaction for each Technology type broken down by Company. Colour shows details about Technology type. The view is filtered on Technology type, which keeps 12 (low-carbon only) out of 24 coded technologies.

In the case of hydroelectric, the acquisitions registered corresponded to early deals in the timeline and as part of state planning, when the companies had more control from the state, such as DONG, Total SA, Eni SpA, and Statoil. The deals classified as under batteries and grid and smart technologies are considered as supporting technologies to one of the main renewables pursued by the companies. Biomass, which also includes forestry, is also some of the early deals, not considered in the following measurement because it quickly lost relevance in the timeline, but it can be considered as zero retention. Finally, electric vehicles are also shown so far as isolated cases of acquisitions with no place within the organisation structure, so they could be considered to have zero retention so far. However, compared to the other more established forms is an innovation that might be still in development, therefore not apt to measure in terms of retention yet.

Given the type of data, the research selected one to two of the main renewable technologies observed in oil majors' overall acquisitions, in relation to each case. This inclined the study towards cases where retention was to be expected were observed, leaving out for example smaller investments, for example Shell's wind business, BP's wind business, businesses on electric vehicles, Eni wind, Repsol solar, and Statoil solar. Only DONG solar business was chosen to be represented as a counter example of the extreme case.

The following table summarises the patterns of retention of each company by technology based on the systematic review of the data. Out of a total of 17 observations, combining per technology and company, this research found three cases of innovation retention, upon the retention index: Total with solar (1988-2019), Statoil with wind (2007-2019), and DONG with wind (2009-2019). Under the stated research definition of innovation retention, the paper does not find a company with retention of two clean innovations in the same period (see Table 4).

Table 4. Description of retention scores in organisational effort

Case and technology	Period of activity	Restructuring score	RE unit name	Sustaining acquisitions score	Transactions over period	Org. effort score	Retention index	Is retention observed?	Difference between dimensions
		(1; 0.8; 0.6;0.4;0.2;0)		(1; 0.8; 0.6;0.4;0.2;0)		(0 to 1)	(-5 to 5)		(A – B)
		A		B		$C=(A+B)/2$	$C=5A+5B-5$	Is C > 50?	(A – B)
BP, solar	1990-2019	0.4	<i>Gas, Power and RE</i>	0.4	17	0.4	-1	No	0
BP, biofuels	2006-2019	0.2	<i>Petrochemical</i>	0.6	14	0.4	-1	No	-0.4
Total, solar	1988-2019	0.4	<i>RE and power, Gas and Power</i>	0.8	31	0.6	1	Yes	-0.2
Total, wind	2016-2019	0.2	<i>RE and power, Gas and Power</i>	0.2	2	0.2	-3	No	0
Shell, solar	2002-2019	0.2	<i>New Energies, integrated gas</i>	0.4	11	0.3	-2	No	-0.2
Shell, biofuels	1995-2019	0.4	<i>Chemical, other industries</i>	0.4	20	0.4	-1	No	0
Statoil, biofuels	2003-2009	0		0.4	6	0.2	-3	No	-0.4
Statoil, wind	2007-2019	0.8	<i>Renewable Energies</i>	0.6	13	0.7	2	Yes	0.2
Eni, solar	2000-2004	0	<i>Energy solutions, CSR</i>	0.2	5	0.1	-4	No	-0.2
Repsol, wind	2010-2019	0.2	<i>Gas and Power</i>	0.2	5	0.2	-3	No	0
DONG, wind	2009-2019	1	<i>Wind power</i>	1	34	1	5	Yes	0
DONG, solar	2019	0	<i>Wind power</i>	0	1	0	-5	No	0

When looking at the restructuring score and the sustaining acquisitions score, the difference between dimensions is lower than expected, pointing towards the complementarity of both dimensions in the way they sustain innovations. However, there were more cases presenting sustaining acquisitions even when the organisation restructuring was low, for example Statoil's biofuels and BP's biofuels for the most prominent. However, to the case of biofuels in oil and gas companies, this technology has been developed to be a minor complementary part of their fuel refinery business. Observing other technologies like solar in Shell and Eni, and wind in Total, we observe that historically the organisational effort in terms of restructuring has been weak compared to their frequency of investments on the technology. As well as there are cases in which both parts of organisational effort are missing, like in the cases of Total wind, Eni solar, Repsol wind and DONG solar. [see Table 4]

Figure 2. Measure of organisational effort

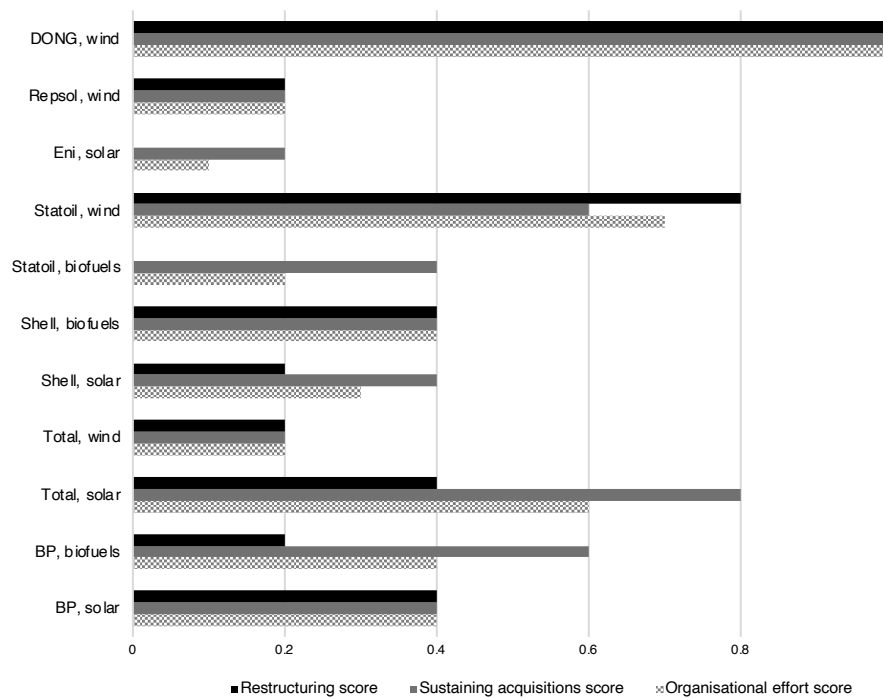
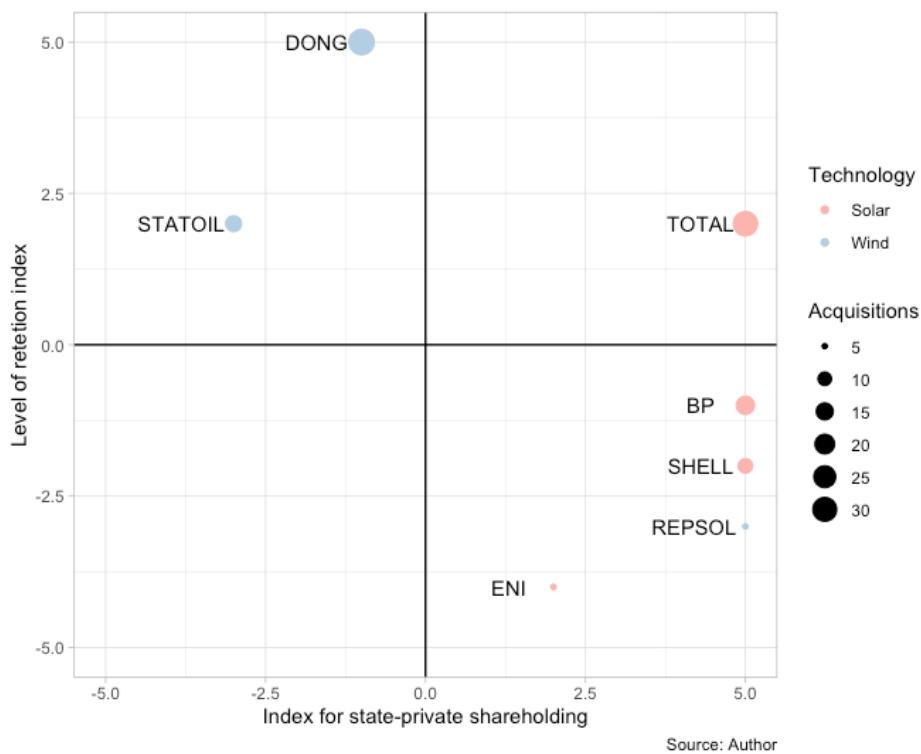


Figure 2 shows detail on the difference between the restructuring and the sustaining acquisitions scores in the companies, as well as the representation of organisational effort as the result of both dimensions. DONG as the extreme case of a company that fully transitioned into offshore wind was expected to score high in organisational fit, however, the fact that this innovation retention also relied on sustaining acquisitions is revealing to how incumbents innovate. Second, Statoil wind and Total solar are the highest scoring in organisational effort with a score of 0.7 and 0.6 respectively. Therefore, show a retention of their innovations with a score of 1 for Total and 2 for Statoil out of a retention index of 5.

To compare this index to features of the companies, this study chose to see differences across their ownership regarding the level of retention index. Figure 3 shows a comparison between the innovation retention scores of companies highest scored technologies, out of Table 4, and compares against an index of the amount of private shareholding from -5 as fully state owned to 5 as fully private shareholder owned, according to our cases description in the previous section (Table 1).

Figure 3. Level of innovation retention and state shareholding for one selected technology



X=state/shareholder. Y=no retention/retention

Figure 3 shows that the two companies with more state ownership have higher innovation retention. The exception is ENI, but in comparison to the companies in the sample, ENI has shown little interest in renewable energies altogether, their acquisition level is low, so it is its organisational effort. Interesting in the sample is the difference between Statoil, Total, BP, and Shell, that have high levels of acquisitions in renewables, but have marked differences in their innovation retention. For instance, BP despite its long involvement in solar and its historical share of the market global has put not enough organisational effort to retain and develop solar technologies. In general, it seems, fully private shareholder owned companies that show interest for renewable energy technologies, tend to display a great capacity to acquire these businesses but show little scores in organisational effort, particularly in terms of organisational fit. The slight exception seems to be Total toward its solar business.

To complement this analysis, BP's solar business development as well as Total's solar business development will be detailed, the first to show a case of an innovation retention that lost all its organisational effort, the other to show how the company kept through weak periods of interest a fit for this technology.

5.2 Case study 1: BP's solar business low organisational effort

BP's solar business case is exemplary to understand the relation between the two dimensions of organisational effort in the development and retention of innovations. Between oil majors, BP has been the most vocal in terms of transitioning to alternative energies, to the extent of undergoing a famous major rebranding in 2001 as Beyond Petroleum. BP Solar unit became then marketing for the company in climate change, especially after its then CEO John Brown decided to be the first movers to publicly agree to the anthropogenic nature of climate change. BP was the first company to create an Alternative Energy division in 2005 to oversee multiple renewable energy businesses, concentrating on solar and biofuels. In 2009, shortly after a change in CEO they announced they were closing this division, however, they claimed to continue their interest and support for developing renewable energies. In 2020 after a change of CEO, BP claims again to be the company most ambitious in their investment plan for renewables.

The solar business at BP corresponded to an initial medium organisation effort. But now BP solar business is considered a retention failure that shows how initial efforts of development of the business are undermined. BP was the earliest oil major to invest in solar energy technologies. Their first acquisition in solar was in 1980 when they acquired half of Lucas Technologies, an UK electronics company that was aiming to develop solar panel manufacturing ("BP and Lucas Form Solar Company," 1981). The solar company was later renamed BP Solar when BP fully acquired the business in 1985. BP solar business was creating profitable income with 'unbroken growth turnover' from 1995 to 1999 for the company for the first time since the first acquisition and was reported to be growing at a rate of 20-30% a year and its first profit reported in 2003. In 1996, BP solar was the third largest solar business worldwide, and in 1998 became the world largest shortly after

merging with Amoco solar business with Enron. This same year solar is described in as much importance as the petrochemicals business, despite the later having larger returns. The growth, profit, and explicit mention of the relevance is what we define as a moment of innovation retention.

Looking at organisational restructuring along BP solar timeline, we find three main moments inside the company. The first restructuring moment is when BP solar was moved from BP Ventures to 'Other business and corporate' in 1992-95, in a business segment shared along BP Finance, flaring systems, and coal and mineral assets, and under the chief executive responsible for BP Chemicals. Although the restructuring did not give the solar business complete independence, the solar business started to report progress year by year, similarly than the petrochemical business at BP which was also under the same division at the start of its scaling up. This period also had BP solar main business based in Sunbury, UK.

The second restructuring moment is when BP solar was moved into the new business segment 'Renewables and alternative fuels activities' in 1999 also under 'Other business and corporate', that named the solar business as one of other renewables explored by the company. More importantly with this change, BP stops mentioning solar independently. It is also in this period that BP solar moves from its base in Sunbury to Madrid, Spain.

The third restructuring moment is in 2002 when all renewables were reorganised under a new business segment 'Gas and Power', renamed 'Gas, Power and Renewables', which made the strategy in renewables be paired with the gas business in the production of 'similar' 'clean' electricity. Shortly after, in 2004, BP sold the R&D segment of BP Solar, that once developed the most advanced solar cells in the world, to the UK's National Renewable Energy Centre. In terms of independence, we observe then, the first restructuring moment as improving the previous conditions, the second as introducing organisation dispersion as solar was no longer intended to be the main renewable nor clean technology, and the third as weakening solar until its complete disposal in 2009.

On the strategy of sustaining acquisitions, two strategic periods were identified. The first period is of consolidation. BP Solar formed in 1990 a joint venture with Tata solar in India which started production of solar panels in 1991, becoming the major solar panel company in the country. To meet their demand in 1996 they added production facilities in Spain to double the manufacturing high efficiency silicon cells with the aim to double it again in 1997. In 1996 Tata BP solar is reported to be having success in India, so the company decided to add a manufacturing line for solar cells. The same year the company acquired production facilities in California to enable commercialisation in the USA solar established market. In 1996, BP solar is under the managing director for BP Chemicals, as before, but now includes as well 'Asia-Pacific region and the Indian subcontinent'. In 1998, BP and Amoco merged in a super major oil company with the purpose of achieving a global reach and combined Amoco's also strong solar business, second in size in the world, in a joint venture with Enron. After this, BP solar only had one more acquisition before the disposal of its solar business. In 2001, BP acquired Agere Systems in Spain, Tres Cantos, to join BP Solar cell manufacturing as part of its already dispersed solar business.

In 1998, BP Solar sales reached \$95 million, with a production growth of 18%, and the completion of a new facility in Spain, which we observe as strong indication of development of assets being present in the strategy for this technology. In 1999, BP Amoco annual report lists they have 'a growing activity in gas and power and in solar power generation'. With the BP Amoco merge, and BP Amoco purchase of Enron's holdings in Solarex for 45 million, the company now had 20% share of the global market and is the largest manufacturer of photovoltaic modules and systems in the world, becoming the world's largest solar company. BP Amoco announced a two-year programme to install solar panels in 200 new service stations in 11 countries, (along a 1.5 billion natural gas project in Vietnam). Also in 1999, BP's CEO Sir John Browne received an award for individual environmental leadership from the UNEP and Earth Day New York. On page 10 of the annual report reads "The world's need for energy is growing steadily day by day. BP Amoco's aim is to

play a leading role in meeting this need from oil, natural gas, solar power and petrochemicals without damaging the natural environment. Our success depends on making, and being seen to make, a distinctive contribution to every activity in which we are involved.” Until this point solar is worded as strategical for BP, and more importantly, not as competing with oil, gas nor petrochemicals. A year later, the annual report instead sets the following defence maintained to date: ‘there are no viable substitutes for hydrocarbons’.

Shortly after this moment, and despite ‘solar’ as a renewable energy being increasingly mentioned in BP’s annual reports, the solar business was no longer what we define a retained innovation. And the last proof is that the business was completely disposed from 2009 to 2011. The company argued that the reason of the disposal was the ‘increasingly commodification of the solar market’ as well as the reduction of subsidies for solar in Spain. And whereas it is true that the technology for solar moved fast shortly after, and that the production rose with China entering the market in 2005, this research argues that this was not the main reason for failure of the retention for solar. Instead, the retention was lost because of the change in the organisational restructuring and the strategy provided by the incumbent, observable from the year 2000. This is the year when we also observe that solar was started to be mentioned as a type of ‘climate change action’ for the first time by BP, and in which the company had strong interests to compete growing instead its gas business.

5.3 Case study 2: Total’s solar sporadic organisational effort

Total’s involvement in solar technologies is a case unexpected of technology retention. This is the oil major that has acquired by far the most solar businesses compared to its peers. Its historical involvement has been used less as a global marketing area compared to Shell and BP, however its involvement was well known nationally. Total involvement in solar technologies is similar in the extent its period as BP, spanning over three decades, however its different in the sense that it did not undergo a big exit like BP or Shell in the technology. Instead, Total lowered its organisational effort when the interest in solar waned in France but

picked it up when this returned. In Total case, acquisitions went through three periods. The first of exploration and early consolidation. The second of dormancy. And the third of strategy and expansion. The periods of consolidation and expansion were met with sustaining acquisitions accompanied by internal developments. The period of dormancy had an absence of acquisitions but also no presence of sales. Over this period an organisational restructuring was observed, however, Solar energy, for most of this period was not a core business to Total, meaning that these businesses are still under Power and Natural Gas and not given more relevance in their organisational structure. Except for a short period from 2015-2016 this unit was restructured to be part of Marketing and Services, which is telling on that renewable energy marketing value to the company. As a hint to its past, in 2021, Total fully rebranded to a new name TotalEnergies, same as the old name of the subsidiary overseeing its solar business at its start. However, even after their pledge to become an energy company, its solar business and other renewable business have had mostly strategic support and not more space in the organisation. This case exemplifies how they retained the innovation, and it describes the turn to their expansion's strategy through international acquisitions.

Like BP, Total acquisitions in solar had an early start, with the first acquisition recorded in 1988. Total first steps into solar were accompanying the French government interest in solar energy. Total journey into solar started as an ally to EDF (the French multinational electricity utility, at the time fully state owned) in 1982 in projects in Africa. Total was a natural and regular partner to EDF in its projects in gas production and exploration in regions of Africa like Algeria and seemed to have a long history of working together.

