Computational Analysis: How ExxonMobil Frames Climate Change's Market Risks

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Abstract

For fossil fuel companies like ExxonMobil, public discourse is critically important, as appealing to the public- and investors- provides the capital that facilitates their growth and survival in the market. Despite the environmental and financial risks of climate change, there remains an acute disconnect between the outward facing statements of fossil fuel companies and their actual actions. My research partners the programming language R and Chat GPT4o-Mini with climate communication expertise to answer the question: how has ExxonMobil's discussion of climate change within the "market levers" frame changed over time? In the past decade, ExxonMobil employed the "market levers" frame the most in June of 2019, March of 2021, and March of 2024, consistent with a general upward trend in frequency of the linguistic frame. 2015 reported the least number of press releases that included the frame, while 2019 included the greatest frequency. I conclude that ExxonMobil's press releases discuss climate change via the "market levers" frame on a cyclical basis when calculated across a rolling 12-month average. This data provides a baseline for future climate communications research, beyond the scope of historical exploration. By employing R and ChatGPT, my work was able to examine a large corpus of climate change-related passages from Exxon's press releases and identify patterns in the text that previous literature has been unable to manually identify. This primary data can be used to establish connections between different regulatory frameworks, financial risk, and climate-related communication in the energy industry at large.

Introduction

There is near-universal consensus (between 97%- 99%) in peer-reviewed scientific literature that the climate is changing as a result of human activity.[1] Scientific evidence shows that climate change is getting worse, with higher levels of carbon in the air causing more frequent and severe weather events. Climate change also bears significant risk economically, with the Potsdam Institute reporting that the global economy is about to lose roughly 19% income in the next 25 years.[2] Despite these risks, financial institutions have continued to fund fossil fuel corporations and carbon-intensive industries while placing significant pressure on consumers to reduce their individual carbon footprint (flying less, buying second-hand, etc). Appealing to financial institutions is critically important for fossil fuel companies, as financial backing provides the capital that regulatory frameworks support and can organically create a market where sustainable technology and practices are affordable and effective. Barring simple market pressures arising from the aforementioned climate-related financial risks, regulatory pressure has also affected financial institutions globally. In March of 2024, the Securities and Exchanges Commission (SEC) adopted rules that enhanced and standardized climate-related disclosures for public companies and those involved in a public offering for the benefit of investor relations and transparency.[3] Yet there still remains an acute disconnect between the outward facing statements of fossil fuel companies and their actual actions, which are a much more poignant litmus test of their legitimate commitment to climate action. How do fossil fuel

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[1] World Economic Forum. (2024, July). *Navigating climate risks: Key strategies for resilient financial institutions*. World Economic Forum. https://www.weforum.org/stories/2024/07/navigating-climate-risks-key-strategies-for-resilient-financial-institutions/#:~:text=Climate%20risks%20can%20affect%20business,repay%20debt%20and%20company%20valuation

[2] National Herald India. (2024, October 24). *Climate change threatens global income by 2049*. National Herald India. https://www.nationalheraldindia.com/environment/climate-change-threatens-global-income-by-2049

[3] U.S. Securities and Exchange Commission. (2024, March 6). *SEC proposes enhanced climate-related disclosures for investors*. U.S. Securities and Exchange Commission. https://www.sec.gov/newsroom/press-releases/2024-31

companies view climate change, and how does their communication enforce or disguise those sentiments?

By analyzing public statements made by major energy corporation ExxonMobil, this thesis will explore how fossil fuel companies have shifted their public discourse on climate change. The project will analyze roughly 10 years of press releases from ExxonMobil. By partnering programming language R with Chat GPT4-o Mini, I will first sift through Exxon's press releases (pulled from database Lexis Uni) to identify sentences and phrases that meaningfully refer to climate change or climate-related risk, under the "market levers" frame. Then, I will employ prompt engineering to create a coded set of instructions- or prompt- that will guide the Machine Learning (ML) platform, Chat GPT4-o Mini, to extrapolate those classifications out to ExxonMobil's press releases from 2015-2024. This method will allow me to quantify how the frequency of Exxon's climate-related discourse has changed over time, addressing a critical lack of extensive research into both the fossil fuel industry's climate communication and the use of automated text analysis within climate communication research. This primary data will be used to establish connections between different regulatory frameworks, financial risk, and climate-related communication in the energy industry.

Background

As stated in the Paris Agreement, to "limit global warming to 1.5°C, greenhouse gas emissions must peak before 2025 at the latest and decline 43% by 2030".[4] However, no urgent action has been taken, particularly lacking from the fossil fuel industry and the financial industry

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[4] National Whistleblower Center. (n.d.). *The role of banking in climate change*.
https://www.whistleblowers.org/the-role-of-banking-in-climate-change/#:~:text=Several%20major%20banks%20have%20acknowledged,introduced%20"sustainable"%20index%20funds

which have both greatly contributed to the Earth's warming over the past century. While fossil fuel companies and deforestation-linked industries (agriculture, forestry, etc) are the primary drivers of climate change, almost all of these companies are dependent on support from major financial institutions.[5] Banks provide loans for expansion, investment banks provide underwriting services that help companies issue new stocks and obtain debt financing, and investment companies continue to gain the price upside from including fossil fuel companies in their portfolios. Historical evidence records that as of 1959, "Big Oil" executives understood both the importance of climate change, as well as their role in the warming of the atmosphere- industry scientists working for like ExxonMobil and British Petroleum (BP) confirmed in the late 20th century that "beyond a reasonable doubt", climate change can and should be attributed to human activity and fossil fuel use beginning during the 1800s. [6] As such, fossil fuel companies scrambled to promulgate campaigns to plant doubt in the public's mind surrounding both the scientists and the science that inform climate action in order to protect their portfolios and continue making money. For example, Shell's 1998 Report "Climate Change: What does Shell Think and Do About It?" acknowledges the connection between the prolific burning of fossil fuels and the warming of Earth's atmosphere. Despite explicitly acknowledging their role in the climate crisis, Shell did not pledge to reduce emissions- instead, they claimed to fight climate change by continuing to foster economic growth and technological innovation via extracting oil and natural gas.[7] Evidence shows that ExxonMobil echoed the same market strategies,