In 1983, Total starts Total Energie combining two of its business Total Energie Development and Total Afrique, and makes it a subsidiary company to oversee the design, commercialisation, and installation of solar PV systems and solar-powered

water pumps to isolated African regions.⁵ In 1988, Total acquires Solems, back then one of the largest solar PV manufacturers in France (Claverie & Chabot, 1989). Solems was created in 1982 as a spin-off from the École Polytechnique in Palaseau, France. Total was brought into solar as part of the national plan to expand solar appliances globally and to facilitate mergers that would allow increasing competition (Claverie & Chabot, 1989).

In terms of organisational restructuring, in 1998, Total has its solar business under one of its core areas, upstream. Then, Total's annual report lists three business sectors as organized into profit centres: Upstream, Downstream, Chemicals. Upstream brings together, alongside TOTAL Exploration Production (TEP), the Middle East, TOTAL Gas-Electricity as well as Other Energies activities. However, newspaper sources see this company shifting its focus away from solar from 1996 to 2005, as Total exited core parts of its electricity business.⁶ Compared to BP, both companies provide a different type of organisational restructuring but with a similar score below 0.5. BP provided more independence and visibility, Total instead provided effort under its core activities.

In 2001, Total also moves to solar panel manufacturing and for which it starts Photovoltech, which is a strategic sustenance provided by important inner developments. The new page of Total Energie was picked up again seeing the success of the solar energy market in Germany, and 15 years after losing its position as world number one solar PV producer.⁷ The same year, Total opens a new division called Gas and Power, under their Upstream business, which includes Liquefied Natural gas and Renewable Energies, so the organisational effort regarding an organisational fit remains unchanged.

⁵ 2002. Dix façades, dix messages: Total Energie Le processus de production révélé <https://www.lemoniteur.fr/article/dix-facades-dix-messages-total-energie-le-processus-de-production-revele.230584>

⁶ 2003 Total se retire du marché de détail de l'électricité. <https://www.lemoniteur.fr/article/total-se-retire-du-marche-de-detail-de-l-electricite.425224>

⁷ 2004. Total Energie va construire une usine de panneaux solaires à Toulouse <https://www.lemoniteur.fr/article/total-energie-va-construire-une-usine-de-panneaux-solaires-a-toulouse.394494>

In solar power, Total manufactures PV cells with Photovoltech, and manufactures and designs solar systems with Tenesol. In 2006 Photovoltech was planning to increase 4 times its level of production to reach 80 MWp/y. In 2007, signs another program with the South African department of energy to supply over 26000 rural households with solar power. In Mali, the company Koraye Korumba (owned by Total 30%) specialized in micro networks and photovoltaic kits.

In 2005, a year after the start of privatisation of EDF, Total and EDF shared each 50% of Total Energie. Total Energie was then renamed Tenesol. Their joint goal was, from the words of Tenesol's general director, Roland Barthez, 'to continue the development of the company', a company that was seen still as one of the world leaders in the design, manufacture, installation, and operation of PV solar systems (Total, *L'Energie Solaire*, 2006). Based in Lyon, one of the most important tasks of Tenesol was to lead the production and sale of solar systems, one of the main markets being rural electrification projects. Tenesol produced its solar panels in South Africa and Toulouse, France, reporting in 2005 'strong growth in consolidated sales' with €140 million in 2005 corresponding to 30 MWp of PV solar panels. At the time Tenesol was present in countries in Europe, Africa, the Middle East, and Latin America, covering both isolated and electrically connected sites. Tenesol, along Total and EDF participated in the decentralized rural electrification program of Morocco.⁸

In 2006, the then director of Total Renewable Energy, Gilles Cochevelou, said 'Total intends to support decidedly the development of Tenesol and Photovoltech and thus intensify its commitment to solar energy'.⁹

In 2008, Total solar power systems, through subsidiaries Tenesol and Photovoltech, are mentioned alongside. Although this interest follows that of the French government. Total's 2008 annual report reads:

⁸ Total S.A., *L'Energie Solaire*, 2006

<https://inis.iaea.org/collection/NCLCollectionStore/Public/38/074/38074252.pdf>

⁹ Ibid.

As part of the Group's contribution to the "Grenelle de l'environnement" program launched by the French government in 2008, TOTAL established a subsidiary, Total Énergie Solaire, to develop photovoltaic projects. Total Énergie Solaire's primary objectives are to carry out demonstration projects for educational purposes and to display different photovoltaic solutions at the Group's sites.

From 2006 it is possible to observe a change of strategy towards increasing their solar presence globally and compete in international financialised markets. This is the start of the expansion period in Total solar strategy and acquisitions. But this new drive does not seem to fully show until the years following 2008, when Total starts a series of acquisitions in key solar businesses in the US. Total buys its first US solar company. In 2008, Total buys 20% the start-up Konarka Technologies Inc (US) a manufacturer and developer of photovoltaic technology. In 2009 Total was also joining a research agreement with the Massachusetts Institute of Technology (MIT) to develop new stationary batteries as it also enters Solar power storage.

In 2010 Total gets its second US acquisition as it buys 25.4% the start-up AE Polysilicon Corp a manufacturer of polysilicon. Finally, in 2011 Total buys (reportedly at a high price) 60% of SunPower Corp, an established US manufacturer of solar cells. This transaction makes Total stand between the largest solar manufacturers and producers globally of solar energy systems and solar power projects.

The 2011 annual report explains that Total achieved with the acquisition of a 60% stake in SunPower its goal to integrate upstream/downstream solar PV. The 2011 annual report reads:

SunPower is an integrated player that designs, manufactures and supplies the highest-efficiency solar panels in the market. It is active throughout the solar chain, from cell production to the design and construction of turnkey large power plants. Upstream, SunPower manufactures all of its cells in Asia (Philippines, Malaysia). In 2011, SunPower operated twelve cell manufacturing lines at its plant in Melaka, Malaysia (SunPower, 50% joint venture), which has a capacity of 600 MWp/y. SunPower's overall cell production capacity at the beginning of 2012 was 1,300 MWp/y. Downstream, SunPower is present in most major geographic markets (United States, Europe, Australia and Asia), with operations ranging from residential roof tiles to large power plants.

Later that year, TOTAL became the sole shareholder of Tenesol acquiring its EDF partner's shares (excluding overseas activities). Tenesol owns solar panel manufacturing plants (South Africa, France), which TOTAL holds a 50% interest in

Photovoltech, a Belgian company specialized in manufacturing multicrystalline photovoltaic cells.

Total, unlike BP, has kept its key assets from 20 years ago and continued developing them, proving in a way a soft case of innovation retention. The strategic alignment provision is shown both as important asset developments as well as sustaining acquisitions. From 2012 to 2015, all the following acquisitions were on the Total/Sunpower arm acquiring businesses to support their solar activities, such as microinverters manufacturer, solar developers in the US, and a power components manufacturer in Philippines. From 2016 to 2018, Total and its solar subsidiaries are focused on developing assets as they also start selling finished solar projects, mostly in the US but also Chile. 2018 to 2020 marks again a period of sustaining acquisitions, where the company buys key complementary businesses to solar and electrification, for example buying in Belgium WinWatt, a solar energy and batteries company, and in the US, Solarworld Americas, between a few others.

6. Discussion and conclusions

This article has focused on providing a definition of innovation retention as a measurable aspect of company behaviour, and to present its operationalisation it used the case of European oil majors, including an extreme case in terms of full transition towards renewables. The study of oil majors has also shed light on how incumbents innovate in praxis, particularly incumbents with a large acquisition capacity.

The paper shows that acquisitions themselves are not sufficient for innovation. Instead, this article has proposed that the observation of organisation effort, both as the organisation restructuring and the sustaining of acquisitions provided by the company, are necessary conditions for innovation retention. This theoretical proposition contrasts to other developments in the study of the organisations' behaviour, that stress behaviour as a response to environmental changes, leaving

out organisations' own agency. Thus, this paper proposed that organisations not only learn but they also choose continuously how they engage with clean technologies and their level of organisational effort.

Further, this paper shows that oil majors despite their high claims as investors and developers of clean energy technologies, have provided very little effort into delivering conditions for the technology maturation. Isolated and random acquisitions as well as acquisitions to be directed by a Marketing Unit or under their natural gas activities show the uninterest for making these acquisitions mature, and much less for making them profitable. The problem it seems is that the value obtained by acquiring and holding these acquisitions is one that is public-facing instead of market-driven. However, these acquisitions have escaped any anti-trust and anti-competitive behaviour investigations. The new empirical database produced for this research shows the need to improve our collective tools to systematically assess dominant companies' behaviour towards industries that carry an environmental value to society and that disrupt the existing incumbent systems.

This paper proposes that defining innovation retention both as theoretical and empirical approach allows to explore new aspects of companies' behaviour. For instance, this research explored the relation between organisation's behaviour regarding innovation and companies' ownership, as one of the main defining features of companies' governance. This article finds that companies with more state shareholding, compared to fully private shareholding, seem more prone to providing organisational effort for innovation retention, particularly in terms of organisational restructuring. This might speak to the role of states in creating the directionality of society needs. However, we also show that shareholding is not the only possible cause of variation. In the detailed case study comparing Total's to BP's solar businesses trajectories, the paper finds Total has put more effort and stability in comparison. Even when Total is fully private shareholder owned, the company has remained close to the national policy decisions on renewable energy.

This might hint that state direction, even as legacy, matters in how incumbents innovate and their capacity to sustain innovation retention efforts across time.

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Appendix I - Coding of mergers and acquisitions data

Eikon has a detailed database for mergers and acquisition, from which it is possible to construct the recorder history of operation from each company. The database retrieved from Eikon include the following categories of information grouped according to the type of information.

- **Deal description:** *Deal Synopsis*
- **Deal date:** Effective Date
- **Operation participants:** Target Name; Target Ultimate Parent Name, Acquiror Name, Acquiror Ultimate Parent Name
- **Operation industry:** Target Macro Industry; Target Mid Industry; Target Ultimate Parent Mid Industry; Acquiror; Acquiror Mid Industry Macro Industry; Acquiror Ultimate Parent Mid Industry

Eikon does not record the industry to which the operation corresponds, but the industry of the acquiror and the target. Therefore, it was necessary to revise and code each operation based on the *Deal Synopsis* (Table 3). The alternative would have been to use the recorded industry of either the acquiror or the target, but this would result in a misrepresentation of deals.

Table 4. Example of coding made.

Year of operation	Eikon deal synopsis	Eikon Target Mid Industry	Author's coding
2018	US - Ares Management LP acquired wind energy business of BP America Inc, a Houston-based provider of support services for oil and gas operations, ultimately owned by BP PLC.	Oil & Gas	Wind energy
2014	US - Pattern Renewables LP, a unit of Riverston Holding LLC's subsidiary Pattern Energy Group LP, acquired the 150-MW Fowler Ridge 4 wind project of BP Wind Energy North America Inc, a unit of BP PLC.	Alternative Energy Sources	
2006	US - BP Alternative Energy, a unit of BP PLC, acquired Orion Energy LLC, a provider of wind energy services.	Power	

Following a Bloomberg New Energy Finance type of coding, with adjustments, the author coded all operations under the two main categories following categories (see Table 5 for a detailed description):

- **Core business:** Upstream, Midstream and Downstream Oil and Gas, Petrochemicals, Coal, Natural Gas
- **Non-core business:** All renewable power; Wind power; Solar power; Renewable fuels, Advanced renewable fuels; Storage technologies; electricity systems, offsetting, etc.

- N/A: restaurants, IT, paper, Others.

The following table presents a summary of the results of the coding, with details for the categories corresponding to non-core businesses. The summary further exemplifies the significance of the coding and provides a perspective on the relative frequency of operations on the different sector of low carbon business and the core business.

Table 4. BP mergers & acquisitions since 1998: summary of coding.

Number of operations	Eikon category	Author's coding
6	Alternative Energy Sources	Multiple Renewable power
	Other Financials	
	Power	
10	Alternative Energy Sources	Solar energy
	Power	
	Professional Services	
	Semiconductors	
5	Alternative Energy Sources	Wind energy
	Machinery	
	Oil & Gas	
	Power	
9	Agriculture & Livestock	Biofuels
	Biotechnology	
	Chemicals	
	Oil & Gas	
	Power	
10	Alternative Energy Sources	Hydroelectric
	Power	
	Professional Services	
1	Other Industrials	Auto parts
2	Chemicals	Biofuels
212	14 categories	Oil and Gas Upstream
68	9 categories	Fuel retail
72	23 categories	Other

Table 5. Coding categories for type of technology

Core	Disruption level	Energy type	Technology type	Description	Value chain
Core	Zero	O&G	<i>Oil and gas Upstream</i>	Oil and gas assets. Exploration and Production. equipment, materials, construction for oil fields	Energy production
			<i>Oil midstream</i>	Fuel, refineries, lubricants, LP gas, leases, pipelines, transport for oil	
			<i>Fuel retail</i>	Fuel stations	Integrated chain
			<i>Auto parts</i>	Auto parts, e.g., Tires; adhesives resins business, etc	
			<i>Plastics</i>	Ethylene, polyethylene, polyester, vinyl, caprolactam, nylon; includes Fertilizers	
	Low-Zero		<i>Natural gas midstream</i>	Natural gas only projects (LNG, Natural gas pipelines, storage) excl. exploration and production	Energy production
	Low-Middle	Fossil Hydrogen	<i>Hydrogen from natural gas</i>	Hydrogen production from fossil fuels, natural gas to hydrogen with capture and storage of CO2 (blue hydrogen)	
		Fossil Power	<i>Power with NG</i>	Utilities, incl. natural gas power plants, combined cycle plants	
	Zero			<i>Coal</i>	Coal mining, coal exploration, coal power, coal bed gas
	Low	Abatement technologies	<i>Pollution solutions and energy efficiency</i>	Air pollution solutions, methane detection technologies, energy efficiency services, waste solutions, waste recycling	Support technology
<i>Carbon capture</i>			Pilot and Technologies to capture CO2 emissions from fossil fuel projects		
Non-core	High	Renewable energy	<i>Solar</i>	Solar infrastructure, manufacture, PV cell technology, Solar parks, polysilicon, photovoltaic	Energy production
			<i>Wind</i>	Wind facilities, Turbine technology, magnetic technology	
			Hydroelectric	Hydro generation plants	
			<i>Biomass</i>	Wood pellets	
			<i>Multiple Renewable power</i>	Utilities with renewable energy	
			<i>Biofuels</i>	Ethanol, biodiesel, cellulosic ethanol, producing plants, distribution facilities, cell-fuel development	
			<i>Hydrogen from renewables</i>	Hydrogen produced using air and renewable electricity, Electrolysis method	
	Electricity systems	<i>Batteries</i>	Energy storage solutions	Support technology	
		<i>Grid and smart technologies</i>	Smart grid, software for renewable energy integration, transmission services, fibre optics		
		<i>Electric vehicles</i>	Electric vehicles	Integrated chain	
Power		<i>Nuclear</i>	Fusion nuclear electricity generation plants, nuclear wastewater treatment, nuclear cooling	Energy production	
Zero	Offsetting	<i>Carbon credits</i>	Companies for certification GHG emission reduction projects	Other	
N/A	N/A	Other	Protein development, clinical products, drugs; convenience stores, toll service, paper, restaurants, Financials, buildings, cement, metals, CSR, Software, IT		

CHAPTER 4

Framing climate tensions: How organisations' role in sustainable system transitions vary across time

This chapter addresses the second research question: *How do companies' frames on their climate actions vary to deal with environmental tensions?* This chapter discusses oil majors' use of their investments in renewable energy discursively for imposing framings of their role in innovation and sustainable transitions.

Abstract

Incumbents across industries have been expected to decarbonise as the only way to contain climate-forcing emissions. Despite increasing attention to climate change by incumbents, there is a key tension at play: the changes expected disrupt existing ways of doing business. There has been a growing focus in the literature on understanding why incumbents across industries tend to frame climate change challenges in ways that hinder transformation over time. In this paper, we build on the literature on climate inaction. We focus on how incumbents frame one identified type of climate action, instead of broadly focusing on their general way of addressing climate change. Climate actions can be understood by external audiences as being legitimate responses to climate change. By following the framing of one climate action longitudinally, we aim to shed light on the processes by which incumbents develop and negotiate their roles in addressing a global challenge. We study six oil and gas companies over three decades situated within shifts in policy. We identify three types of frames: transformational, conflictual, and business as usual (BAU), being used by companies over time. The use of these frames demonstrates the mechanisms powerful incumbents use at the heart of framing contests – an interplay between negotiating their future and building their role in the current challenges. This work provides insights into how companies normalise avoiding change in the face of increasing external pressure.

1. Introduction

This paper asks how incumbent business organisations build their role in sustainable energy transitions across time. For oil companies, the literature has been overwhelmingly critical of their actions or lack thereof. Scholars have pointed to oil companies' denial of climate change and direct meddling into climate politics to block regulatory efforts (van den Hove et al. 2002). When oil majors have chosen climate strategies as precautionary actions, they have opted to repurpose their efficiency as green efforts (Kolk and Pinkse 2004; Levy and Kolk 2002). Their ambition on climate activities tends to be one of resisting (Green et al. 2021) or of minimising compliance costs with hedging strategies (Meckling 2015). However, companies' public position often conveys a different aspiration.

This research aims to set the empirical basis to describe companies own public view about climate action. Using framing theory and text analysis of over three decades of annual reports in six oil and gas companies, this study looks at a timeline of frames as communicated outside the organisation to understand variation in organisations positioning within external calls of transformation. The analysis of frames within corporate communications opens a window to understand the tensions and conflicts that define a company's decisions and the need to justify it both internally and externally. Analysing the companies' public frames takes organisations as collective actors in search for a logic in a competitive field, rather than behaving as strategic unified actors (Ansari et al. 2013; Fligstein and McAdam 2011).

Large businesses primarily, as highly dependable on global governance, before attempting their transformation they have learnt to navigate climate expectations. For example, holding low-carbon assets like renewable businesses are now seen as a form of climate action. This article focuses on the specific case of European oil majors' communications of their renewable energy activities, as the companies more sensitive to climate policy and given the need to replace most fossil-fuel based energy with renewable sources (IPCC, 2022; Welsby et al., 2021). The research places special focus on renewable energy and how it is included in

companies' communications. In the association between their renewables and their oil business, this study traces the framing variation of oil majors' climate actions across time. Oil companies activities in renewables are usually taken as an indicator for 'green' transition (Fletcher et al. 2018; Rooze et al. 2020). Yet, the extent renewables can offer a view as the frontier to oil is only relative to the priorities set by the oil companies themselves.

The study spans over a 29-year period, from 1990 to 2019, to cover the start of oil majors' involvement in renewable energy to the year before the pandemic, and it uses annual reports as the text source for the frames' analysis. This choice is made both as oil companies are the model case of resistance to climate change by the nature of their business on fossil fuels and given European oil majors' growing activity on renewables as part of their climate strategies and energy transition efforts.

The paper identifies that across the period, oil majors have built their positioning on climate change on three main strategic frames: (a) recognising their potential but postponing transformation; (b) normalising their renewable energy involvement along an unchanged oil business; and (c) highlighting a hierarchy between fossil fuels businesses and renewables, particularly at key political moments.

This article proceeds with the literature review that defines frames as well as the study of climate actions in organisations. In the methodology the article explains the case selection, the historical setting, and the text analysis strategies. Next, it sets the context and the identification process of frames and the results. In the conclusions the article discusses the relevance for a long-term study of frames and on the relevance of understanding oil majors own positioning on climate change across time for how climate actions are understood.

2. Literature review

This literature covers two aspects of how frames have been used to understand companies' climate strategies. First, it introduces the choice of strategic frames for studying climate responses. Second, it situates the study in research of climate actions and companies' strategies.

3. Frames and collective actors

Scholars on organisations have highlighted that studying how actors frame climate change is key to understand their activities and shortcomings over time (Ferns et al. 2022; Nyberg et al. 2022b). Frames, as conceptual constructs, are used across social sciences disciplines. In sociology the act of framing is defined as the process of constructing, contesting, and disseminating grievances (Benford & Snow, 2000; D. Snow et al., 2014). Frames, in this sense, are the result of a process of description, assessment, and comparison that catalogues interaction outcomes (D. Snow et al., 2014). The process of framing, in the broad context of social movements, varies depending on the actors' cultural context, their political opportunities, their collective identities as well as their interactions with actors within their field (ibid). In the literature of frames, social movements, for example, are not taken simply as carriers of ideas or ideologies that emerge in response to disruptive events, rather, these are actively produced by the actors within (Benford & Snow, 2000). Actors of shared purpose are viewed as 'signifying agents actively engaged in the production and maintenance of meaning for constituents, antagonists, and bystanders or observers' (Benford & Snow, 2000, p. 613).

Frames are called collective action frames when are part of social movements campaigns and activities, which 'focus attention, articulate, and elaborate the elements within the frame, and often transform the meanings of the objects of attention' (Snow et al. 2019:395). In contrast to common interpretative frames, collective action frames have mobilisation functions used for a) action-mobilisation, to mobilise or gain support for action, b) consensus-mobilisation, seek adherents and alignment, c) to counter-mobilisation, diminish, neutralise, or disrupt opposing parties (ibid).

Organisations are collective actors that construct shared meanings and are involved in the same collective strategic action observed in social movements (Fligstein & McAdam, 2011). Organisations, as other types of actors, compete over strategic advantages in their own strategic action fields, which sets the interactions on the common understandings of the relationships, rules, and purposes of a field (ibid). As they interact in a particular field, this being a political, social, or economic, such as climate change global governance or energy transitions, organisations bring interpretative frames of both their positions and others' doings within a given field (ibid).

Frames, in their strategic sense, are useful to observe agency processes over meaning. In organisations' research, strategic frames are defined as 'a jointly constructed cognitive representation of firms in an industry, including assumptions of capabilities and bases of competition' (Cornelissen & Werner, 2014, p. 184). Organisations use strategic frames as 'scenarios of decision-making, often relating to their own capabilities' (ibid), but ultimately the main function of frames is to explain how an event or grievance, such as their progress on renewable energy, relate to their business. As described by Levitt and March, 'organizations devote considerable energy to developing collective understandings of history', which depend on the frames selected, refined, and constructed from shared storylines in the interpretation of events (1988:324). For oil companies, climate tensions are the main events to be interpreted and sought to be understood, but also are the main subjects of meaning contests.

When studying frames as part of the strategy of organisations, strategising is simultaneously political in the sense of the 'struggle for power in and around organisations that seeks to determine the nature of concepts and subject positions and to control how the resulting objects are understood and treated' (Phillips et al. 2008, quoted in Clegg and Kornberger 2015, 390). However diverse frames are, their use in organisation research has allowed scholars to study different levels of agency in meaning use and construction. Companies' discrete actions may appear similar as belonging to a field, but their strategies might not be necessarily the

same. Since frames tend to vary through time, their variation shows the processes of companies' adaptation to changes in their fields as means of building unifying meaning or by creating the basis of resistance, both observed in their immediate past as well as the trends set for the future.

Few studies have focused on observing frames across time, despite acknowledging their fluidity and framing as an ongoing practice (Lindstedt 2018; McCammon 2012; Snow et al. 2019). Frame variation allows to observe how collective actors engaged in contentious politics change their framing not only as a result of their own perspectives and assumptions but also as a response to their context (McCammon, 2012). Framing scholars have proposed that studying the association between two or more concepts is useful to trace frame evolution, as association offers a point of comparison to observe change (Lindstedt, 2018).

It is within these concepts that this article studies the variation of organisations' climate positioning frames when responding to climate tensions.

4. Businesses and climate (in)action

There has been increasing attention to the role of business in responding to the climate crisis. Large businesses, particularly those on fossil fuels are responsible for a considerable share of global historical greenhouse gas (GHG) emissions, most of which occurred when they were already aware of their climate impact (Ekwurzel et al., 2017; Heede, 2014; Licker, Ekwurzel, Sideris, et al., 2019). While pressure for these businesses to respond has been growing, there has been a simultaneous increase in frustration with the types of actions that have emerged (Slawinski et al., 2017). The early literature that studied business responses to climate change mostly focused on identifying ways for companies to respond by combining benefits to the business in terms of cost savings for example or the identification of new markets (Hoffman, 2006; Ans Kolk & Pinkse, 2005).

More recently, scholars from various traditions have begun to question this approach due to the growing disconnect between what companies are doing and

what is needed. Tackling climate requires companies and other actors to reduce absolute GHG emissions. Without absolute and permanent reductions, the impact on the climate of a company's activities will continue to grow (Slawinski et al., 2017). Disrupting the connection between economic growth and increase the stress on the climate actions requires transformational change (Nyberg et al. 2022). From a systems perspective, for example, a focus on organizational outcomes is fundamentally at odds with the nature of climate as a global, systemic, and wicked problem. Whiteman et al. (2013) argue for a systems approach which focuses first on the ecological problems and then on the approach of companies to dealing with those problems.

While this focus on systems has encouraged a broad, collaborative, and long-term approach, it does not attempt to disrupt the idea of opportunities for business in responding to ecological challenges such as climate change. Taking this approach one step further, critical scholars have begun to challenge the underlying assumptions at the heart of the relationship between business and society. While aware of their environmental impacts, companies have historically opposed climate action, funded climate denial studies and spent fortunes greenwashing their image to suit shareholders' demands and to tone down its critics (Ferns & Amaeshi, 2019; Ans Kolk & Levy, 2003; Levy & Egan, 2003).

Most of the literature on businesses and climate change follows the premise that businesses can eventually address the environmental problems they themselves produce by improving efficiency and by innovating. However, when studying incumbents, the literature offers mixed answers. For instance, authors have encountered that in leading industries in fact climate inaction prevails over real climate efforts (Ferns & Amaeshi, 2019). Others find incumbents engaging in strategic actions to survive climate confrontation, such as adopting similar language to those putting ambitious demands on them, like vocal NGOs (Ansari et al. 2013; Ferns and Amaeshi 2019). Failing to produce ambitious climate strategies is usually studied as a lack of vision, which has led to the focus on understanding and influencing the way companies frame the problem of climate change. However, this approach overlooks the fundamental tension of embedded agency, i.e. relying

on those who are embedded in existing systems to be the same actors who drive transformational change (Zietsma & Lawrence, 2010).

3. Method and data collection

To identify frames in response to climate tensions, this paper had to find a subject containing meaning negotiation. Climate change as a multifaceted issue has produced complex climate strategies in organisations, from reducing waste and emissions, to water use, forestry, inequality, and technology change. Depending on the industry, each climate strategy would require higher organisational effort than others. However, in the case of oil majors, once discounting corporate social and responsibilities practices, most of their climate strategies need to focus on emission reduction and technology. One could argue that there is ever so much they can cut in emissions if, even accounting for future technologies projections, oil and the rest of fossil fuels must be replaced highly by renewables (IPCC, 2022). Furthermore, this emphasis on renewables as a form of climate action is not new. Oil majors have been involved in this technology for at least 30 years. The framing their renewable energy actions and aspirations and the negotiation of their transformation potential allows to observe as well not only the framing of climate tensions but also of oil majors negotiated future.

To observe a timeline of a climate action as the subject of strategic framing, this paper uses the mentions of renewable acquisitions across three decades of annual reports. The data collection involved the systematic review of annual reports and documents available for the companies of study over the period, which resulted in an estimate of 13,000 pages of textual data. More detail on the research setting and the data analysis follows in the next sections.

As an empirical research strategy gathering primary documents for their coding was deemed the most suitable strategy, especially in contrast to generating original content through interviews. Interviews in the present would make for limited use to reflect the language and frame used two decades ago, even if key decision makers were available.

3.1 Research setting

The research is set on the cases of the oil industry in Europe since it is the most environmental regulated region in the world and has continued advancing ambitious climate legislation to date. At the same time, as a highly developed region it has large industries that are under pressure to transition to low-carbon models. Large European oil companies have been the most active investors in renewable energy businesses since the last 30 years. The distinction on institutional environment is relevant in this sector in which European companies are set apart by having higher —although still insufficient— ambition than the rest in terms of climate strategies (Kolk and Pinkse 2004). In comparison with their peers, European oil majors account for 70% of the current renewable capacity between worldwide major oil companies (CDP, 2018). Renewable energy is set to increase in the next years in Europe (Rack & Dholakia, 2021; Stern, 2022).

The companies were selected within the same industry in function of their size and by ensuring the companies in the sample met two conditions of theoretical relevance: that all share a similar institutional environment that has favoured the development of renewables and all to have made their way into renewables through investments. To meet these conditions, first, companies in the oil industry were chosen because this industry is under high climate pressure, has long been involved in fostering renewables as a form of climate action, has a large capacity to innovate and market power, plus their renewable activities receive great media attention.

Second, within oil majors, the choice of those headquartered in Europe, allowed to control for a similar institutional environment. In their present names the six companies studied are: Royal Dutch Shell plc (Shell), BP plc (BP), Equinor ASA (previously Statoil), ENI SpA (Eni), TotalEnergies SA (Total), and Repsol SA (Repsol). These companies are main European oil producers (see Table 1). The period covered extends from the first investment in renewables recorded in 1985 to 2019

Table 5. Case studies description

Oil majors in Europe	Type	Size by number of employees	Climate change engagement timeline
BP	Public	70,100	First investment in solar panels in 1981. Opens BP Solar's panel manufacturing business in 1985. Joins the lobbying group Climate Global Coalition (CGC) in 1989. In 1992 solar panels are displayed in the UK pavilion's Universal exhibition. In 1996 resigns from GCC. In 1997 gives a public discourse in support of the KP. Rebranded in 2000 as Beyond Petroleum. Alternative Energies is created as new business in 2005 and closed with BP Solar in 2009. Changed its name to 'BP' in 2008. In 2009, BP sings a call for action on climate change ahead of Copenhagen talks. In 2019 announced its shift to an 'integrated energy company' as it expands into 'low carbon electricity and energy'.
Total	Public	105,480	First investment in solar manufacturing in 1988. Launches rural solar program running from 2000 to 2014. Creates New Energies department in 2015. Rebranded in 2021 as 'broad energy company' named TotalEnergies as it is committed to produce reliable and clean energies.
Shell	Public	87,000	In 1988 circulates confidential report "the Greenhouse effect". Joins GCC lobbying group in 1989. In 1994 evaluates consequences of climate change in confidential report 'The Enhanced Greenhouse Effect'. Leaves the GCC in 1998 after pressure from European environmental groups. In 1999 first opens production facility for solar panels in Germany. In 2002 becomes one of the largest solar panels manufacturers in the world. In 2007, Shell sells its solar business. In 2009 also sells out its wind and hydro power business to continue only with biofuels as it sings a call for action on climate change ahead of Copenhagen talks.
Eni	Listed; 30% State owned	31,495	In 2008, ENI starts its collaboration with the Massachusetts Institute of Technology (MIT) to advance and develop fusion nuclear technologies. The same year, it establishes the Eni Corporate Research Center for Non-conventional Energy. In 2012, ENI founds ENI Rewind as an environmental company for environmental damage remediation, and it also includes solar panels as support to restoration of sites. In 2014, ENI Board of Directors establishes the 'Sustainability and Scenarios Committee' to oversee sustainability in the company and establish their first R&D Environmental Centre.
Repsol	Public, Limited	24,506	In 2001, the company creates Repsol YPF Gas Bolivia. Repsol YPF Gas expands to Libya, Spain, Argentina, Venezuela, and Indonesia, following new discoveries and decides to expand the generation and commercialization of their electric business. ¹⁰ In 2002 Repsol YPF makes its first public commitment to minimise its climate change impact. The acquisition of YPF in 2001 and Gas SDG made the Repsol an international company with a 'balanced business structure' expanding in natural gas. In 2007 Repsol is top listed in the Climate Leadership Index because of their 'investment in new technologies for emission reduction' ¹¹ . In 2012, Argentina expropriates YPF and then is forced to pay a high compensation of 5 billion US dollars to Repsol. In 2015 Repsol acquires Talisman Energy, a Canadian oil company, for 8.3 billion US dollars which turns Repsol into an oil major. In 2018, they start a series of acquisition of assets on 'low-emissions electricity and natural gas' which for Repsol 'represented a step forward in [their] roadmap towards energy transition by operating in a low-emissions business with a profitable, long-term position in line with [their] commitment to fight climate change.' ¹²

¹⁰ Repsol website. 'Advancing towards becoming an international company'. <https://www.repsol.com/en/about-us/history/international-expansion-and-innovation/index.cshtml>. Accessed: 20 June 2022.

¹¹ Repsol website. 'Repsol YPF enters the Climate Leadership Index because of its strategy regarding climate change'. <https://www.repsol.com/en/press-room/press-releases/2006/09/19/repsol-enters-climate-leadership-index.cshtml>. Accessed: 20 June 2022.

¹² Repsol website. 'The future of Repsol'. <https://www.repsol.com/en/about-us/history/a-new-era-of-growth/index.cshtml>. Accessed: 20 June 2022.

Statoil	Listed; 67% State owned	20,200	In 2001 starts a business unit to develop the technology and business opportunities for CO2 removal and utilisation. In 2007 creates the Technology and New Energies business unit that includes wind power as it seeks to build on the KP mechanisms to use their CO2 expertise. In 2009, with CCS and offshore wind, Statoil seeks to utilise 'core capabilities' from O&G industry for climate change. In 2011 it opens its first offshore commercial wind farm. In 2015 starts building the first floating wind farm. Rebranded in 2018 as a 'broad energy company' named Equinor.
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*CCS=Carbon Capture and Storage, O&G= Oil and Gas

The six companies as of 2019 had on average 56,464 employees, 26.9 billion dollars in sales, and 35.3 billion dollars of market value. And to present they all have pledged to achieve Net zero emissions in 2050.

The first stage grounded the research in a historical context to explore the relation between transformational demands and companies' efforts to define an appropriate research question. First, the main events and changes on climate change and renewables for each company were collected to assembly each company timeline. The timelines were complemented with information from company's websites, annual reports, and newspapers, as well as research articles, reports, and policy documents to identify potential moments of higher climate tension for our sample companies. The key climate moments on the international political scene preferred international climate negotiations over domestic policy. While multinationals are also subject to domestic policy, are most sensitive to international or regional regulation.

3.2 Analysis of strategic texts

To identify frames across time due annual reports were used due to their strategic nature. Annual reports are released yearly in a public presentation usually at the end of a calendar year and are the most important earnings reporting document of a company. Annual reports are the main medium of communication from managers with the company shareholders. Particularly in publicly owned companies, annual reports serve to inform shareholders of management decisions and of the company performance. Annual reports also capture the cultural identity of an organisation, and simultaneously, serve to inform the organisation members of the values placed

in their activities, their view of the future, as well as to identify their present challenges and opportunities (S. Kaplan, 2011).

Annual reports are the main strategy document of businesses organisations, and as such they allow to observe decisions, strategies and views as they happened in a timeline, opposed to interviews that rely on recounts of past events (S. Kaplan, 2011). As well, their availability over time provides an advantage for longitudinal research. Like other strategy documents, annual reports are essential in stablishing an organisations' ideology and purpose. Strategy documents have 'textual agency' and ideational force as they serve organisations to 'communicate negotiated meanings, legitimate ways of thinking and action and de-legitimate others, produce consent but may also trigger resistance and have all kinds of political and ideological effects, some more apparent than others' (Vaara et al., 2010, p. 686).

In climate change research, businesses use annual reports to report conformity, progress, or challenges to climate actions, as well as to report risks to future profit or business materiality. Annual reports are used also as mediums where scenarios of the future are presented, as well as spaces where the corporate purpose is envisioned and communicated. Annual reports are also a mechanism in climate change related accountability, as they are allegedly the preferred information source for shareholders over other sources, such as environmental reports (Haque & Islam, 2015). In the case of big corporates, like the companies of our sample, the annual report release event is attended by the press, and annual reports are also seen as the event that marks the companies political positioning. Furthermore, annual reports in their own textual agency respond to their political environment. Studies have shown that that managers do adapt the readability level of their annual reports depending of their immediate political environment if that grants them an advantage or allows them to avoid extra costs (Xu et al., 2022).

To use annual reports as the empirical material of this article, the analysis focused on tracing historical annual reports over three decades from 1990 to 2019 for the six European oil companies of the study. Once the timelines of annual reports were gattered, the analysis followed a process of 'open coding' to identify the general

themes in the narrative of the organisation practices. To facilitate the coding, we used the qualitative data analysis software NVivo.