[5]National Whistleblower Center. (n.d.). *The role of banking in climate change*.
https://www.whistleblowers.org/the-role-of-banking-in-climate-change/#:~:text=Several%20major%20banks%20ha
ve%20acknowledged,introduced%20"sustainable"%20index%20funds
[6] Georgetown University. (n.d.). *Defense, denial, and disinformation: Uncovering the oil industry's early knowledge of climate change*.
https://commonhome.georgetown.edu/topics/climateenergy/defense-denial-and-disinformation-uncovering-the-oil-in
dustrys-early-knowledge-of-climate-change/
[7] Shell International. (1998). *Profits and principles: Does there have to be a choice?*https://www.climatefiles.com/shell/1998-shell-report-think-and-do-about-climate-change/

intentionally diverting blame away from themselves by claiming that technological innovations

and geoengineering will "reduce the potential risks posed by climate change." In fact, major

fossil fuel companies have been found to engage in a new form of climate denialism:

greenwashing. Greenwashing is misrepresentation by a company of their products, services, or

climate goals to be more environmentally conscious than in reality to attract sales and

investment. Not only a marketing strategy, greenwashing tricks an eco-conscious public into

favoring that company because they believe the organization is taking climate action seriously. In

reality, fossil fuel companies seeking investments for their ventures are only contributing to the

problem by misleading the public, allowing for a continued ability to extract the resources they

need to fuel their own profit margins.

Climate Communication: Why Does it Matter?

A growing body of literature investigates the role of climate change communication in

shaping the debate surrounding the Earth's warming and influencing policy on a broader scale,

particularly the role of framing. A frame, in the context of communication, can be visualized as

linguistic guardrails established by the orator or author that guides the audience's perception of

what they are reading, seeing, or hearing. A frame is intended to set a certain train of thought in

motion, and is established intentionally through a series of choices the author or speaker makes:

how they introduce a topic, the sequence of components of a message, (the order), even the use

of rhetorical devices such as emphasis and metaphors can guide a frame.[8] Communication is

critically important with regards to the climate crisis, because public perception of the issue- or,

conversely, reinforcement of climate denial- can be shaped by the way media sources,

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[8] FrameWorks Institute. (n.d.). *What's in a frame?*
https://www.frameworksinstitute.org/articles/whats-in-a-frame/#:~:text=A%20frame%20is%20a%20guide,put%2C
%20every%20communication%20is%20framed

politicians, and corporations frame climate change. Research has demonstrated a particularly polarized perception of climate change, specifically along partisan and ideological lines.[9] The Yale Program for Climate Change Communication (YPCCC) outlines how one of the central tenets of effective communication is "know thy audience", which requires an understanding that to shape public engagement with a topic (such as climate action) you have to first understand the diverse and often conflicting ideological, political, or cultural beliefs that inform their propensity to accept climate change, let alone be called to act upon it.[10] Through studies conducted in 2008, the YPCCC established "Six Americas" of global warming, parsing each "America" into a different category of belief system surrounding the climate crisis. As of 2023, the Six Americas can be divided into the categories shown below.

Alarmed 28% — **Concerned** 29% — **Cautious** 15% — **Disengaged** 6% — **Doubtful** 11% — **Dismissive** 11%

Highest Belief in Global Warming
Most Concerned
Most Motivated

Lowest Belief in Global Warming
Least Concerned
Least Motivated

Global Warming's Six Americas, Fall 2023
Base: 1,033 U.S. adults
Source: Yale Program on Climate Change Communication;
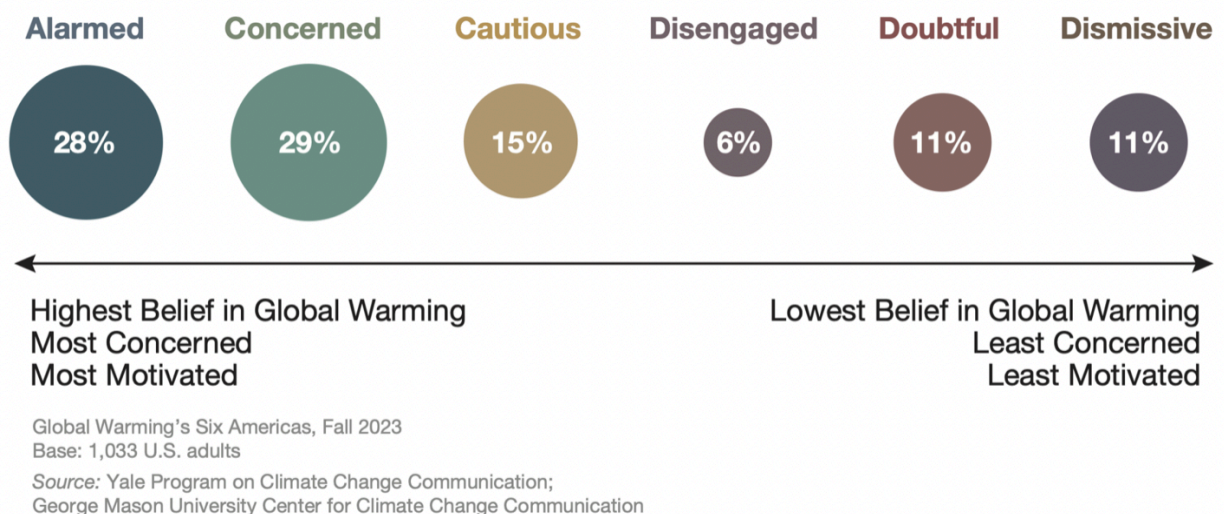George Mason University Center for Climate Change Communication

Figure 1. Global Warming's Six Americas, ranging from "Alarmed" (individuals who are the most concerned about global warming and the most motivated to act) to the "Dismissive" (believe in global warming the least, and are simultaneously the least motivated to act). Taken from Yale Program for Climate Change Communication, 2023.[11]