3.3 Steps of data analysis

The data analysis had two stages. The first stage used textual nodes identified in the annual reports. The textual nodes were identified as statements, description of practices, strategies and objectives that denoted an attitude towards their renewable energy investments, simultaneously as engagement in a clean technology and as a form of climate action. This approach was made knowing that when studying industry incumbents, annual reports serve to observe the attention and planning managers give towards innovations and new technologies (Eggers & Kaplan, 2009). Since renewable energy as a subject was chosen as the anchor to observe the change of frames in response to climate tensions, the coding revolved around its associated concepts.

To approach our textual data this research followed an inductive process to observe the frames companies construct and deploy to interpret and communicate in their environment. Two steps were followed. First, the coding of in-vivo statements that included key words such as “renewable”, “alternative energy”, and “climate change”. This allowed identifying the company statements on developing or transforming based on renewable energy or their arguments for their distance towards it. Second, during the in-vivo coding, 49 initial nodes were identified in their capacity to denote oil majors’ actions on climate change and renewables, such as “investing in new companies”, “expectations for”, “our role”, and “business case”. As well as nodes used for describing their positioning, such as “challenge”, “core activities”, “financing”, “revenue”, “complementing”, and “energy needs”.

4. European oil majors and climate framing

4.1 Historical context and climate tensions

To situate the research on frames and climate tensions, and given the longitudinal nature of this research, a first stage of the analysis consisted in identifying the main climate moments around which to observe the companies’ decisions on climate

change (Table 2). This served to identify a relationship between climate tensions towards more renewables and the companies' frames. A first observation pointed that in general major oil companies have responded to the main climate policy moments either by increasing ambition, rebranding their corporate identity, or by opening or closing climate related divisions. Aside from committing to emission reduction targets, that is taken as a constant, for most of the climate moments following Kyoto, the European oil majors seem to have responded in a positive way towards climate change, either by announcing a rebranding or by opening new renewable business areas. The exception is the period of around the Copenhagen Accord that saw both the exit of Shell and BP from their renewable businesses.

Table 6. Climate change moments and context

Climate change timeline	
Key dates	Description
(1997-1998) Kyoto Protocol (KP)	Consensus that CO ₂ emissions are driving global warming. States commit to reduce greenhouse gas emissions for first time. The European Union (EU) commits to reduce 8% of emissions. The US and China do not sign. George W. Bush wins US presidency in 2000. BP publicly supports the Kyoto agreement in 1997. Shell and Total follow a year later. BP is rebranded as Beyond Petroleum in 2000.
(2004-2005) KP is ratified	Canada and Russia join the agreement and ratify the KP in 2004. The KP goes into effect in 2005. BP opens its Alternative Energies division in 2005. The first Global Day of Action on Climate Change is held in 2005. The EU launches in 2005 its Emissions Trading System as part of the EU energy policy.
(2007-2009) Copenhagen Accord	Shell exits its solar business in 2007. Statoil opens a Technologies and New Energies unit in 2007. The UK establishes its Climate Change Act (2008). BP and Shell sign call for action on climate change among 500 companies, ahead of talks. BP announces the closing of its Alternative Energy division in July 2009. Copenhagen is considered a failure after negotiations end in December 2009. Canada withdraws from KP in 2011. KP first commitment period expires in 2012.
(2014-2016) Paris Agreement (PA)	192 countries sign agreement to hold the increase of temperature below 2°C and to pursue efforts to limit it to 1.5°C. Countries in the PA commit to mitigation, adaptation, technology transfer, and capacity building actions in NDCs. The PA was considered a weak agreement by some, but it is regarded to have set the basis for more ambition. The PA is the largest stirrer for climate litigation, after the KA ratification. Total opens its New Energies department in 2015. Statoil starts its first offshore windfarm.
(2020-2021) PA starts; Glasgow Pact	School Strikes for Climate Movement started in 2018 and became a global movement in 2019. Extinction Rebellion protests start in 2018 in the UK and gain influence in Europe in 2019. Statoil is rebranded as a broad energy company in 2018. BP announces a rebranding as an integrated energy company in 2019. The US withdraws the PA in 2020; re-joins in 2021. In Glasgow, the PA's Article 6 on carbon markets is agreed, countries agree to phase out 'inefficient' fossil fuel subsidies and to phase down coal. First global emission inventory from the PA is set for 2022. Total rebranded in 2021 as TotalEnergies with ambition to become a net zero emissions company.

*NDCs=Nationally Determined Contributions.

These oil companies fought through efforts to influence policy and scientific discussion before the Kyoto Protocol by joining climate denial coalition groups, like the CGC. However, after Kyoto any opposing instance on climate change policies was not as apparent. This also gives an insight of the dynamics of oil majors with their collective action fields, in which there is a tendency towards less direct confrontation and a progressive learning towards ways of conforming to or navigating rising climate tensions.

Climate change discussions were not what brought oil companies interest in renewables. Before Kyoto, Total and BP had a strong presence already in renewables even though they were part of climate change opposing groups. Total, as the then Compagnie Française des Pétroles, started investing in renewables in 1987 as part of their efforts of diversifying its energy business and later as part of business for energy provision in remote rural areas. Total's renewable project later evolved into corporate responsibility efforts in rural communities but was no longer seen as strategic until again picked as part of their climate plans. Similarly, BP started investing in renewables by acquiring Lucas Solar company in 1988, with the aim to foresee energy security options to oil, a project which later evolved into BP Solar own business and with a climate-change-oriented purpose.

These observations speak to a process of 'translation' of climate and transformational demands into the business responses of companies. We use the term translation as the process identified by Wright and Nyberg (2017) in which members of business organisations have to make decisions through competing views between environment protection and market forces oriented to profit goals. These initial observations informed our initial questions on how companies frame their climate actions in response to climate tensions.

4.2 Identifying frames: oil companies' climate actions

The inductive process of the analysis started with coding statements. From the statements coded, the repetitions that emerged led to groupings between similar categories.

A characterising feature of the statements of oil majors on their climate actions was on signifying their role as leading the decisions on the profitability or feasibility of renewable energy within climate tensions. The discussion over profitability was either presented as a goal towards which to direct efforts, for example, 'the strategy of Renewables is to establish significant, commercially viable businesses in both areas' (Shell_2001); or as a potential given by the investments and acquisitions made. For example, 'we are exploring emerging opportunities and investing in those where we believe sufficient commercial value is available' or 'New Energies business explores emerging opportunities linked to the energy transition and invests in those where we see sufficient value' (Shell_2019), or 'we formed our New Energies business to explore lower-carbon energy opportunities with clear commercial value' (Shell_2017). The profitability of renewable energy is in fact one of the most politicised aspects of these technologies, when often attention is directed towards their rentability as a given instead of their profit as their potential (Christophers, 2022). This contraposition gave first indication that two different frames were at play.

Investing in renewable energies also became part of a seemingly process of routinisation and normalisation of the companies' climate endeavours, with statements such as 'we have been investing in renewables for many years', 'we pursue venturing and low carbon across multiple fronts' (BP_2018), and 'as part of our growth process we are making some of the most significant investments' (ENI_2005). Not only their investments in renewables were routinised, also were their U-turns, like 'we are increasingly active in wind and solar power. But today, the greatest contribution Shell can make to providing more and cleaner energy is to deliver more natural gas' (Shell_2017). More importantly, their involvement in renewables gave them a role of future reach, such as 'TOTAL has been active in the renewable energy sector since 1983(...) and intends to continue developing

renewable energy as part of its sustainable development policy and in order to contribute to preparing the world energy supply for the future' (Total_2004).¹³ As their renewable involvement, mostly through acquisitions, was framed as part of sustainable and climate efforts, so it was the inclusion of oil in that meaning, such as 'New Energies is developing renewable energies that will, in combination with hydrocarbons, help establish a more diversified energy mix while also generating lower CO₂ emissions' (Total_2013). This gave indication of a framing both negotiating a role for oil in the future and its place in climate actions.

Identifying these two trends was important as it showed frames had both directions, one acting on naming the value of renewables, and another on rewriting a role for their oil business. However, from the coding of statements a more definitive and direct stance towards renewables not only contested their viability in the future but made it as an indefinite stance for keeping on with their own business, for example 'Our New Energies business intends to act with conviction and commercial realism – when the value for shareholders and society is clear. In the meantime, Shell's existing oil and gas portfolio will help drive growth' (Shell_2017). This showed that some statements aside of providing meaning or roles, had also a tone, and for instance some were clearly disputing climate arguments.

This gave orientation on grouping the statements coded based on how their relation to oil was presented, which resulted in the following three frames, detailed with examples on Table 3. First, a transformative frame to group the statements that offered renewables as a new energy avenue being pursued and with high expectations as an alternative to oil. Second, a business-as-usual (BAU) frame to contain the statements where renewables were normalised as additional,

¹³ It would be consequential to ask how much this self-taken role of financiers for the future was negotiated but in an interview in 2016 the following was said: "Around 2005/6, a minister told Desmarets [then CEO]: 'you, Total, earn too much money, I'll put a supertax on oil revenues.' Desmarets answered: 'no, my business is to invest, to invest in projects.' And he gave pledges to the government that he would explore this new technology [CCS] by developing a project in Lacq [a drained gas field in southern France]; quite a mischievous outcome, isn't it? [...] but in the end, it cost more than the expected 50M€ (rather the double, actually!)" (Choquet, 2018, p. 122).

complementary, far future, or inferior in treatment and value to revalued hydrocarbons. Finally, a conflictual frame to describe the statements where renewables were improbable, deviant, and or were not an alternative to the benefits of oil.

In the final sum, only a few statements resulted transformative. The statements that saw a future in renewables with rapid progress happened before the Kyoto protocol for most cases. The greater contrast might be linked to the fact that after 1998, the year the Kyoto protocol was signed, renewables were associated mostly with climate change. In contrast, the events that fell in the BAU attitude category abounded. They had in common with the conflictual attitude that they all were presented in a climate change context. BAU attitudes included the moments where renewables were diminished, described aside, or as a purpose towards presenting the business in a certain manner. Instead, conflictual statements were scattered in periods. They were not as abundant as the BAU normalising frames but sometimes were predisposed to contradict previously stated BAU statements.

Table 7. Description of three strategic frames

First statements	Second order Themes	Frame explanation	Example
Renewables presents high expectations as an alternative to oil	<i>Transformational</i>	Demonstrate they can develop renewables within their business, or places renewables equal to the oil business.	The distinctive G8 Solar Showcase – supreme winner in the 1999 Chairmen’s Awards – was built to demonstrate the potential of renewable solar energy to the G8 heads of government summit in Birmingham, UK. AR_BP1999 To play a leading role in meeting these needs from oil, gas, solar power, and petrochemicals without damaging the environment is BP’s goal. AR_BP1997
Renewables are merely additional, far future, or inferior in treatment and value to hydrocarbons.	<i>Business as usual</i>	Normalize renewable energy investment, showing they are active on climate change, but refuting investments will be transformational.	[New energies] aims to identify new opportunities, support projects, and carry out initiatives in fields such as biotechnology and renewable energies applied to transport, as well as in other areas that could unlock synergies with Repsol’s current businesses and the geographic regions in which it operates. AR_REPSOL_2012, 2013 We are also evaluating other areas where we can grow our involvement in lower carbon opportunities, particularly where they may play a role in complementing existing businesses such as natural gas. AR_BP2016 We are increasingly active in wind and solar power. But today, the greatest contribution Shell can make to providing more and cleaner energy is to deliver more natural gas. AR_SHELL2017

			New Energies is developing renewable energies that will, in combination with hydrocarbons, help establish a more diversified energy mix while also generating lower CO2 emissions. AR_TOTAL2013
Renewables are improbable and are not an alternative to the benefits of oil.	<i>Conflictual</i>	Use conflict frames to highlight the hierarchy between the fossil fuel business and the renewables.	<p>The world will continue to need supplies of hydrocarbons. We need the understanding and trust of society to make these investments to meet this global demand. Renewables cannot be developed quickly enough to meet the increasing need for energy. This is not a choice between two investment approaches, both are needed for the world to be able to grow. AR_BP2017</p> <p>Eni's business depends on the global demand for oil and natural gas AR_ENI2014</p> <p>Hydrocarbons are crucial to the economic success of the world. Demand for oil and gas is growing. Renewable energy, from solar power or hydrogen, holds great long-term potential and we continue our research and development work, which is producing excellent results. For the moment, however, there are no viable substitutes for hydrocarbons. AR_BP2000</p> <p>Even if renewable energy sources develop faster than any energy source ever did, we believe that they could provide no more than 30% of global energy by 2050. Fossil fuels and uranium will continue to supply the bulk of the world's energy for the foreseeable future, and the energy industry has to do what it can to ameliorate their known environmental impacts. AR_SHELL2010</p>

4.3 Aggregate patterns of frames in time

The next step in the research process was to observe the pattern of frames in time. The summary in discrete periods is presented in Figure 2, which shows three main dynamics. First, all the companies in our sample showed frames on renewables as climate action and with a stance of relation to their oil business, but only the largest companies had a frame with transformative values. Some of them picked these early on, others did pick them later in their timeline. Second, despite the initial involvement in renewables, there was a process where climate actions stalled. Similar to Wright and Nyberg (2017), the frames showed that most of the strategic framing effort was in normalising minimal effort, or in setting the terms of their business as usual. Third, along BAU, companies also showed moments of resistance and confrontation.

The transformational frame was more relevant for BP in the early periods of the climate discussion before the Kyoto Protocol entered into force and when regulation of emissions was only plausible event in the future. In contrast, the

conflictual frame, is more important in recent times, especially for Shell and BP, after the failure of the Copenhagen climate diplomatic meetings and as ambitions ratcheted through the Paris Agreement. Yet, business-as-usual was the dominant frame since the 2000s.

Figure 15. Average frames coded per year period per company

Average frames per year	1990-1998	1999-2006	2007-2013	2014-2020
Transformational				
TOTAL (1998-2020)	-	-	0.2	0.3
BP (1992-2019)	2.0	1.4	-	0.2
SHELL (1997-2019)	-	0.1	-	-
BAU				
BP (1992-2019)	0.1	2.9	5.3	7.7
ENI (1997-2019)	-	1.0	4.5	3.5
REPSOL (2005-2019)	-	0.3	3.7	3.5
SHELL (1997-2019)	0.9	6.0	6.0	15.0
TOTAL (1998-2020)	0.1	4.4	5.8	5.5
STATOIL (1990-2019)	0.1	0.6	3.0	3.7
Conflictual				
BP (1992-2019)	-	2.7	0.8	1.0
ENI (1997-2019)	-	-	-	0.2
SHELL (1997-2019)	-	0.1	1.5	2.8
TOTAL (1998-2020)	-	0.3	0.2	0.3
REPSOL (2005-2019)	-	-	-	0.3
STATOIL (1990-2019)	-	-	0.5	-

Source: Author with data from annual reports. Periods vary slightly per company. The yearly average was calculated by periods.

4.4 Robustness test- sentiment analysis

The final stage of the data analysis consisted of confirming the three frames observed and the coding robustness. This included conducting a sentiment analysis using R 'tidytext' package to corroborate that there is a difference between the three frames identified. This analysis provided an external evaluation of the relative consistency of the coding.

This approach is based on the analysis of a predefined lexicon, based on the English dictionary, that rates words for their negative or positive connotations and it excludes neutral words. This allows to ponder the general sentiment of a paragraph or group of text. The expectation was to observe the quotes of transformative language having more positive words, than BAU, and BAU than conflictual.

To run this program, all the quotes for each frame were saved in separate text files. The analysis was run for each of them. The results showed a marked difference among the three frames. The transformative frame, as expected, was the frame

with the highest positive score, followed by BAU. The conflictual frame scored 0.32 lower than the transformative frame, and 0.24 points lower than BAU (Table 4).

Table. 4. Sentiment analysis and robustness test

R word analysis	Mean
Transformative	0.7352941
BAU	0.6559061
Conflictual	0.4117647

5. Results

This research expected oil companies' meaning of renewables to change as climate change concerns became more serious, and thus expected to see either a progressed increase in renewable energy relevance in frames or a systematic resistance in them. However, this is not what is observed. The patterns found provide evidence to the idea that incumbents resist change and that as political entities will join framing contests to justify their inconsistent involvement in climate actions. After observing how frames vary in time, transformational and conflictual framing appeared inconsistent within constant BAU frames. This speaks to the literatures that emphasises businesses' focus on profits and margins. The emerging patterns that correspond to companies attempts to downplay the place of renewables in the context of a climate transition are discussed below.

5.1 The transformative frame to displace action into the future

Oil companies have rarely had a transformative attitude towards renewables. However, the literature and public assume they do because oil majors' claim to be considering a transformation in the long term. We consider that a transformative frame must include action or a statement in the present, as opposed to displacing most of the action in the future. We identified only four moments in which this frame was used: before 1997 in BP and before the Paris Agreement in Total SA.

The early use of the frame is also the most relevant example from the sample in the 1990s. For BP in 1997, solar power was an important business area along oil and gas. BP has a long history of engagement in solar. Energy security concerns made

oil majors and governments in Europe turn to alternatives to oil due to the oil price crisis of 1973. But the Kyoto Protocol, drafted in 1997, implied a co-existence between renewables' technologies like solar and fossil fuels. The following quote from BP's 1997 letter to shareholders shows a logic that began in 1980 and lasted until 1999, in which solar technologies were described to be developed as part of the main business and that had the opportunity to grow 'significantly'.

To play a leading role in meeting these needs from oil, gas, solar power, and petrochemicals without damaging the environment is BP's goal. [...] By 2020, solar and other renewable forms of energy could supply 5% of the world's energy needs; over time that could rise significantly. (AR_BP1997)

In this role, BP showcased developments of the technology to show confidence and pride in its growth. Solar here is used as an attractive technology. In their reports, they mention government contracts in the head quarter country, international expansion and exposure, and high-level political visibility, all of which are valuable. Oil companies, not only BP, recognize they can transform but decide to postpone transformation to the future. This discursive tactic is associated to statements that offered renewables as a new energy avenue being pursued and with high expectations as an alternative to oil.

5.2 Framing business as usual as a recurrent but marginal turn to clean tech

In contrast to the transformational frame the importance of renewables is displaced to the far future and contrasted to the importance of fossil fuel in that future. References to natural gas and the introduction of pollution control technologies serve the purpose of relativising the importance of renewables.