[9] DeYoung, S. E. (2009). *The role of public health in climate change prevention. Environment: Science and Policy for Sustainable Development*, 51(2), 12–23. https://www.tandfonline.com/doi/pdf/10.3200/ENVT.51.2.12-23
[10] Yale Program on Climate Change Communication. (2023.). *Global Warming's Six Americas.* https://climatecommunication.yale.edu/about/projects/global-warmings-six-americas/
[11] Yale Program on Climate Change Communication. (2023). *Global Warming's Six Americas, Fall 2023.* https://climatecommunication.yale.edu/publications/global-warmings-six-americas-fall-2023/
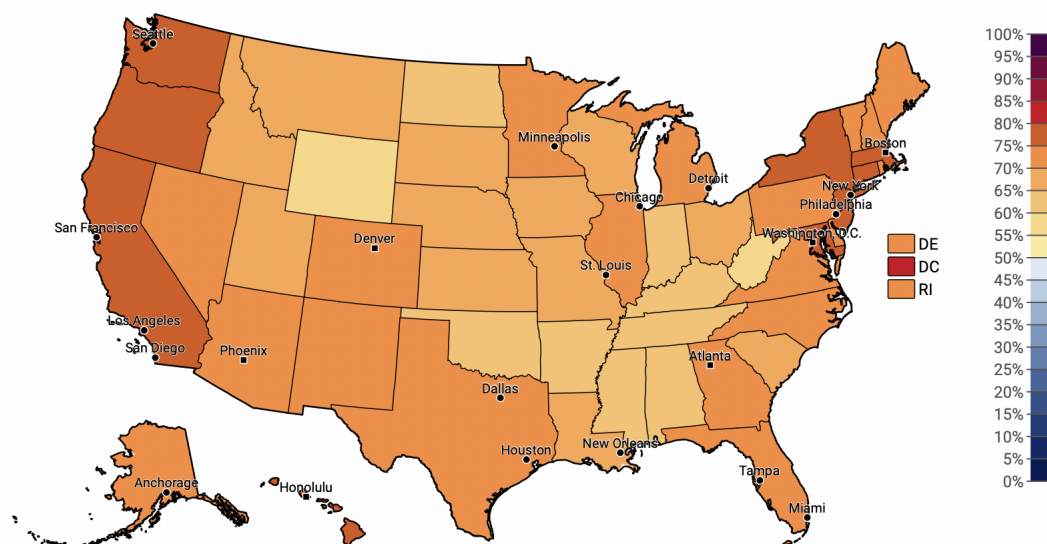
Figure 2. Estimated % of adults in the US who believe climate change is happening. The national average is 72% as of 2023. The estimates are derived from a statistical model using multilevel regression on a large national survey dataset (n>31,000), along with demographic and geographic population characteristics. Taken from the Yale Program on Climate Communication. [12]

Since this research was first conducted in 2008, media sources have only grown more

fractured along ideological and cultural lines. Social media sites like Instagram, X (formerly

Twitter), TikTok, and FaceBook have all contributed to the spread of climate misinformation that

undermine scientific evidence and solutions. Social media algorithms are trained to deliver to the

user content similar to that which you have interacted with in the past. This can create echo

chambers in a positive feedback loop- if a user interacts with one post that might contain climate

misinformation, more content will appear because the platforms feed on the users' continued

validation. Research demonstrates that systematic attempts to sow doubt in climate science by

various actors (fossil fuel companies, ideological groups identified within the "Dismissive"

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[12] *Yale Program on Climate Change Communication. (2023.). Yale Climate Opinion Maps. https://climatecommunication.yale.edu/visualizations-data/ycom-us/*

typography in Figure 1, for example) have increasingly been found on social media platforms.[13]

Research also suggests an intersection of actors from various categories. A 2020 study conducted

by the National Academy of the Sciences compared various election cycles (local, state-wide,

national) and found that oil and gas companies consistently provide financial sponsorship for

candidates who openly take a dismissive and skeptical tack to environmentalism or global

warming.[14] Anthropogenic global warming has been consistently documented by climate

scientists globally- however, from the outset, there has been an organized "disinformation"

campaign that has capitalized on the iterative nature of research and the inherent uncertainty that

comes with the scientific process to generate skepticism, denialism, and even techno-solutionism

to "manufacture uncertainty" surrounding anthropogenic contributions to climate change.[15]

Skepticism, or the doubt as to the truth of something presented, appears healthy, but climate

scientists and communicators alike concur that there is next to *no doubt* as to whether or not

human activity has contributed to rising global temperatures. This campaign has been waged by

a coalition of industrial (fossil fuel) interests and conservative think tanks that are often assisted

by a small number of "contrarian scientists" and conservative media outlets who have created a

culture of denial disguised as "healthy" probing into the legitimacy of climate science.[16]

However, it's critical to understand that this skepticism and denialism- strategically posed as

[13] Mildenberger, M., & Tingley, D. (2019). *Beliefs about climate beliefs: The importance of second-order opinions for climate politics. Wiley Interdisciplinary Reviews: Climate Change, 10(1), e665. https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wcc.665*

[14] Goldberg, M., Marlon, J. R., Wang, X., van der Linden, S., & Leiserowitz, A. (2020). Oil and gas companies invest in legislators that vote against the environment. *Proceedings of the National Academy of Sciences of the United States of America*, 117(10), 5111–5112.

[15] Feldman, L., Hart, P. S., & Milosevic, T. (2015). Polarizing news? Representations of threat and efficacy in leading US newspapers' coverage of climate change. *American Behavioral Scientist, 57*(6), 693–714. https://journals.sagepub.com/doi/full/10.1177/0002764213477097

[16]Feldman, L., Hart, P. S., & Milosevic, T. (2015). Polarizing news? Representations of threat and efficacy in leading US newspapers' coverage of climate change. *American Behavioral Scientist, 57*(6), 693–714. https://journals.sagepub.com/doi/full/10.1177/0002764213477097

reasonable mistrust- has played a crucial role in tearing down trust in climate scientists and policy makers who push for climate action. 97% of climate scientists agree that climate change is real, it is caused in large part by anthropogenic burning of fossil fuels, and it must be slowed or stopped as quickly as possible.[17] Yet, by appealing to those who fall under the "doubtful" or "dismissive" categories in the Six Americas map shown in Figure 1, these actors have effectively delegitimized not only climate scientists' ability to accurately study the Earth's patterns, but also the existence and scale of global warming.[18] The spread of climate misinformation on social media is particularly dangerous as it increasingly polarizes those who hold climate misconceptions away from those more receptive to act upon the urgency of global warming.

Climate Communication: Fossil Fuel Companies

While research surrounding fossil fuel companies' communication with regards to climate change is prolific and impactful, few sources have analyzed climate-focused communication from an investment-focused perspective. Thus, this project focuses on press releases from ExxonMobil from the last 10 years (2015-2024), and will study how the company discusses climate change within the frame of "market growth/ market risk" to incorporate the financial tact under the assumption that market risk and growth, within environmental risks, entails how the corporation views their interactions with climate change. These growth and risk touchpoints fall under the "market levers" frame found within Exxon's press releases. Market levers refer to aspects of the market (American and otherwise) that have been identified by ExxonMobil as factors either shifting ExxonMobil- and fossil fuel companies- towards or away

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[17] NASA. (n.d.). *Do scientists agree on climate change?*
https://science.nasa.gov/climate-change/faq/do-scientists-agree-on-climate-change/
[18] Ecker, U. K. H., Lewandowsky, S., Cook, J., Schmid, P., Fazio, L. K., Brashier, N., Kendeou, P., Vraga, E. K., & Amazeen, M. A. (2022). The psychological drivers of misinformation belief and its resistance to correction. *Nature Reviews Psychology*, *1*(1), Article 1. https://doi.org/10.1038/s44159-021-00006-y

from sustainable divestment and climate-focused action. This project will enumerate the factors

that ExxonMobil deems relevant to the energy transition (or lack thereof). These factors, or

levers, run the gamut from regulations and the political climate in the US, to forecasted trends in

certain industries or in the global economy over the next 20-30 years. ExxonMobil was chosen

because over the past 10 years, the company has broadcasted the most daily press releases from

which data can be most effectively extracted and explored compared to other major fossil fuel
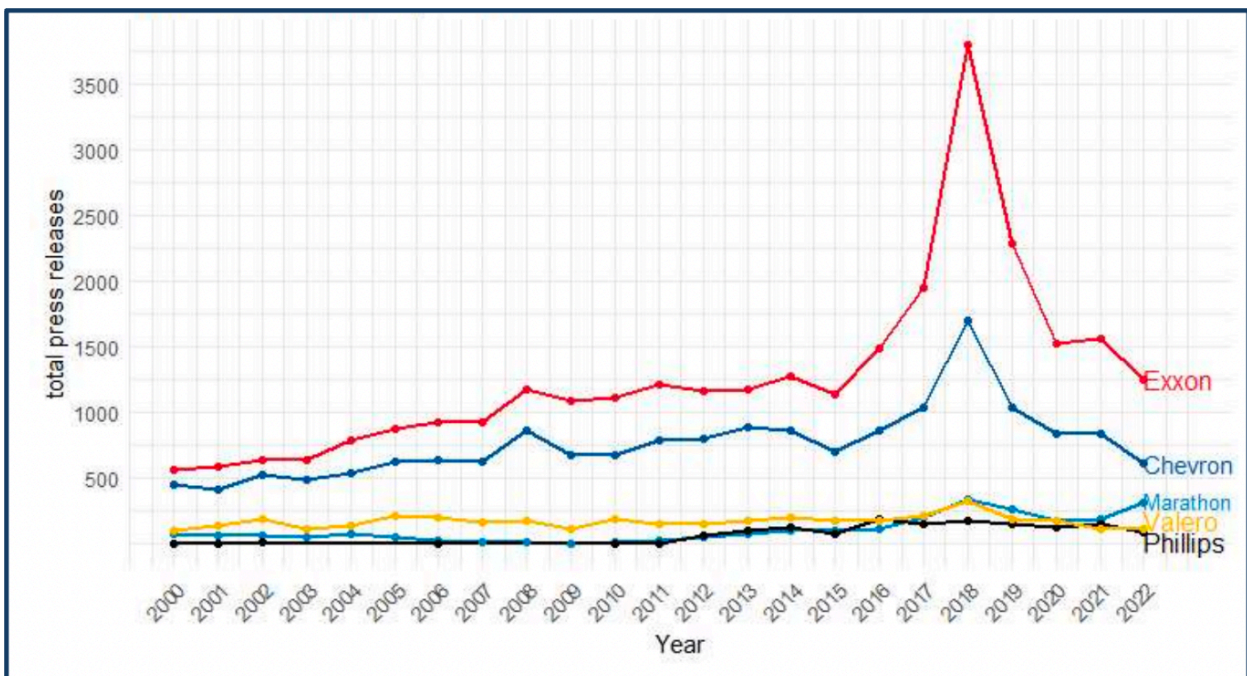
companies (shown in Figure 1 below).

Figure 3. This figure displays the trends in press release publication by the five largest American energy companies from 2000 to 2022. Retrieved from Schlichting, 2013.

By providing stockholders and investors with financial updates, progress reports, and

announcements about various projects, companies like ExxonMobil communicate with their

stakeholders and the public via press releases. Historically, press releases from fossil fuel

companies have maintained a non-committal stance on climate change, including keywords like

"markets" and "energy" with a financial frame. The press releases are a valuable data set, as by

analyzing their content the company's internal and external views on global warming surface

through the language that ExxonMobil uses to shape the public perception of their

"environmentalism". Many existing studies focus on other sources of media, such as blog posts,

social media traffic for disinformation posts, and conservative news articles or media outlets, but

almost no studies analyze press releases in this manner, and as such this thesis is adding to the

field of study by focusing on such an understudied facet of climate communication. Automated

and manual content analysis has been used to analyze how the prevalence of frames in news

media has changed since the beginning of the climate debate in the 80s. A 2019 paper published

by Dominic Stecula and Eric Merkely titled "Framing Climate Change: Economics, Ideology,

and Uncertainty in American News Media Content From 1988 to 2014" used automated content

analysis to study how different frames are employed in international news coverage of climate

change and how these frames have shifted across four major news outlets *(New York Times, Wall

Street Journal, Washington Post, and Associated Press)* over the time period studied.[19] This

research demonstrated that in the last 10 years, the ways that news outlets present climate change

has shifted in a positive direction: frames meant to turn constituents away from climate action

have shown up less and less in the media, while frames conducive to engagement with climate

policies have been gaining in popularity.[20] Holly Jean Buck's "Spectacle, Tragedy, or Solution?

A Content Analysis of News Media Framing*"* was published as a chapter in the 2013 book

Interpretive Approaches to Global Climate Governance. Buck's work highlights the intersection

between news outlets and their discussions of climate change via frames and how that framing

can influence international climate policy, finding that the prevalence of frames that support

[19] Nisbet, E. C., & Scheufele, D. A. (2019). The polarized public: Why rational citizens often believe irrational things. *Frontiers in Communication, 4*, Article 6.
https://www.frontiersin.org/journals/communication/articles/10.3389/fcomm.2019.00006/full
[20] Nisbet, E. C., & Scheufele, D. A. (2019). The polarized public: Why rational citizens often believe irrational things. *Frontiers in Communication, 4*, Article 6.
https://www.frontiersin.org/journals/communication/articles/10.3389/fcomm.2019.00006/full

climate legislation across a variety of news sources can contribute to positive momentum for international legislation supporting sustainable engineering (i.e. innovations in biofuels, "green" technology, etc).[21] Yet, how does this apply to specific frames like "market levers" that take a financial tact on the research? Furthermore, how are said financial frames applied to public shifts in perspective through fossil fuel companies like ExxonMobil? This research is important to allow for an in-depth analysis of financial implications associated with climate change and how fossil fuel companies have employed communication within their public-facing press releases to shape their own company's goals, perceived standing, and focus. It addresses a gap in the research focusing specifically on the attributes that ExxonMobil deems as relevant to the energy transition, as most literature has proven to be higher level or centered around different frames of communication.