We have supported the need for precautionary action on climate change for six years - believing that much can be done that is both economic and helps to meet other energy challenges, such as enhancing security. [...] We also play a progressive role, contributing to solutions by developing: • the gas supplies which are the most important medium-term way of reducing carbon emissions; • commercial wind, solar, biofuels and hydrogen businesses; • ways of locking up carbon dioxide underground or in inert building materials; and • mechanisms to enable cost-effective emissions reduction, such as trading. (AR_SHELL2002)

We are investing for the future in both hydrocarbons and in technologies which will be important in that transition. The world is changing quickly, quicker than we have seen before. There is no one solution and no one right way ahead. Our approach is clearly aimed at being flexible and responsive. (AR_BP2017)

An even stronger form of business-as-usual frame sees renewables as an area of business that does not conflict with oil and gas. This follows a framing in which unchanged oil businesses become a requirement to ‘scale’ renewables or maintain ‘energy security’. This frame also helps the companies build their role in the investment and development of clean energy.

TOTAL is a leading international oil and gas company and aims to be the responsible energy major by helping to supply accessible, affordable and clean energy to as many people as possible. (AR_TOTAL2016)

We have substantial positions in both heavy oil and oil and gas plays. These reserves are in production today, with substantial longer-term growth potential. Reflecting the long-term trend in demand growth for lower-carbon energy, we intend to make investments in large-scale and commercial forms of lower-carbon technology and energy, such as natural gas, carbon capture and storage, biofuels, wind and solar energy. (AR_SHELL2015)

Furthermore, we started the project to build a 50 MW wind farm at Badamsha in Kazakhstan, to supply renewable energy to the Country. Our businesses growth is even more focused on the long-term sustainability. Climate change is a pillar of our industrial strategies [...]. (AR_ENI2018)

How is BP responding to the twin challenges of energy security and climate change? Our job is to help meet the world’s energy needs today, invest in the next generation of energy sources and support the transition to a low-carbon economy. (AR_BP2008)

This vocation is to be accomplished in a responsible manner and by working to provide an effective response to the climate change challenge, in particular. Meeting the energy needs of a growing global population, providing tangible solutions to contribute limiting global warming, adapting to new patterns of energy production and consumption and changes to the expectations of customers and stakeholders constitute the challenges that a major energy player like TOTAL can help tackle. (AR_TOTAL2019)

New Energy Solutions (NES) NES reflects Statoil’s long-term goal to complement our oil and gas portfolio with profitable renewable energy and other low-carbon energy solutions. NES is responsible for wind farms and carbon capture and storage as well as other renewable energy and low carbon energy solutions. (AR_STATOIL2017)

Finally, the use of the business-as-usual frame stresses renewables viability only if commercial value is available or to simply ‘complement’ the traditional oil and gas business. As expressed by Total and Shell:

The Gas & Power division is also developing new energies that emit fewer greenhouse gases to complement hydrocarbons so as to meet the increasing global demand for energy. (AR_TOTAL2011)

TOTAL' s challenge is to increase access to affordable energy to satisfy the needs of a growing population, while providing concrete solutions to help limit the effects of climate change and supplying its clients with an energy mix featuring a progressively decreasing carbon intensity. (AR_TOTAL2016)

In New Energies, we are exploring emerging opportunities and investing in those where we believe sufficient commercial value is available. We focus on new fuels for transport, such as advanced biofuels, hydrogen and charging for battery-electric vehicles; and power, including from natural gas and low-carbon sources such as wind and solar. (AR_SHELL2019)

BAU as a frame and practice takes time for these companies and involves making sense of their own businesses in terms of climate change. Under this frame while companies talk about investing in renewables and about a transformation of their business in the long-term, they also define the ways to keep on track with business as usual. Renewables is an investment that is mentioned and pushed along, however in practice it competes with other (less transformative) solutions: natural gas, CSS and even hydrogen. The attention is scattered.

The New Energies portfolio is largely being built through acquiring established companies or through start-up companies. Most of these opportunities are in business sectors that are different from Shell's existing oil and gas businesses, but have some similarities and/or adjacencies to our Downstream and gas and power trading businesses. (AR_SHELL2017)

5.3 Conflicting frames to challenge heightened climate expectations

Companies are in dialogue with external pressures, which is more evident in moments of high political visibility. Thus, the years with high conflictual frames where 2016 (post Paris), 2019 (pre-Glasgow), and earlier in 2005 at the start of the European emissions trading system. For example, this quote shows from 2019 that the chair addresses social pressures from the wider public and younger generations. In the UK and Europe these pressures were led by extinction rebellion and Fridays for future groups, demanding a phase out from fossil fuels. In the UK and across. Without mentioning directly, Shell replied to these movements:

In 2019, people all over the world, many of them very young, demanded change. They demanded urgent action to protect the climate: change to our lifestyles, change to how the world produces and uses energy. [...] but the need for oil and gas will remain for decades to come. In Shell, as we shape our businesses to deliver more and cleaner energy, we must also continue to invest responsibly in developing conventional oil and gas resources. This generates billions of dollars in revenue, allowing us to reward our investors with dividends. Crucially, it also provides the financial muscle to invest in cleaner forms of energy. (AR_SHELL2019, Chair's message).

Hence, the conflictual frame is a strategic tool used sparingly, in moments of more public questioning of fossil fuels. This is itself important, as it shows the need for the industry to push back and show power in critical moments, but that this position cannot be sustained in times –or against all forms of— political pressure. However, even when trying to be conciliatory this frame shows pushbacks.

As I said, last year we set out our strategic priorities. Simply put, these are designed to meet the dual challenge: to produce more of the affordable energy that the world needs while producing and delivering it in new ways, with fewer emissions, that society wants. The key to this dual challenge is to recognize that this is not just a race to renewables, it's a race to lower greenhouse gas emissions. So, while we are fully committed to the energy transition that is underway, we also see a lot of uncertainty around the pace and path of how this will unfold. (AR_BP2017, CEO letter)

Further, conflictual frames serve a dual purpose. Conflictual frames attempt to undermine low-carbon transition demands, but when doing it, they push forward statements that aim repositing the value of oil, and oil companies, in society. For example, bringing development and revenue to the countries in which they operate or bringing solutions. Conflictual frames also speak of active lobbying efforts of influencing climate policy and ways the companies use to impose 'their' climate solutions.

Repsol supports the Paris Agreement, and works towards being part of the climate change solution. This transition to a low-emissions future requires a holistic approach that means considering the costs and maturity of the technologies that will ultimately be successful. There are many possible paths towards a low-emissions future, in which Repsol has identified three common elements: enhanced energy efficiency and energy savings; reduction of emissions in the generation of electricity, where natural gas will be a key player, and the deployment of low-emission technologies in final sectors. (AR_REPSOL2017)

We have stepped up our efforts to actively inform and support governments in their efforts to develop an international policy framework for responding to climate change that encourages the technology development and investments required without distorting international competition. This involves sharing our insights into the energy system and technology development, for example through our own strategic energy scenarios. It also includes helping building the coalitions between companies, the public sector and non-governmental organisations (NGOs) that will be needed. We actively promote the use of emission trading systems for heavy industry and the power sector, in which governments set absolute limits on the amount of GHGs the industry can release, coupled with incentives to speed up the demonstration and deployment of technologies to capture and store CO₂ underground. (AR_SHELL2007)

6. Conclusions

The overarching conclusion of this study is that the role of incumbent organisations in sustainable transitions is not given, rather it is constantly being negotiated between the organisations' context and identity. This study has shown a compelling way organisations', such as oil companies, share their ideology and their reinterpretation of history, like other collective actors, in action-oriented beliefs and meanings (D. A. Snow et al., 2019). As well, this study has established the relevance to study frames across great lengths of time to capture dynamics of system transformations.

The empirical research illustrates cases of frame variation by observing companies' framing climate change actions across different policy moments. Whereas framing conveys responses to internal and external negotiations within collective actors, framing also seeks to contest collective histories. This research identified three dominant frames: transformative, business-as-usual, and conflictual, proposed here as a typology of how incumbent business organisations frame climate actions across time.

Scholars have shown that collective action frames serve three different functions, call to action, form alliances or diminish oppositions (D. A. Snow et al., 2019). In this research we find that the business organisations studied did not convey any frames for action or mobilisation. Yet, it was observed that a business-as-usual frame serves for building alliances within the organisation's business status quo, as it seeks conciliation between a small share of renewables that need a big share of oil to be of value. This frame builds a role for oil majors to participate in a climate consensus that does not compromise their existing business, nor its sustainability, placing the burden on the price and feasibility of climate actions, i.e., renewables.

In contrast, the conflictual frame shows a different face of oil companies, and of business organisations, as collective actors. As they are increasingly a direct target of climate movements, oil companies use frames intended to diminish opposition by questioning the appropriateness of the criticisms and derating alternative

technologies. This frame seems to be accompanied of a direct-action component, one in which, the companies expose their efforts in actively interfering and influencing policy. The initial but scant use of transformation frame earlier in the period, and the increasing use of conflictual frames in the 2010s speak of different approaches to experience political pressure vis-à-vis change. This shows how structural factors relate to how individuals and collective actors engage in meaning-making (D. Snow et al., 2014).

When studying framing processes in lengths of time, it is expected to find frames that overlap (McCammon, 2012). Corporations as other collective actors respond to different internal audiences and in the case of multinationals, also to multiple geographies. Thus, it is possible to try tracking how different frames relate to concrete business choices made in the recent past, or in response to political and public pressure in specific geographies, as section 5.3 discusses. Whereas to the question of what matters more in frames construction, if the context of the organisation or its identity (McCammon, 2012), this study offers a case where the identity as oil companies mediates all the responses to a changing context, however it is the context that seems to trigger the need of framing.

This article also contributes to ongoing debates in the studies of organisations and the environment. Wright and Nyberg (2017) argues that company managers tend to start with ambitious climate strategy ideas that systematically lose ambition until they resemble their business-as-usual. This research observes companies' initiatives sufficiently integrated into company logic and history that make it into public strategy documents. While Wright and Nyberg observations refer to managers' frames dilution over time, this research finds businesses organisations' actively framing their public positioning as business-as-usual.

Equally, the scholars that have characterized oil companies' resistance to action or their hedging strategies tell an important, yet still partial, account of oil companies' strategies in relation to climate change based on companies' observable actions. This research on frames complements these finding by showing how companies not only normalise the lack of ambition of their strategies

in public communications, but also actively use framings seeking to counter or neutralise action on climate change.

Future research can approach climate strategies focusing on specific types of climate action (like involvement with renewable energy) instead of studying the broad spectrum of climate strategies together. Similar research on a subject like carbon capture might result in different positioning and framing as it is a technology closer to oil identity, unlike renewables. Understanding the combination of different framings in relation to different technologies will help in building a more robust and complex understanding of incumbents' actions and their consequences –beyond the ambiguity of greenwashing.

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CHAPTER 5

The global reach for green innovation: An imbalanced deal between the state and corporations

This chapter addresses the third research question: *How do incumbent companies acknowledge and use subsidies in their acquisitions?* This chapter studies the role oil majors' claim to have in the energy transition of innovation advancement against the unquestioned benefits from policies they seek and take.

Abstract

For 35 years, oil multinationals, as large energy players, have acquired and abandoned renewable energy companies. Climate change-related energy transitions are among the largest effort led both by state and private funding. Although large incumbents are expected to play an increasing role, their behaviour towards new technologies is still unclear. This paper provides an empirical analysis of oil majors' interaction with policy-led emerging energy technologies and brings back the discussion on the state-incumbents relationship. For such, this research produced a unique and original database of three decades of oil majors' mergers and acquisitions with 3,500 observations for seven European oil major companies, of which 211 are acquisitions in renewable energy. The paper uses acquisitions as an economic action situated in a policy context and proposes four main findings. First, oil companies invest in renewables where they already have operations. Second, investments in renewable energy are sensitive to governments and mandates. Third, companies can strategically choose to grow across markets, arbitrage between markets, or leave all markets altogether for a particular technology. Finally, they will seldom recognise the role of state policy when they invest but will often refer to state policy when they divest.

1. Introduction

Oil majors' ability to develop climate solution innovations, especially on renewable energy, brings both serious doubts from environmentalists and high hopes to market fundamentalists. Corporates have excelled at their sustainability talk rather than at concretising their actions (Wright & Nyberg, 2017), and oil majors' have a long history of climate denial, lobbying and greenwashing (Bonneuil et al., 2021; Franta, 2018; Supran et al., 2023). Yet, their way of doing business as well as their activities are still central to much of the global economy, energy policy and the planning of climate pathways. Corporations, as the ultimate form of capitalist structure, are expected to lead and aid in transforming economic systems through green innovation, even with historical packages of green subsidies such as the recently announced in the US (Storm, 2022), and which have prompted Europe to rethink its own approach of an activist state (Kleimann et al., 2023).

Transforming the economy towards a cleaner and just model needs conceptual and evidential frameworks to guide coordination and action (Stern, 2022), but we still do not know what role large oil corporates have had in the advancement of emerging energy technologies, nor which role they ought to play in advancing energy transitions (Geels, 2014; Roberts et al., 2018). This paper looks at oil majors' history of acquisitions, as the moment of entry or commitment to emerging technology markets, to answer such questions. More specifically, this paper asks: *how have oil majors interacted with policy-led efforts for new energy technologies?*

European oil majors' have been the most engaged in climate goals and targets, and, in contrast to their global peers, they have also been the most advanced in renewable investing over the years (Pickl, 2019b). As global fossil fuel companies, their investments in oil and gas –in the form of acquisitions— have dominated geographies rich in hydrocarbons; but their acquisition behaviour in renewables does not have the same distribution concentrating in a few countries, particularly in Europe, the US and Brazil.

Usually, large corporates, as global incumbents, are thought to be able to dedicate their capabilities to develop, shape and advance innovation; yet critics

consider their role as marginal and instead stress the role of states in producing markets (Lazonick, 2010; Mazzucato, 2018; S. K. Vogel, 2018).

This paper presents novel empirical data to examine the relationship between oil companies and government renewable energy through an economic geography analysis of the distribution of investment decisions. This article presents acquisition as a means to trace the relationship between large oil multinationals and state support policies, focusing on the relationship between acquisitions and individual states and the mobility of capital across borders. The data covers three decades of government renewable energy policy in solar, biofuels and wind technologies, starting from 1987 in the earliest deal available to 2019, before the global pandemic. The use of this original data allows us to link complementary sources of qualitative data, such as the use of press releases used to identify the link to government subsidies and grants to each acquisition deal.

The paper finds large incumbents to be strategic subsidy-takers. The analysis shows that corporations are sensitive to state policies and policy change. Oil corporations can have a relevant role in emerging markets for clean technologies but can also disengage from certain markets altogether. Until 2019, acquisitions in renewable energy did not follow oil and gas acquisitions everywhere but only in certain markets, which, nonetheless, are beyond their European home countries. For 30 years, oil majors have responded to the few strong mandates in their fuels business, biofuel blending in Brazil and the US, and for renewable energy subsidies in the electricity industry.

Finally, by analysing the history of oil multinationals' acquisitions in renewable energy and the government renewable spending programs, this article provides insights into the dynamics of emerging industries and incumbents in dominant industries. This research contributes to the literature on economic geography by providing empirical data on the evolution of financial decisions and their embeddedness in policy contexts. It also contributes to discussions on industrial policy by showing how global incumbents interact with emerging policy-supported markets and provides implications for climate change governance with an empirical discussion on oil majors' shortcomings for transformation.

2. Theoretical framework: An imbalanced deal between the state and global corporations

This article's analytical framework builds on the decades-old debate on the balance between the state and corporations' roles in shaping and creating new markets and innovation (Lazonick, 2010; Mazzucato, 2018; D. Vogel, 1989; S. K. Vogel, 2018). We consider this a question of balance between the state and corporations that must be assessed empirically. To establish the framework for this analysis, we revisit the literature on the political economy of corporations' participation in innovation and new market development, paying attention to both national state policy and corporations' strategic autonomy to shift across geographies.

Since the work of Fredrich List, Alexander Hamilton, and John Stuart Mill, to name key economic thinkers of the modern era, there is a recognition of the state's role in the development of new industries (Helleiner, 2021). But apart from national economic development, state economic policy for industrial progress is key to achieving targeted goals and promoting their subsequent maturity. Mazzucato (2018) reminds us that consistently the largest technological leaps have been supported by publicly funded innovation, but when the innovation grows to become profitable, the state is kept invisible from the innovation's history and, therefore, from any paybacks as an early funder. In this discussion, there is something else that emerges as problematic.

The role of the state in supporting risky innovation also has the purpose of establishing guidelines and priorities of what creates value for society. This might not appear to be evident because the state and society might not receive the benefits of its investments (Lazonick & Mazzucato, 2013; Mazzucato, 2018). Further, the state not only sets the guidelines for new energy systems, but it is also central in reproducing the systems that allow continued incumbency (Newell & Johnstone, 2018). For example, in fossil fuel subsidies, oil corporations have been successful in industrial coordination to ensure they keep access to the very same subsidies that guarantee them a key role in the energy sector and ensure their own incumbency (*ibid.*).

2.1 Corporations and renewable energy innovation

Corporations have an autonomous position to act regarding the climate crisis and climate innovation. However, assessing their role in supporting the progress and development of clean technologies is empirically challenging. In the Global North market of OECD countries, renewable energy support policies are ubiquitous and now largely expanded, yet the progress of this industry cannot be presumed as merely the result of policy, nor has the policy yet been able to push renewable energy systems to surpass the incumbent oil systems.

Certainly, in the discussion of innovation progress in the energy industry, corporation autonomy is key for driving and conducting innovation. Large corporates are usually conceptualised for their role in the economy as engines of wealth, employment, and value. One way in which corporations achieve their goals, like market position or innovation, is through acquisitions (Ahuja & Katila, 2001; Lee & Kim, 2016; Makri et al., 2009). States are key in setting rules that affect not only the types of national firms in a jurisdiction but also their own investment dynamics (Christopherson, 2002). Christopherson (2002) noted that the US economic regime was different to Japan's and Germany's, and each country's rules and bureaucracies were key in creating hubs for the advancement of different capacities that required distinct types of labour. A regime that tends towards labour mobility and, therefore, liberalisation, like in the US, favoured the speed of development of technological industries and suited their high failure rates, but was a weakness for developing industries that required a long-term investment horizon and employment, such as manufacturing and heavy industries. Differences in labour policy regimes had core influences in shaping the success of firms' investments, the firms' own structures and the resulting configuration of the national economy. The increase of globalisation and of multinationals in the economy, however, blurred the limits to what firms can access in terms of innovation and the necessary labour skills in time and space. Now we see firms as global governance actors present in multiple geographies at once and able to not only escape government mandates (Bartley, 2018b), but also shape these mandates.