<u>Computational Content Analyses</u>

Content analysis is a research tool used to determine whether a given piece of qualitative data, in this case text, includes the presence of certain words, themes, or concepts. Data sources can come from a variety of qualitative sources, such as interviews, field notes, conversations, surveys, news articles, or press releases.[22] A computational content analysis employs digital tools, machine learning (ML) models, and algorithms to analyze large volumes of text and identify patterns in themes, frames, or sentiment. This thesis included 3,379 press releases from ExxonMobil taken over the time period of 2015-2024. Clearly, this amount of data would be

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[21]Buck, H. J. (2014). Climate engineering: Debates, values, and governance. In *Geoengineering, the Anthropocene and the Climate Crisis* (pp. 181–195). Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9780203385579-14/climate-engineering-holly-jean-buck

[22] Columbia University Mailman School of Public Health. (n.d.). *Content analysis*. https://www.publichealth.columbia.edu/research/population-health-methods/content-analysis

impossible to manually verify in the time allotted. However, by using a content analysis, this project is able to process and quantify linguistic choices efficiently and accurately which would not be detectable through manual coding alone. [23] Computational content analysis often incorporates natural language processing (NLP) techniques such as keyword frequency analysis and topic modelling that can pick up on nuance in textual data, such as ExxonMobil's framing of hot-button topics like climate change and corporate activism.[24] Content analyses using programming in conjunction with ML algorithms are also easily scaled to larger time frames and can be replicated scalability over hundreds or even thousands of documents such as the corpus of press releases studied within this thesis.

This thesis addresses an important gap in climate communications research because by employing the programming language R and ChatGPT4o-Mini, it arguably adds objectivity in the assessment of the textual data presented. Manual methods rely on human coders to apply predefined or emergent coding schemes, which presents limitations in the breadth of text studied. However, manual methods can enable the identification of subtle rhetorical strategies, context-dependent meanings, and affective tones that algorithms may overlook or misclassify.[25] Manual analysis, therefore, is particularly useful in early-stage research or when studying complex cultural, ideological, or emotional dimensions of texts. Geoffrey Supran and Naomi Oreskes' 2021 study "Rhetoric and Frame Analysis of ExxonMobil's Climate Change Communications" manually analyzed ExxonMobil's communications across different platforms. The researchers uncovered deliberate framing distinctions between public advertising and

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[23]Grimmer, J., & Stewart, B. M. (2013). *Text as data: The promise and pitfalls of automatic content analysis methods for political texts.* Political Analysis, 21(3), 267–297. https://doi.org/10.1093/pan/mps028

[24] Krippendorff, K. (2018). *Content Analysis: An Introduction to Its Methodology* (4th ed.). SAGE Publications.

[25] Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2002). Content analysis in mass communication: Assessment and reporting of intercoder reliability. *Human Communication Research, 28*(4), 587–604. https://doi.org/10.1111/j.1468-2958.2002.tb00826.x

internal scientific discourse—something Supran and Oreskes suggest that computational models might struggle to detect without fine-tuned training.

Manual content analysis has a long-standing tradition in communications research, particularly in the study of environmental messaging, media framing, and corporate image management. A notable example includes the 2004 work conducted by Boykoff and Boykoff, who hand-coded hundreds of newspaper articles to reveal a "false balance" in climate change coverage, where journalists gave equal weight to viewpoints that were scientifically unsupported and cast doubt over anthropogenic global warming in the name of "reasonable inquiry".[26] Similarly, a 2005 study conducted by Anabela Carvalho and Jacquelin Burgess examined UK newspaper discourse over the time period 1985-2003 in order to understand how climate change narratives evolved over time, using manual coding to assess shifts in tone, authority, and attribution of responsibility with regards to global warming.[27] All of these studies demonstrate the ability of manual content analysis to engage with the symbolic and political dimensions of language, an essential capability when assessing corporate narratives surrounding contested issues like climate change.

Methods

Study Area

This thesis partners text-to-data processing methods with climate communication expertise to conduct a content analysis on how ExxonMobil's public facing discussion of climate change within the "market levers" frame has changed over time. Press releases from ExxonMobil

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[26] Boykoff, M. T., & Boykoff, J. M. (2004). Balance as bias: Global warming and the US prestige press. *Global Environmental Change, 14*(2), 125–136. https://doi.org/10.1016/j.gloenvcha.2003.10.001

[27] Carvalho, A., & Burgess, J. (2005). Cultural circuits of climate change in UK broadsheet newspapers, 1985–2003. *Risk Analysis, 25*(6), 1457–1469. https://doi.org/10.1111/j.1539-6924.2005.00692.x

were chosen because between 2015-2024, ExxonMobil released the most public-facing

statements of all major fossil fuel corporations, and thus their press releases provided accessible

and indispensable insight into the industry at large. The past decade was chosen to analyze, since

I required a large enough time frame to appropriately quantify changes in Exxon's discussion of

climate change. The research question this thesis addresses are:

a. How have fossil fuel companies shifted their public discourse surrounding climate

change over time?

b. Is there evidence of market levers influencing ExxonMobil's discussion of climate

change and market risk over time?

Data Gathering and Description
- Sourced ExxonMobil's press releases from 2015-2024 from Lexis Uni (3,379 press releases in total), manually identified the "market levers" frame

⇩

Preprocessing and Exploration
- Converted the text into numerical data using Bag of Words (BOW) model for easy visualization and exploration
- "cleaned" and processed the corpus to only include press releases that were directly published by ExxonMobil (1,165 releases)

⇩

Iterative Prompting with ChatGPT4o-Mini
- Employed iterative prompt engineering in R and ChatGPT4o-Mini to identify passages that discussed climate change and/or the "market levers" frame

⇩

Data Collection and Analysis
- Ran the corpus through the model in R, returning [1] if the text included the frame; returned [0] if not
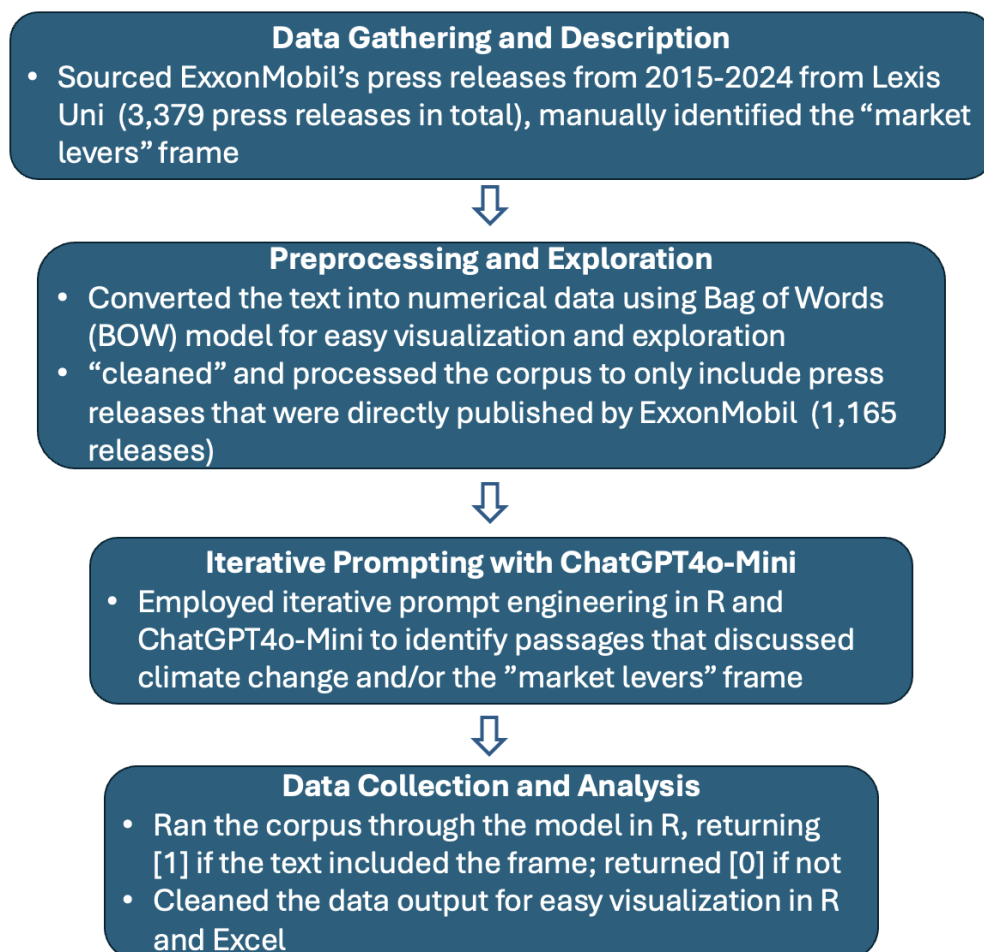- Cleaned the data output for easy visualization in R and Excel

Figure 1. This is a flow map of my methodology presented in this thesis. The flow map presents each step logically that concludes with the desired data output.

1. *Data Gathering and Description*

A sample of 43 press releases from ExxonMobil were pulled from the NexisUni Academic Database spanning from January 1, 2015 to December 31, 2024. The sample number of 43 was not significant for the research purposes- the number 43 was chosen because it was roughly 200 pages, an appropriate number of press releases to read manually. These press releases were compiled into a pdf, where I read and annotated them by hand. Within this step, I identified when and how ExxonMobil referenced climate change throughout each release, and established the "market levers" frame through which the data could be studied. A frame, as discussed prior, consists of communication choices (i.e. types of language, explanatory examples, a narrative, the use of numbers, etc) within a message or statement intended to guide the audience to perceive the message a certain way. After a close reading of the sample of press releases, I identified the "market levers" frame as consisting of the factors that ExxonMobil believes will affect their market outlook related to climate change and climate action. These factors include, among others:

➢ Global Population growth

➢ Increasing energy demand forecasted for 2025-2040, adjusted via the population expansion

➢ Decreasing demand for lignite coal and mining operations

➢ Increasing demand for sustainable grid infrastructure

➢ Advancing Enhanced Oil Recovery (EOR) operations

➢ Risk analyses for natural disasters and infrastructure insurance

➢ Political changes and legislative support (or lack thereof) for fossil fuels

➢ Global energy crises and energy security demands

A list of 20 quotes were pulled from this annotation process as examples of the market levers frame, so as to support the iterative refinement of the definition by increasing understanding of the types of statements that could (or could not) include the "market levers" frame.

2. *Preprocessing & Describing the Data*

The full data, pulled by my mentor Julia Cope from the Nexis Uni Database, contains every ExxonMobil press release from January 1, 2015 to December 31, 2024. The press releases were converted into an Excel-compatible file (CSV), which was then read into RStudio. In total, the combined corpus contained 3,379 press releases, with an average of 4539.76 characters per press release (roughly 658 words). Embedding the textual data into R showed that 2018 had the most press releases (713). Figures 3a and 3b, respectively, display examples of sentences pulled from the manual screening of press releases that do and do not include the desired market levers frame. I worked with R to create a word cloud of the most commonly used words in the press release corpus in order to better understand the mechanics of R as a programming language and visualize the data. This word cloud is displayed in Figure 2. As the analysis began, it became clear that some of the press releases were not a) published directly by ExxonMobil and/or b) did not include a mention of Exxon, only their subsidiaries. The data was then processed further into only the press releases that were directly released from ExxonMobil, to a new total of 1,165 press releases.

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Data
  ExxonPressReleases   3379 obs. of 9 variables
Values
  avg_chars            4539.76176383543
  avg_words            658.095294465823
  CharCount            integer  (empty)
  WordCount            Large integer (3379 elements,  15.5 MB)


[1] "LNID"           "Title"       "Date"         "FullText"
[5] "Year"           "month"       "char_count"   "word_count"
[9] "FirstSentence"