Large corporate multinationals use acquisitions differently when investing in developed economies than when investing in emerging economies (Lebedev et

al., 2015), and given the reliance on policy support a similar distinction applies to their acquisition of emerging technologies. Since oil majors' acquisitions in renewable energy pursue a diversification aim, the classic drivers of acquisitions – such as maintaining market power, complementing the value chains of their business, strengthening network ties, and market expansion— do not serve to describe their acquisition motivations. Instead, we must turn to the role of institutions. Seminal studies have shown the key role of corporations in motivating acquisition behaviour in instances –or technologies— in which institutions already tend to malfunction (Meyer et al., 2009; Scott & Meyer, 1994). While in well-oiled institutional incumbent systems, institutions seem 'invisible' (ibid.).

Market-supporting institutions are important for economic actions and market development. However, how economic actors use to their advantage their capacity to pick and choose strong institutional hubs has been so far left out of the discussion. For instance, acquisition dynamics, as well as the type of mega-mergers large multinational corporations seek in sectors like agriculture and clean energy can have serious consequences for environmental governance in terms of concentration dynamics and in the types of control that emerge over crucial subjects of sustainability (Clapp, 2018; Clapp & Dauvergne, 2011).

2.2 State policy and renewable energy innovation

The development of new renewable energy technologies, like solar photovoltaics and wind, must be seen as the result of the international interconnection of value chains and industrial capacity developments. These need not be coordinated to have a global effect. As Jonas Nahm (2021, 2022) argues, the current solar energy industries developed within the complementarities of research, industrial production, and consumption dynamics of Japan, the United States, Germany, and China. These dynamics are defined by the interrelation between state policy and the national economic structure. When global corporations choose to invest or acquire specific technologies, they are also selecting the state policies they prefer.

Which renewable energy policy incumbent corporations seek when deciding to invest in renewable energy businesses? According to descriptions of renewable energy policy used by the International Energy Agency and the International Renewable Energy Agency, policies include aspects like targets or

framework legislation, strategic planning, technical regulation, codes and standards, or information mechanisms, tax arrangement, payments and transfers, and others (IRENA, 2018). These might all be relevant to a company; however, some are more directly relevant to a companies' investment decisions because they establish specific obligations —sticks— or offer concrete financial incentives —carrots. The policies are not deployed independently, but in configurations, usually referred to as policy mixes, that are specific to countries and change in time (Schmidt & Sewerin, 2018).

In western economies, renewable energy support policies started in response to the oil price crisis years before the United Nations Framework on Climate Change was signed. And while decarbonisation is the main goal of renewable energy deployment, energy security has also been a crucial driver of policy deployment (van de Graaf & Sovacool, 2020). Renewable energy policy has also evolved as a result of changing economics of technology, in particular with solar and wind electricity generation becoming more cost competitive with other generation technologies, also observable with EV and electricity generation technologies more recently (Breetz et al., 2018). In the late 2000s, venture capital expected and favoured government demonstration grants and Feed-in-Tariff (Bürer and Wüstenhagen 2009). More than a decade later, the support of the state seems crucial given prevailing funding inequalities between clean and fossil energy. For instance, research has found that firms involved in R&D for renewable energy are more prone to financing constraints, compared to businesses innovating in fossil fuels (Noailly & Smeets, 2022).

Combining these approaches to policy support to a systematic perspective of business investment. These assets are connected to the corporation through investment mechanisms like venture capital with a corresponding expectation of returns to investment. This distinction between the corporation and the assets is, at least in part, the result of the process of financialisation, which allows corporations to package business operations, technological goods, and even intellectual property as assets. And we will discuss further below how financialisation enables companies to strategically invest in groups of assets, as well as to sell and leave a particular business line.

A key difference across countries is the distribution of competencies across levels of government and political systems. However, within western democracies, the starkest difference is the distinction between unitary and federal states, and the distribution of jurisdictions between federal and state governments in the second case. In a country like France, regulation over transport fuels and electricity both happen at the national government, in the US only transport fuel regulation is competence of the federal government, while electricity regulation is shared between the two levels, with the choice of policy over renewable energy generation happening mostly at the state level (Shrimali et al., 2015).

3. Methodological framework

To observe the intersection of corporate behaviour and policy, this article approaches acquisitions as an economic action embedded in time and space. This paper produced an original database of mergers and acquisitions that provided access to unique data on the type of technology of the acquired targets, which allowed to distinguish between the oil-based business and to identify acquisitions on renewable energies.

3.1 Case selection

The focus on oil major companies was selected from the start of the study since these companies represent the epitome of relation between incumbent and emerging systems in the energy transitions and given their extensive propaganda and self-reporting on their scaling-up on renewable energy businesses. Between global oil majors, only European oil majors have been active in renewables (Pickl, 2019b), therefore, this study selected as cases the six largest oil and gas companies based in Europe: Royal Dutch Shell, BP, Statoil, ENI, Total, and Repsol, with the addition of DONG (now renamed Ørsted) as an extreme and unique case of transition of a major oil company into renewable energy. DONG fully transitioned in 2017 supported by an increasing acquisition activity starting in 2009 into wind technologies and electricity production and reached 30% control of the global offshore wind market in 2021.

3.2 Data

To build the acquisition database to trace renewable energy investments, three steps were followed. First, the merger and acquisition records for all seven companies and subsidiaries were obtained from the Refinitiv Eikon database, from the earliest record available in 1987 to 2019, before the start of the pandemic. In total, 3,540 deals were obtained on the total record of all M&A by this group of companies for 1987 to 2019. These deals were then manually coded using the deal description aided with search engines to classify each deal by type of technology, between oil-based and the types of technologies pursued in renewable energy. 211 acquisition deals fell into the renewable energy category, representing 6% of their total acquisitions. The categorisation also included the energy type, the type of deal and the location of the target (see section 4.1 and Appendix I). Much of the categorisation required revising up to 576 press releases which also were used to identify previous grants and subsidies in the history record of the acquired targets, which were also recorded in the database (further described in section 4.3).

For the analysis of government frameworks (developed in section 4.2), this research used both academic articles and an existing database from the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA) called Policies and Measures Database (available at www.iea.org/policies). This policy database includes the IEA/IRENA Renewable Energy Policies and Measures Database as well as other databases on energy efficiency and climate measures, and it provides data of policies from 1970 to date, searchable by policy, country, jurisdiction, and status.

The longitudinal data on acquisitions showed the acquisition behaviour of oil majors towards renewable energies. The focus on acquisitions serves mapping economic actors' shifting identities by using text sources related to the press releases from each acquisition, and as a reference to identify the spatial context that contains economic decisions —jurisdictions in this study— as well as its role in shaping them (Yeung, 2003). By tracing acquisitions back to their national contexts, jurisdictions and policies, the data sheds light on multinational corporations' relationship with renewable energy markets, as well as with the states and policies in place that support them.

4. Results

4.1 Firms' operations across countries

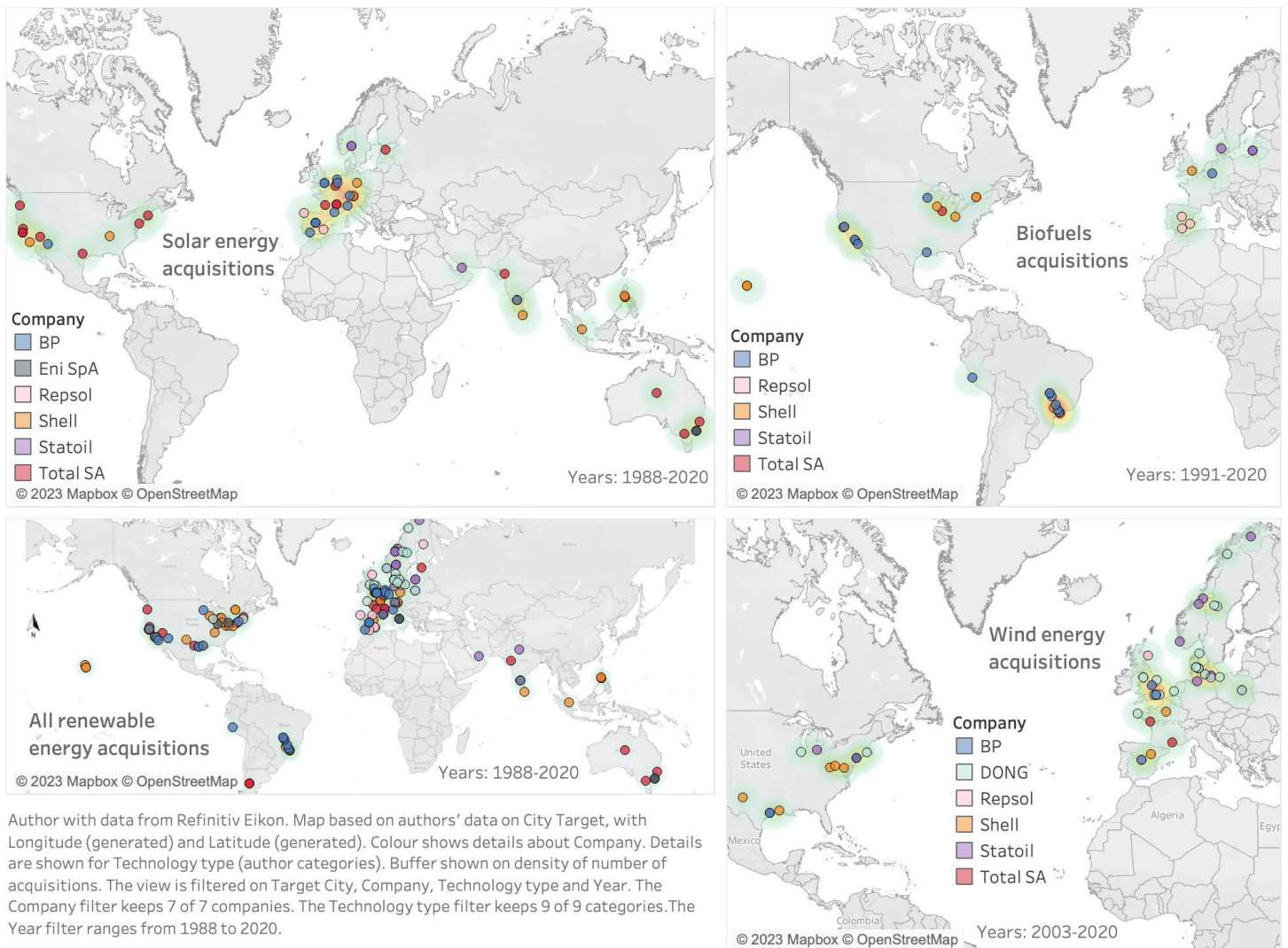
The initial analytic step consisted in identifying patterns in companies' investment geographically. Figure 1 depicts the location of all acquisitions in solar, biofuel and wind as recorded in the original financial database. Appendix 1 depicts the acquisitions in the upstream and midstream oil and gas industry. The exploratory comparison of this research shows a concentration of investment that do not correspond to the presence in the oil and gas industry.

Companies' acquisitions in renewable energy not always happen in locations where companies have other oil and gas acquisitions, which means that their renewable businesses acquisitions do not follow the usual places of oil and gas acquisitions. Thus, having existing operations appears to be a necessary condition. However, the distribution of acquisitions does not match the distribution of operations (see also Appendix 1), which means that having business capacity in a country is not a deciding factor for acquiring renewable energy assets in that same country. Moreover, investments are concentrated in Western Europe, United States, and to a lesser degree Brazil, India, and Australia. The remainder of the article will place special attention on European cases, the US and Brazil. However

Economies with active renewable energy policy started them under concerns of energy security but were later dominated by concerns from of environmental policy (in Europe), industrial development (Brazil) or a combination (United States). This motivates further investigation into the role of specific policies within these countries, and the sensitivity of companies to them. The earlier acquisitions in solar can be traced back to 1978 for Total SA and 1981 for BP aimed at leading national strategies of energy security, although the oldest recorded deal in solar in this database is an acquisition by Total in solar energy in 1988.

Figure 1. European global acquisitions per renewable energy assets

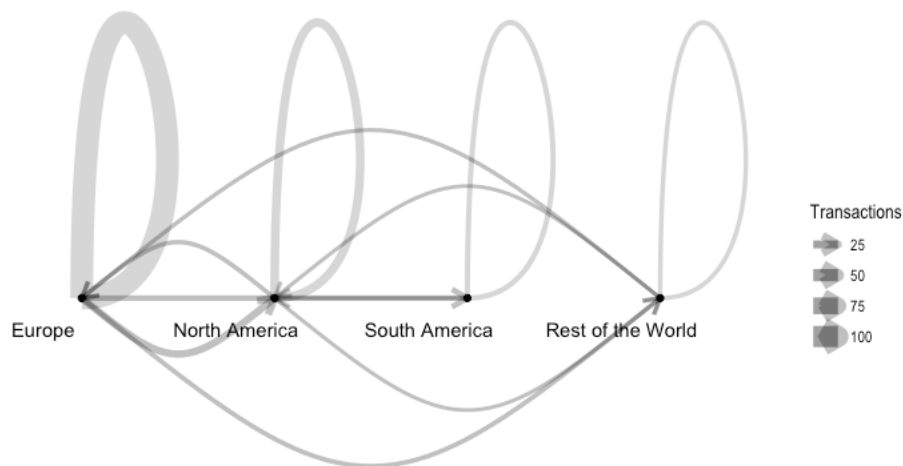
European Oil majors' acquisitions in Solar, Biofuels and Wind per city of Target



Using this data, a nation-centred view (common in policy studies) would misrepresent the nature of companies' involvement in the sector. Instead, an economic geography approach investigates how financial capital defines networks of relations between the location of a company headquarters and other markets (Wójcik et al., 2022). Figure 2 presents this structure of relations through depicting the regional location of the acquiror and the seller in each operation. The size of the arrow lines represents the place where the acquisition comes from, this is Europe —where European oil majors' headquarters are located—, the US —where all have at least one subsidiary—, South America—mostly Brazil—, and the rest of the world that includes Southeast Asia and Australia.

Figure 2 shows four loops which represent the links of intra-regional acquisition transactions. Most acquisitions by the seven European oil majors in this study occurred as intra-regional transactions. However, the acquisitions can also be operated from subsidiaries in other regions. This explains why the loop in North America is equivalent to the arrow from Europe to North America, as well as the arrow from North America to South America and the Rest of the World. This business practice offers another perspective on the relevance of pre-existing business operations previously discussed. The patterns of this geographical flow of capital require consideration for the types of business opportunities that companies find to lure them into a specific technological choice within a country, and to consider the relation between the temporal sequencing of acquisitions as a result of policy choices.

Figure 2. Flux of number of renewable energy deals per region, for BP, Shell, Total SA, Eni, Repsol and Statoil



Source: Author, with data from original database and Refinitiv Eikon. R for network analysis chart.

4.2 Acquisition/country policy regimes

Most European oil majors' acquisitions in renewables occurred in Europe, the United States and Brazil. In this section, we turn particular attention to those cases. Table 1 provides a summary of most acquisitions in the database grouped per periods for their analysis. This table describes the company, technology, years of acquisitions records, existing government support policy framework in the period,

and the evidence of specific state or international support grants that the acquired firm previously received.

The analysis shows that in all cases there were relevant support frameworks, but there are relevant differences by technology and country. For instance, the most important biofuels policy is a government mandate for a blending obligation, which provides refining and retail companies with a motivation for acquiring biofuels operations, even in the absence of direct financial support. However, as the evidence depicts, companies can still take advantage of technology support programs. In electricity generation technologies, support policies can provide a low-risk business, because incentives are based on guaranteed price. This was notably the case of feed-in-tariffs (FiT), and more recently competitive auctions for long-term contracts.

As described in the previous section, most acquisitions took place in Europe. Within the European Union, renewable energy deployment responds to two complementary policy systems. The first is the GHG emissions policy system anchored in the Cap-and-Trade system that imposes emissions limits across industries with a system of tradable certificated of emission allowances or European Trading Systems (ETS). The second system is specific to the energy industry with variances across countries. The European Union and its member countries defined policy goals, like 20% renewable energy by 2020 (set in 2008), allowing countries to set national support policies. But attending to free trade principles and EU internal market competition policies, most of the policies focused on demand side support policies. In the electricity industry these included renewable energy quotas, feed-in-tariffs (FiT) and renewable energy auctions.

The presence of FiT provides a window to understand the centrality of state subsidies or guaranteed payments in business choices. In Spain, for example, acquisitions in the early 2000s correspond to the early adoption of FiT, while divestment in early 2010s corresponds to the government decision to retroactively reduce payment under existing contracts following the fiscal stress after the Great Financial Crisis. In the UK FiT were adopted significantly later, not until 2010. For instance, the acquisitions of distributed solar companies in the country reflect the interest in the UK market only when FiT enable companies to acquire portfolios of long-term contracts.

The UK offers another unambiguous example of the centrality of policies, as acquisitions increased in the country after the introduction of the renewable energy auction system (commonly known as Contract for Difference – CfDs). To international energy companies, CfD on large wind offshore projects represent unique opportunities to acquire assets that are comparatively big in the industry. The acquisition of companies backed by the long-term contracts of the FiT or CfDs show a preference for low-risk (and potentially low returns) businesses. This aspect of acquisitions should be considered when assessing firms' motivations to invest in these businesses, potentially for non-economic reasons.

The renewable energy policy in the US and in Brazil is different to European renewable policy and reflects the type of acquisitions for the combination of two factors. First, the type of technologies targeted include a strong component of biofuels unlike in Europe and, second, both national governments have direct authority on energy regulation in their federal systems. In transport fuels, the government of the US and of Brazil hold concentrated authority to regulate biofuels blending mandates and have the resources to develop research and development (R&D) subsidy programs. However, in electricity only the Brazilian central government concentrates regulatory power, while the US federal government role is limited to issues of competition, leaving state governments to decide on the regulation of technology. To support clean technology, the federal US government has deployed a different range of instruments.

After choosing not to ratify the Kyoto Protocol, the US embarked on several policy cycles to attempt and enact an economy-wide emissions management system, like the European ETS, all without success. To date, renewable energy policy in the US has depended on specific sector policies. The first successful policy was the Energy Policy Act of 2005, which codified ongoing mechanisms to provide subsidies to renewable energy producers through tax incentives, in particular the Production Tax Credit, established first in 1992 and renewed since with broad bipartisan support. At an industry level, the tax credit has been criticised because it creates uncertainty about the future benefits of renewables, since evidence shows that when the tax credit lapses, the installation of new projects also falls. But when active, the tax credit offers important benefits for businesses with tax liabilities.

Table 1. Acquisitions and policy support

Acquirer firm	Country	Selected policy support	Acquisitions years	Number of acquisitions	Technology type of targets	Acquired firm's grant support records
Solar						
BP	Spain, Italy, India	FiT in Spain (2004-2012) and tax to PV plants from 2012 onwards.	2001-2009	4 acquisitions 7 divestments (2010-2012)	PV solar cell manufacturing. BP Solar expansion and market exit.	2003-2005 United Nations Environment Programme (UNEP) Indian solar loan programme for rural home systems.
Shell	Germany, Sri Lanka, India	FiT in Germany (since 2004).	2002-2009	1 acquisition 5 divestments	PV solar cell manufacturing, PV installation. Shell's solar market exit	World bank loans for off-grid solar PV to India and Sri Lanka. Global Environmental Facility (GEF) grant per unit installed. 2003-2005 (UNEP) Indian solar loan programme for rural home systems.
BP	UK	FiT in UK since 2010 after 8 years of failed quota scheme.	2018-2019	2 acquisitions	Solar electric power generation operator.	Fast track feed-in tariff high rate 2011, Multiple bank loans.
Total	France	FiT in France since 2001 but specially between 2006-2012. Total French fully state-owned until 2011.	2005, 2011, 2012	3 acquisitions	Solar manufacturing, PV installation.	30 years of public funds finance, fully French state-owned until 2011.
Total	USA	US Renewable Energy Tax Credit since 1992, renewed several times, some states renewable energy quota.	2011-2016	9 acquisitions	Solar production and global distribution.	30 years of multiple US Department of Energy (DOE) Grants (since 1970), funding from Associate Venture Investors and an R&D contract from EPRI, Solar America Initiative (SAI) 2009.
Wind						
DONG	Denmark, Germany, Poland, Norway, Sweden, UK	FiT in the UK since 2010, Quotas in the UK since 2002. Feed-in-premium in Denmark since 1999. Auctions (targeting offshore wind) in the UK (2014-15), Dema.	2009-2019	20 acquisitions 23 as seller	Wind turbine manufacturers, utility capacity, installation of wind turbines, owners and operators of wind farms, offshore installation services. Seller of built projects as part of business.	Industrial research and development (IFU) agreement with Innovation Norway to facilitate capital-intensive technology development, StatoilHydro LOOP program (fully state-owned), Innovation Norway grants. In Poland: subsidy contracts for difference (CfD) of price guarantee for offshore wind projects in the Baltic Sea.
Statoil	Norway, Poland	Direct subsidies in Norway since 2010 for offshore wind.	2007; 2011; 2018	2 acquisitions 1 as seller	Wind turbine manufacturer, wind farm operator (sell), wind farm construction.	
Biofuels						
BP	USA, Brazil	Public mandate in USA since 2005, Brazil since 1990s, R&D in US.	2000, 2008-2011, 2014, 2016-2019	14 acquisitions 1 as seller	Manufacturer of ethanol, ethanol production facilities, wholesaler of ethanol, producer of sugar and ethanol.	DOE Loan Guarantee Program, DOE demonstration-scale project for biofuel production facilities, USDA initial loan guarantee, 2011 Farm Bill's Bioenergy Program for Advanced Biofuels.
Shell	Canada, USA, Brazil, Argentina	Public mandate in USA since 2005, Brazil since 1990s, R&D in US.	2002, 2007, 2011, 2017, 2018	6 acquisitions 5 divestments	Bioethanol services, marine algae R&D, biotechnology company, manufacturer of biofuels, ethanol mills.	Canada federal government \$500-million investment fund to finance up to 40% of biofuels plants in 2007; USDA's National Institute of Food and Agriculture (NIFA) and DOE grant for Biomass Programs, part of the National Algal Biofuels Roadmap.

In contrast to the uncertainty of a tax break for renewable electricity, the US biofuels policy combines the enforcement of a biofuel blending mandate as part of the Energy Independence and Security Act with the use of generous R&D grant subsidies. The experience of the US on biofuels follows the earlier strategy of Brazil that in 1975 started its successful ethanol programme Próalcool for the large-scale production of sugarcane-based biofuel to guarantee the energy security of the country. By the 1990s, Brazil already had a high blending mandate, but it has progressively increased, providing certainty of a long-lasting motivation for global companies to acquire biofuel operations. As a point of reference, the national oil company of Brazil, Petrobras, has produced ethanol since it was established. BP instead entered the biofuel market as a reaction to the regulation of markets where it had downstream operations and fuel retail (Mojarro, 2014).

4.3 Firms' operations and public-facing politics.

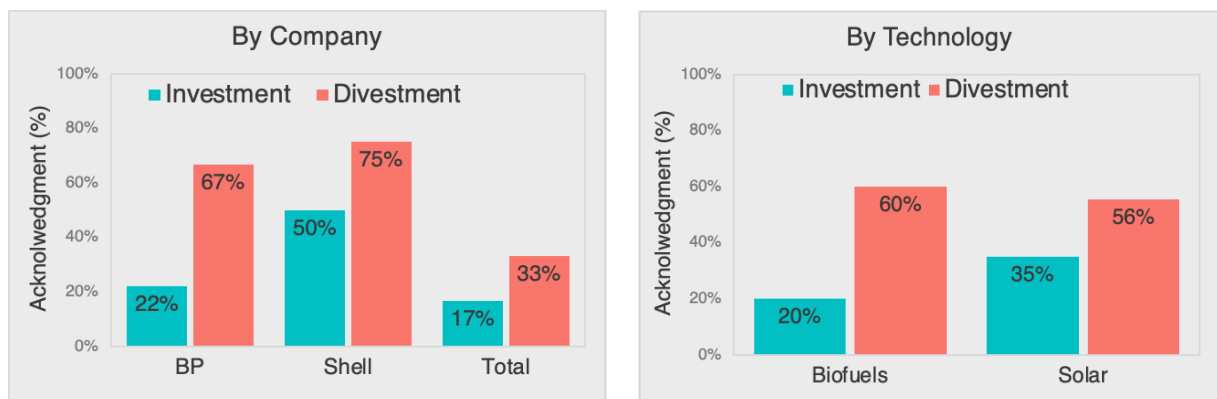
Despite the ubiquitous evidence of state support for renewable energy development, companies' public communications present a different picture. We used press releases to find out how often companies acknowledge the relevance of government subsidies or other policies in their acquisitions. We reviewed the press releases for the three companies with the most acquisitions, Shell, Total and BP, over the period on the two technologies, solar and biofuels, associated with subsidies in electricity markets and mandates in the fuels market. We expected to find acknowledgement of the grants, subsidies, government support, and policy interventions, as well as the existence of laws and regulations. However, the results showed that government interventions were more frequently acknowledged in divestments than in investment, as described in Figure 3.

There are important differences across companies (left side of the figure). BP mentions government policies three times more frequently in divestment announcements than for investments. Overall, Total mentions government intervention less frequently but twice more frequently for divestment than for investment. Shell, in contrast, mentions government frequently, in half of the investments but three-quarters of divestments.

For the technologies (right side of the figure), biofuel deals showed a low rate of acknowledgement in investment, with three times more mentions in

divestment announcements. The pattern for solar is similar for more moderate. Most biofuel investment acquisitions are in Brazil and the US. It is interesting that they do not mention government policies, even though biofuel markets have been the renewable energy technology that has benefited the most from government mandates, such as national requirements for companies to mix gasoline and ethanol. This could be an indication of the effect of a stable policy mix.

Figure 3. Acknowledgement of subsidies in press releases per company/technology



Source: Author.

5. Discussion

Government adopts new policies in the face of the failure of existing mechanisms, such as the UK adoption of auctions after the failure of renewable energy obligations systems. Countries can also learn from others, as the US did from Brazil's long history with obligations. Yet, national governments are not entirely free to choose the most effective policies. They are constrained by the structure of the state and historical institutional developments, which might also vary across industries, in particular the electricity industry and the fuels industry. The European national government has exercised their competencies to both establish obligations and economic incentives to support the deployment of renewable energy directly within the electricity market, whereas the US federal government has no legal competence to establish mechanisms like feed-in-tariffs or auctions in

the electricity industry because these are under the jurisdiction of states; leading the federal state to adopt other policy approaches, especially tax benefits.

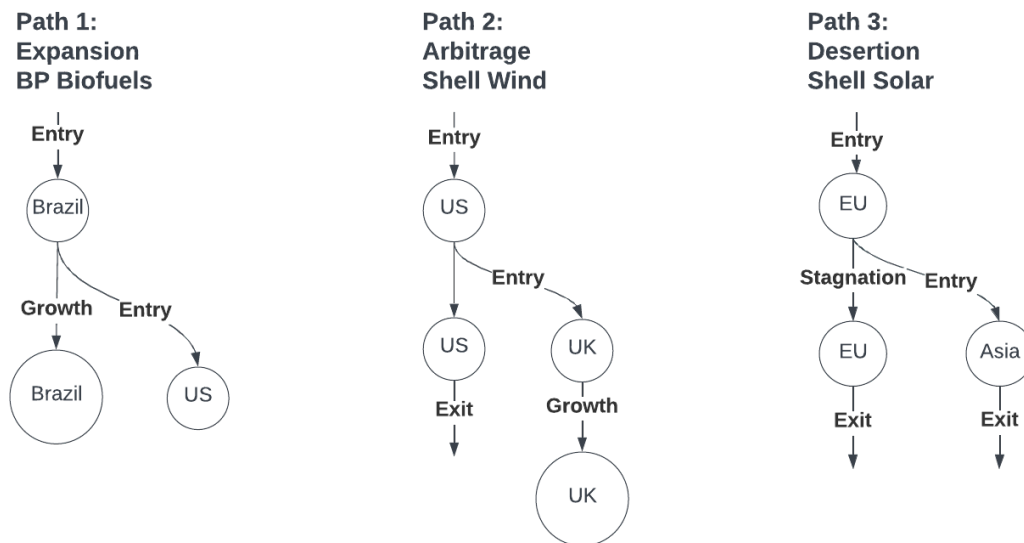
The policy review shows the use of multiple mechanisms to subsidise renewable energy in Europe, both in the form of obligations and in the form of payments and transfers. However, in the electricity sector, the timing of oil companies' decisions to join a market through acquisitions shows a preference for payment schemes that can guarantee revenues through long-term contracts, like feed-in-tariffs, premiums and, most recently, auctions –in opposition to renewable energy obligations targeting incumbent utilities. In contrast, in the fuels sector, oil companies are the target of obligations.

In contrast to the studies that consider national cases as independent units of analysis, in this project, we consider corporations' capacity to expand their business operations across countries or to shift across markets based on state policy. We consider three patterns of business choices: expansion, arbitrage, and desertion (Table 2).

Table 2. Patterns across companies

	Path 1. Expansion	Path 2. Arbitrage	Path 3. Desertion
BP	Biofuels	Wind, Solar	
Total	Solar	Wind	Biofuels
Shell	Biofuels	Wind	Solar
Statoil	Wind		
DONG	Wind		

These three patterns are exemplified in Figure 4. The first pattern, expansion, describes companies' decisions to enter new markets after the experience of a first market, as BP's choice to acquire firms in the US after the Brazilian experience illustrates. This expansion is not endogenous but the result of the sequencing of policy adoption, with blending mandates first in Brazil and later in the US.

Figure 4. Pathways of technology acquisitions

The second pattern, arbitrage, refers to the choice of entering and leaving markets based on the evolution of state policies. For example, BP left its solar business in the UK in the early 2000s and moved its brand BP Solar to Spain and Italy, leaving both a few years later by fully exiting the business. Eventually, BP returned 10 years later to the solar business acquiring one of the largest distributed solar producer companies in the UK in 2018. Founded in 2010, Lightsource, the most recent BP solar acquisition benefited from the first year of a high FiT rate. The third pattern is desertion, in which a few years after their entry companies simply leave or divest the previously acquired business across all their jurisdictions. Shell early entry into solar, but a later exit, as well as Total investments and later divestments in biofuels are examples of this later practice.

6. Conclusion

Government support of renewable energy ecosystems via grants, subsidies, mandates, and tariff structures has sought to make low-carbon industries grow. However, advanced renewable energy companies often migrate from being supported by state grants to being owned by incumbent corporations through a sequence of mergers and acquisitions. At least two issues emerge from these types of deals. First, the advertisement of these acquisitions of renewable energy

businesses as climate actions creates incentives towards greenwashing practices that are independent of the trajectory of the acquisitions. Second, these deals can be harmful to climate change governance and to the progress towards climate change mitigation by giving oil incumbents an opportunity to both slow down the competition while boosting their reputation. This article revisits the link between government spending in promoting the expansion of renewable energy businesses and incumbent global corporations' reaping these benefits.

This subject not only allows us to study a flow of assets and the development of innovation, but also to map corporate decisions as they move following different state-led incentives. By using corporate acquisitions of low-carbon innovations, this paper proposes a new way of testing and observing preconceptions of investment incentives, and the global reach of corporate power. In particular, we find corporations behave as global subsidy-takers when entering emerging markets in low-carbon technologies.

Policies' support creates ecosystems in which otherwise expensive isolated technologies such as low-carbon energy are in theory rendered profitable and interesting to capital. There are different approaches to states' role in market-making, from fully liberalised economies to higher regulation. However, the role and coordination between state policies and large incumbents has waned from scholars' interests. One reason is the appearance of globalised markets, where multinational leverage high capex while covering larger governance systems compared to states. Another reason is the rise of financialisation of solutions and the increasing role and size of the finance sector (Haberly & Wójcik, 2022). Excluded from that argument has remained the fact that large incumbents have prevailing power over the advancement of innovation in holding important shares of their emerging markets. Equally, understanding the role of the state is important for both the evolution of business and innovation and delimiting power asymmetries. Nation-states represent both companies' jurisdictions and governments' funding programs, and therefore contain the root of both finance and technology systems.

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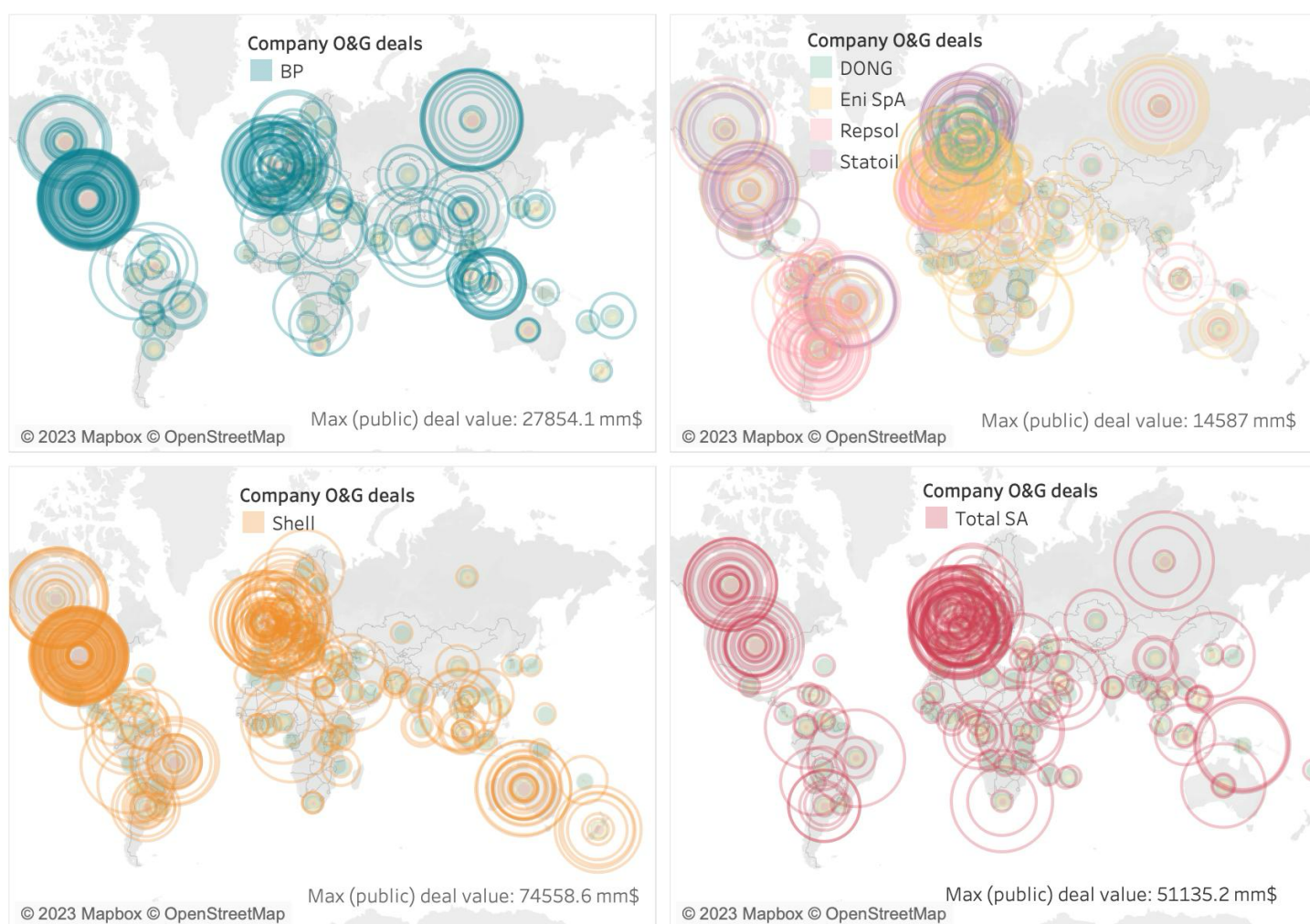
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Appendix I. Upstream and midstream data

As described in this article, the original database built for this research comprised all acquisition deals completed by the seven European oil majors in our sample. The Figure A1 below illustrates 2,461 deals recorded exclusively in oil and gas assets for the oil and gas Upstream and Midstream businesses. The figure shows how spread the oil and gas business is across geographies, but it identifies the US and Europe as the main location that concentrates a large proportion of acquisitions, and then activity is also shown in countries of know large oil and gas resources.