2015 2016 2017 2018 2019 2020 2021 2022 2023 2024
 176  303  534  713  418  278  322  246  157  232
```

Figure 2a. And 2b. respectively. These two R outputs show the number of press releases within the corpus, the average characters and words per press release, and the press release counts per year.

Figure 3. Word cloud generated that demonstrates the most used words in Exxon Press release corpus. This word cloud was generated during the data description phase of the methods to familiarize with the R programming language and the text corpus in general.

The outlook projects that global energy-related carbon dioxide emissions will peak around 2030 and then start to decline. Emissions in OECD nations are projected to fall by about 20 percent from 2014 to 2040.

Figure 4a. This passage was identified manually as including climate change. Taken from ExxonMobil's press release from January 25, 2016.

Exxon Mobil Corporation (NYSE:XOM) today announced estimated third quarter 2016 earnings of $2.7billion, or $0.63 per diluted share, compared with $4.2billion a year earlier. Results reflect lower refining margins and commodity prices.

Figure 4b. This passage does not include climate change, and thus does not receive that categorization. Taken from ExxonMobil's press release from October 28, 2016.

3. *Iterative Prompt Engineering with ChatGPT 4o-Mini*

In R, I created a prompt that employs Chat GPTmini to label the climate change related paragraphs identified in the classifier above as either including the market lever frame or not. A prompt is a set of instructions given to a machine learning platform that are detailed, specific, and allow the algorithm to then accurately process data sets according to the guidelines established. ChatGPT is an increasingly common form of conducting a content analysis, because it can process large amounts of data quickly and efficiently. Multiple studies in the past 5 years have been conducted to better understand ChatGPT's capabilities for quantitative data processing. One such study, published by the National Institute of Health (NIH) in 2023, concluded that ChatGPT is "fairly reliable" in assisting with content analysis, and provides evidence that ChatGPT could be used for a variety of stages in a qualitative analysis as well.

However, the study admits that there needs to be iterative improvements made to the ways in which ChatGPT processes prompts. In the past two years, though, both the breadth and depth of ChatGPT's capabilities have deepened, as ChatGPT 4o and ChatGPT 4o-Mini are both more advanced than the original OpenAI products that went to market in 2015.[28] There are two types of prompt engineering: "zero shot" prompting and "few-shot" prompting. Large language models (LLM)s, such as GPT 4.0, are advanced enough that they can extrapolate a prompt across large data sets with only one set of instructions. "Zero shot" prompting means that the prompt used to guide the ML algorithm won't include an example of the desired classification.[29] However, with larger data sets, debate remains around which type of prompting is the best suited, as some data analysts report that zero-shot prompting isn't always the most appropriate. In that scenario, they argue, it is advisable to provide the LLM with a demonstration of your desired output ("few-shot" prompting) to help guide the algorithm. Few shot prompting means you provide the LLM examples with the desired labels. In this case, I would provide ChatGPT 4o-Mini with a sentence and provide the label I require (either [1] or [0] for the market levers frame). By experimenting with prompt engineering in R, I determined that zero-shot prompting was the most effective way to achieve the desired data output. One key drawback of few-shot prompting is that when dealing with complex learning tasks this prompting style might require more elaborate and detailed examples to provide the LLM with instructions to receive desired output.[30] Within the corpus this thesis studied, the press releases were both varied in their focus and

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[28] National Institutes of Health. (2024). *Greenhouse gas emissions and cardiovascular health: An emerging link.* https://pubmed.ncbi.nlm.nih.gov/39052327/
[29] Prompting Guide. (n.d.). *Zero-shot prompting techniques.* https://www.promptingguide.ai/techniques/zeroshot
[30] Brown, T. B., et al. (2020). *Language models are few-shot learners.* arXiv. https://arxiv.org/abs/2005.14165 https://www.promptingguide.ai/techniques/zeroshot

importantly contained such a large amount of text that providing examples and verifying their accuracy proved ineffective.[31]

The prompt engineering process is iterative, meaning that the prompts given to Chat GPT 4-0 mini through the API may not initially produce the desired response. Initially, I worked with my mentors to develop a basic prompt outline (text, instructions, output) for ChatGPT and asked the model to provide me with text and a justification. Below, Figure 5 provides an example of the prompt as used in my analysis. In the prompt engineering stage, I included a justification as part of the output over a randomly selected 25 press releases that ChatGPT was analyzing. This was to verify the accuracy of the output, and to ensure that the code was running smoothly. Figure 6 displays an example of a data output that was inaccurate, because it returned a [1] for including language surrounding climate change and a [0] for including the market levers frame. However, this thesis targeted discussions of climate change via the frame itself, so the separation of the two was not what I was asking the prompt to return. Thus, the instructions given to ChatGPT were tweaked in R to accommodate these errors, exemplifying the iterative nature of the prompt engineering.

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[31] Prompting Guide. (n.d.). *Zero-shot prompting techniques*. https://www.promptingguide.ai/techniques/zeroshot

```
prompt1 <- "
####TASK####
Here is a press release from ExxonMobil.

###Text###
{Justification_text}

###INSTRUCTIONS####
Based on its content, decide whether or not the text contains at least one sentence about climate
change. This includes language around global warming, rising sea levels, or other discussions of
climate change through the "Market Levers" frame. The "Market Levers" frame refers to levers, or
factors, that ExxonMobil has identified as shifting their market towards, or away from, climate
action and sustainable investments. This includes factors such as: global renewable energy demand,
demand for low carbon fuel sources and/or ExxonMobil's plans to meet that demand, ExxonMobil's
projections for their own future carbon emissions, market demand for low-carbon technology, and
attention to components such as environmental risk, natural disasters, or other climate-related
financial risk.

######OUTPUT####
Classify whether the text mentions the market levers frame. Return the output as a JSON object:
  Market_levers: [1 or 0]"


# Create a chat object for GPT-4o-mini with Ellmer
chat <- ellmer::chat_openai(
  model = "gpt-4o-mini")
```

Figure 5. Example prompt from prompt engineering detailing what exactly Chat GPT was being asked to accomplish. The output is a return of either [1] or [0] as a json object, depending on whether or not the press release met the required criteria.