Figure A1. European global acquisitions in oil and gas assets

Upstream and Midstream M&A per deal value (1988-2020)

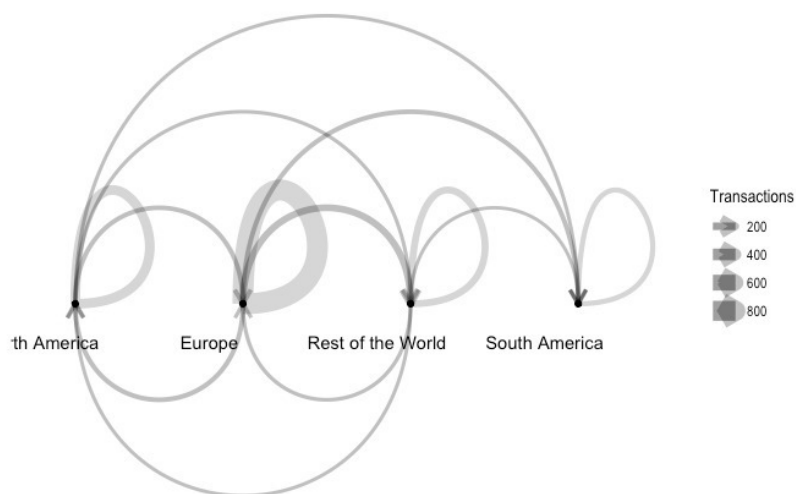


Author with data from Refinitiv Eikon. Colour shows details per Company. Size shows details about Deal Value. Density is shown for number of deals per Target Nation. The context is filtered per Company. The view is filtered on Technology type (author coding), which keeps Coal, Natural gas midstream, Oil and gas Upstream and Oil midstream.

In Figure A1, the size of the circle in the map is represented by the total amount paid by the company in each acquisition –or deal value. These acquisitions consisted mostly of leased areas for exploration and production, oil and gas projects, industrial chemical plants, refineries, and other companies in oil and gas Upstream and Midstream. It excludes pipeline, fleet, service stations, distribution and other parts of the Downstream business, as well as assets such as buildings, consulting services, restaurants, hotels, vehicle companies, between others. Compared to deals in renewable energy, most of the deals in the Upstream and Midstream business are public transactions so the value of the acquisition is disclosed. In renewable energy acquisitions, deals are held private, and the value of the deal is disclosed only in a few cases.

Figure A2 shows the acquisitions of the oil and gas business segments, and how the financial transactions are enacted across regions. Of all the regions considered, for the largest European oil majors their headquarters in Europe are still the centre of most of their financial operations, however this role seems to be coordinated with their subsidiaries in the US. Subsequent work on in this research could investigate if the balance has changed across periods of time or after financial crisis, following on current work in financial geography (Wójcik et al., 2022).

Figure A2. Flux of number oil, gas, plastics, and fossil fuel electricity deals per region, for BP, Shell, Total SA, Eni, Repsol and Statoil (1987-2019)



Source: Author, with data from original database and Refinitiv Eikon. R for network analysis chart.

CHAPTER 6

Discussion and conclusions

The thesis has studied through three substantive chapters three ways incumbent corporations use their investments as a form of power: in decision-making to advance low-carbon innovation, discursively to negotiate their role in transitions, and to capture opportunities across geographies. This concluding chapter presents the overview of the findings for the research questions and the main contributions.

1. Thesis summary and main findings

The overall aim of this thesis was to study dominant corporations' acquisitions as a source of power, influence, or control in the global governance of sustainable transitions. To address this aim, the thesis used the timeline of European oil majors' entries into renewable energy and followed three research questions. In each question, the three substantive chapters addressed three forms of power: decision-making power, discursive dominance, and on benefiting without questions from advantages.

Research question 1: What explains oil companies' support of climate acquisitions over time? The first research question was addressed in Chapter 3 by proposing a definition of innovation retention and a measure of the organisational effort to identify real intentions of maturing low-carbon business acquired over just 'grabs' of innovations. The chapter showed that, in the chain of renewable energy acquisitions, oil majors had different levels of innovation retention, and oil companies were found to have provided little to no effort to retain their acquired renewable businesses. The chapter identified moments in which the companies showed more effort towards their acquired businesses, showing that organisations have the ability and know-how to support emerging climate acquisitions.

In other words, the chapter showed that incumbent organisations do have resources to *decide* whether to push an innovation towards maturity, as well as have means to just to hold on to the acquisitions for public-facing purposes. The chapter discusses whether oil incumbents are obtaining another source of value out of 'clean acquisitions', one that is intended for showing climate alignment rather than pursuing market value. Thus, scant effort towards clean acquisitions is explained by the conflicting incentives in which public-facing politics interests prevail over market-driven. The ability of *deciding* over the 'clean' emerging businesses they acquire is the first side of power that the act of acquiring transfers to dominant incumbents.

Research question 2: How do incumbents frame their role in sustainable transitions to deal with environmental tensions? The second research question was addressed in Chapter 4, that presents an in-depth analysis of the strategic documents of the largest six European oil majors over the thirty-year period of study. This chapter focuses on how incumbents use their acquisitions in renewable energy in discourse and identifies the frames they construct to position a role for themselves in sustainable transitions. This chapter identified, first, that oil majors' use their activities (mostly all acquired) in renewables to buy themselves a seat at the table of climate discussions and solutions, and second, to set the terms of a business-as-usual in which oil always prevails.

The most frequent frame, business-as-usual, attempts to be conciliatory of renewables as complementary to oil and of their lower potential. But in moments of rising tensions –such as the Paris Agreement or global anti-fossil fuel movements— oil majors’ turn confrontational and challenge the adoption of renewables as ‘non-realistic’. Further, in confrontational frames oil majors’ also exhibit how they work towards influencing policy on climate change and champion policy solutions over others, providing a direct example of the link between frame and action. Little difference was found between companies, which also points towards how industry actors tend towards institutional isomorphism and conciliating similar interests. Yet, BP and Shell were the companies found to be the most confrontational of all. The ability to define their role in sustainable transitions and their role towards the development of emerging industries in renewable energy is the second side of power oil majors obtain from ‘clean’ acquisitions.

Research question 3: How do companies acknowledge and use subsidies in their green acquisitions? The third research question was addressed in Chapter 5, which mapped acquisitions as an economic action that happens within a context. The idea that oil companies have a key role to play, based on their large capital and capabilities, in advancing emerging technologies like renewables is predominant. Yet, this chapter shows oil companies do not necessarily invest in renewables where they operate, and do not take risks with their capital. Rather, they seem to behave as subsidy-takers with regards to renewable energy acquisitions. Their acquisitions concentrate in Western Europe and North America, places with subsidies and long-term fixed contracts.

Oil majors’ global scope also gets them to be able to pick and choose between countries, entering or leaving markets based on the prevailing policy of a given country. This chapter distinguishes between companies’ choice to expand in a renewable technology across markets, to arbitrage between markets, and to leave or desert all markets. Oil companies take advantage of the financialisation of ‘green’ assets and acquire companies with portfolios of feed-in-tariffs in solar energy or with long-term auction contracts in wind energy with lifetimes of 20 years or beyond.

Despite their ability to choose, they blame policy when divesting, but rarely recognise it as a reason motivating the acquisitions. For the case of acquisitions in biofuels, Chapter 5 discusses whether oil companies are targets of the blending mandates and are unable to avoid it unless they were to leave the retail market altogether. The ability to benefit from transition policies without being noticed and without questions is the third side of power oil companies obtain through their ‘clean’ acquisitions, where the benefit is owning easy businesses that grant oil companies with ‘green’ reputation.

2. Research contributions

The thesis originality steams from building a new type of database that describes acquisitions per their technology type and that allows to study emergent industries in their interaction with incumbents —a dimension prominent in oil majors’ and renewable energy dynamics. The attention to this type of data provides a novel way to study climate actions in large corporations, and to study innovation dynamics and incumbents’ behaviour in sustainable transitions.

This thesis problematises ‘clean’ acquisition investments, to point towards their relevance for understanding incumbents’ behaviour towards emerging ‘clean’ markets. The thesis reveals an overlooked aspect of incumbents’ behaviour and provides novel data and evidence to suggest dominant incumbents have conflicting interests towards innovations that hold strong social expectations. This is the specific case of technologies deemed favourable to addressing climate change, and the ones more urgent to support through investments. Instead, ‘clean’ acquisitions for public-facing instead of market-driven interests end-up captured by incumbents at the expense of innovation advancement and development. This conceptual contribution is relevant for the understanding of markets, the behaviour of economic actors in the context of climate change, their governance, and legal research on anticompetitive practices.

Finally, the thesis covers in its three main chapters three important aspects of business control over emerging markets that have consequences for the global governance of corporate actors, as well as the global governance of climate change.

In doing so, the thesis echoes in its three main chapters the three faces of power of Lukes (2005), as it shows three ways incumbents exert financial, ideological and material control over emerging industries.

3. Limitations and future research

The thesis is bounded to the observation of oil majors and renewables dynamics, but the evidence and problematisation provided could be expanded to other instances of incumbents with conflicting interests towards emerging technologies. In this sense, this research provides the start of an avenue to explore market transactions like M&A data for the interest the type of technology might carry. Some of the areas this research can spill towards is taking the long tradition of economic and financial research and ask how some questions might be different if the types of assets are differentiated by 'clean' and 'dirty' technology. For instance, the seminal theory of signalling and information exchange in markets could use this framework to test if the type of information agents exchange follows different incentives when there are reputation expectations towards a green behaviour. One aspect that is relevant to note here is that firms know that after acquisitions are completed and innovations are added to a companies' portfolio, to date there is very little checks of what a company does with the innovation since it is assumed the market puts an incentive in making profit out of investments. A complementary argument needs to be developed to identify the other sources of value obtained from transactions loaded with social-expectations or, said it otherwise, of reputation-carrying deals. This thesis already presented a first step on the information that can be obtained from press releases and oversees potential to study it as a text source for information exchange between managers, investors, and the new carbon-asset capitalist regime.

Equally, this research has discussed how greenwashing can be identified in patterns of behaviour that go down to the strategic and financial decisions of firms, one in which the decision to not support an innovation in a business portfolio seems to be proactive and even political. Research needs to study next if there is a correlation between acquisition investment for green reputation gain and active

lobbying efforts of companies, either as pro-supporters of renewables or against more ambitious climate policy. The lobbying activity of oil majors is known to be high in influencing and opposing climate action, however in recent years there is a divide observed between US oil majors –more outspoken and political— and European oil majors –that seem more conciliatory yet nonetheless involved in climate policy. Such research would prove if investments in ‘green’ assets are also used as part of the political activity of firms.

This research has shown just the start of the potential of using M&A data to observe the economic decisions of companies across geographies to study and understand the different contexts and their influence in different behaviour patterns in firms. Further research could take acquisitions to observe different cultures investing behaviour and different types of capitalism coexisting across regions in the context of carbon asset management and climate policy. In this respect, this thesis has shown hints on how the French state might show a closeness and coordination to Total SA that is different to how BP and Shell relate to the UK, US, and Netherlands, in the development of renewable energies. Furthering research on this distinction will contribute to pinning down more clearly the role of states and corporations in advancing common social interests, and how coordination emerges to be more fruitful and the type of relation and context that create spaces for anticompetitive and inefficient practices, that might harm valuable assets for global carbon governance.

Studying other industrial sectors of relevance for climate change policies, such as the chemical and the agricultural industry could be fruitful to observe if the same dynamic is replicated towards ‘clean’ industries in bioplastics, biofertilizers, alternative proteins and circular systems. Similarly, more research will be needed to grasp the consequences of oil industry interference with the renewable industry, knowing that for the oil sector these assets have been almost negligible, but for the renewable industry it has meant up to a third of their total market.

This thesis has explored the role of transition policies in providing benefits to this behaviour, but beyond policies, universities and other international organisations are also part of this chain of innovation. Finally, future research can build on this thesis and define a new type of business power over innovation as

well as study the effects of business investments as an overlooked aspect of the global governance of corporations.

4. Insights for policy and strategy

To policymakers, this research provides empirical grounds to be sceptical on oil majors' commitments to transition towards climate aligned pathways. While writing the final edits on the thesis, BP –once one of the most ambitious in its climate transition plans pledging to grow renewables as up to 40% of their business— has just backtracked its climate and transition commitments. Similarly, Shell has just announced the company will reduce its renewables spending while investing in more oil exploration and production fields. These companies have learnt to navigate the new capitalist carbon-asset regime —where carbon assets change the value of economic transactions and risk— and they do so by a systematic back and forth of creating trust and hope in their interest in clean energy while really protecting their main oil business interests. This practice is widely regarded as greenwashing, in the way companies tend to seek benefits out of advertising desirable environmental actions or features of their products but falling short at completing or ensuring them.

Greenwashing as a deceiving practice has more recently been addressed at court in litigation cases raised against companies, or by advertising regulatory entities. Shell, for instance has been brought to court over greenwashing on carbon offsets advertisements, and over falsely and misleadingly portraying natural gas as clean and under a 'renewable' category in their operations, as well as famously losing a court case in The Hague in 2021 for failing to do more to reduce emissions. This research contributes to these efforts by providing empirical work to expand and detail 'greenwashing' practices as something more systematic also seen in how oil majors invest and acquire environmentally valuable assets to portray interest beyond what is in practice allocated for their development.

In practical terms, the recommendations to policy and to the global governance of transitions is a call to, first, establish the need to build more tools to observe corporations and multinationals own behaviour regarding climate change

and to propose their market activity as one of the main arenas that must be enquired for potential regulation, such as other aspects of M&A to correct anticompetitive practices. Second, this research invites to reconsider the role given to oil incumbents in the oil transition, particularly in the Western World where publicly owned corporations are considered one of the potential largest investors for the clean energy transition.

The key policy insight for the European countries, is that subsidies for renewables should reflect the risk and possibility of acquiror incumbents that backtrack or even slow down the effort pursued in the policy. Concrete quantitative mandates in the case of transitions would be required if governments expect oil companies to transition, and even more to 'lead' the transformation. Otherwise, governments and public officials should not assume oil companies will provide the resources and effort required to build emerging clean technologies into efficient and profitable industries just because they are willing to invest on it, usually up to 5% of their total capex. Equally, this thesis has shown the power that oil and gas firms hold in climate change and energy planning, and therefore this empirical work shows we need more policy work and policy research towards establishing a progressive scale back of oil and gas activities.

In terms of companies' strategy, and business management, this thesis has provided empirical materials and concepts useful for managers to adjust their planning towards new ventures and renewable business units. For instance, the main takeaway presented in this study is that to provide support and growth to non-core or novel acquisition businesses, acquirors need to ensure there is a vision for such acquisitions equally to there is room within the organisation for the new venture to create synergies. The cases observed in the thesis that presented acquired renewable businesses developed under units of marketing and corporate relations showed little retention and development of the innovation and was instead inefficient both for the market and for the acquiror in the long run. Many oil majors studied reported losses after their exits of unsupported innovations, and most had to return to the development of the same technologies that they once turned their backs on. BP and Shell were each the largest renewable companies in the world once holding up to a third and a fifth of the total market, a position that

if kept could have been enormously beneficial to the business itself and to society in our present times. Companies could be watched closer in their behaviour towards environmental investments, and a direct avenue to contribute to this would be to include the technology categories in financial data providers such as Bloomberg and Eikon.

In terms of implications for decision-making, new avenues of research could also expand this study on 'green' acquisitions to be specifically related to anti-competitive practices and antitrust legal research and litigation. This thesis points to an area of potential regulation of mergers and acquisitions to ensure the protection of emerging industries against anticompetitive and inefficient practices.

Lastly, NGOs and advocacy groups have been the most relevant actors in ensuring climate ambition is protected and pursued and this research provides evidence on records of investment to question the moments where critically oil incumbents had the resources and capacity to support and develop renewable energy businesses, along the lines oil majors' themselves declared to their investors, but they chose to keep them loose.

5. Concluding remarks

Since acquisitions are central to innovation consolidation and to market expansion, it is not surprising that large incumbent businesses have built their role in low-carbon transitions through investments in low-carbon intellectual property, innovations, and assets. Both corporate ownership and investments in low-carbon innovations are presented in annual reports as climate actions, and third parties use 'green' corporate acquisitions as a measure of climate affinity and progress. This thesis points towards conflicting interests in the types of value sought out of green acquisitions and has argued that these seem to play a public-facing purpose, or a role in sustaining power over emerging industries, instead of been driven by a market pursuit. The consequences of these dynamics can be profound, as it could point to the weakness of market-driven solutions for solving climate change.

References

Lukes, Steven. 2005. *Power: A Radical View*. 2nd ed., Basingstoke: Palgrave Macmillan.

Appendix: List of publications and statement of co-authorship

This thesis main chapters are comprised of work that will be submitted to the following peer-reviewed journals:

- **Pierard, E.**, Acquisitions and innovation: How incumbents retain clean innovations within system transitions. Submitted to *Research Policy*.
- **Pierard, E.**, Framing climate tensions: How organisations' role in sustainable system transitions vary across time. Submitted to *Business and Society*.
- **Pierard, E.**, Valenzuela, J. M., Subsidy-takers: Oil majors' role in sustainable innovation in the global business of acquisitions. Under revision after editor comments for *Review of International Political Economy*.

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To Whom It May Concern,

I, Dr Jose Maria Valenzuela, certify that Elena C. Pierard completed the majority of the work in the journal article "**Subsidy-takers: Oil majors' role in sustainable innovation in the global business of acquisitions**", which form part of her DPhil thesis.

Signature:

A handwritten signature in black ink, consisting of a stylized, cursive script that is difficult to decipher but appears to be the name of the signatory.

Date: 23 February 2023



The School of Anthropology and Museum Ethnography incorporates:

The Institute of Social and Cultural Anthropology
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The Centre on Migration, Policy and Society
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