```
 "Climate_related": [0, "The text primarily discusses ExxonMobil's financial performance,
growth plans, and operational updates without mentioning climate change, global warming, or
environmental impacts. It focuses on projected earnings and production without indicating
any direct discussions or commitments to climate action or sustainability."],
  'Market_levers': [1, "The press release includes references to ExxonMobil's future plans
related to liquefied natural gas (LNG) projects and the expected growth in global LNG
demand. It highlights how the company is adjusting its strategies and investments in
response to projected energy needs, which can be seen as market levers influencing
ExxonMobil's position in the evolving energy landscape. The mention of the growing demand
for higher-value fuel and lubricant products also aligns with considerations related to
market dynamics in the energy sector."]
}
```

Figure 6. This is an example of a justification that the model provided that did not return the desired output- by separating "climate related" and "market levers" as categories, and then returning a [1] for the latter but not the former, I discovered the prompt was inaccurate.

4. *Data Collection and Analysis*

After verifying the accuracy of the model's results, I ran the entire corpus through the model to return a value for each press release (1,165 total). Then, using R and Excel, I plotted and analyzed the usage of the market levers frame over time. I was able to identify shifts in language through a time series plot and word clouds. By overlaying the time series and linear-form plots, I visualized the data for straightforward analysis. I segmented the data both by year and by month for easier processing of the text.
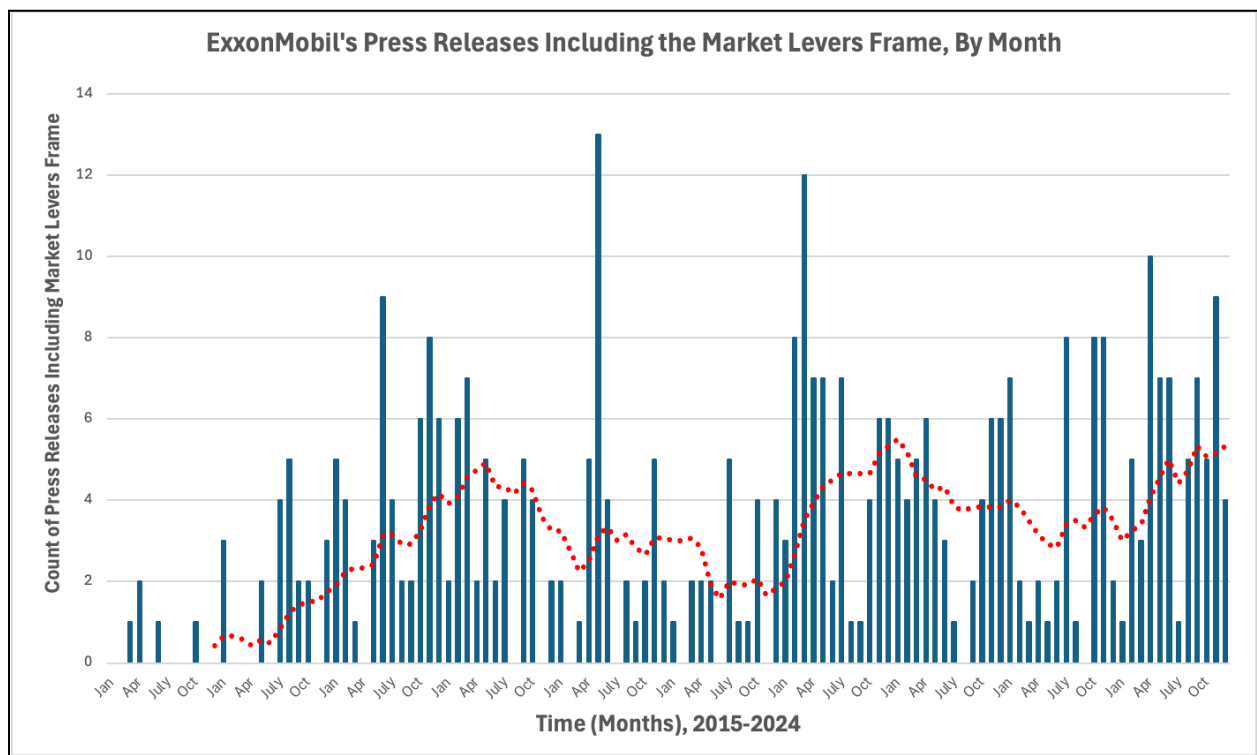
Results

Figure 1. ExxonMobil's press releases that include the over the time period of 2015-2024, on a month to month basis. The trendline (red) represents a year-to-year rolling average.
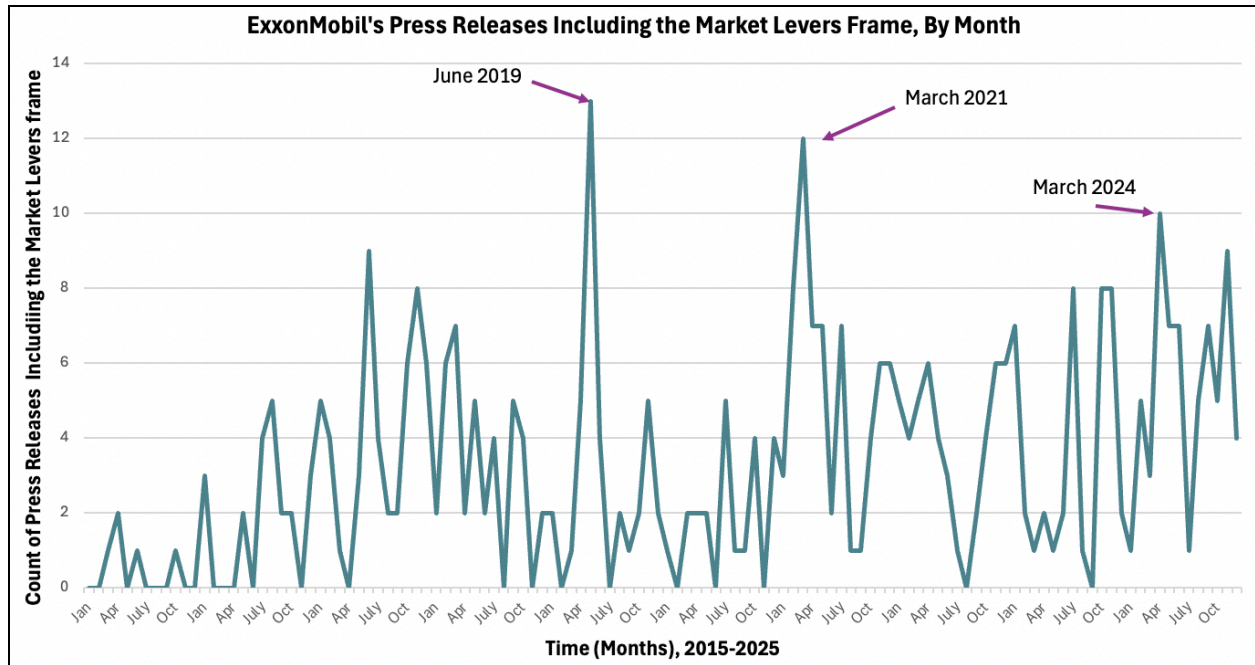
Figure 2. ExxonMobil's press releases including the "market levers" frame from 2015-2024, on a month to month basis. The peak counts are shown in June of 2019, March of 2021, and March of 2024.
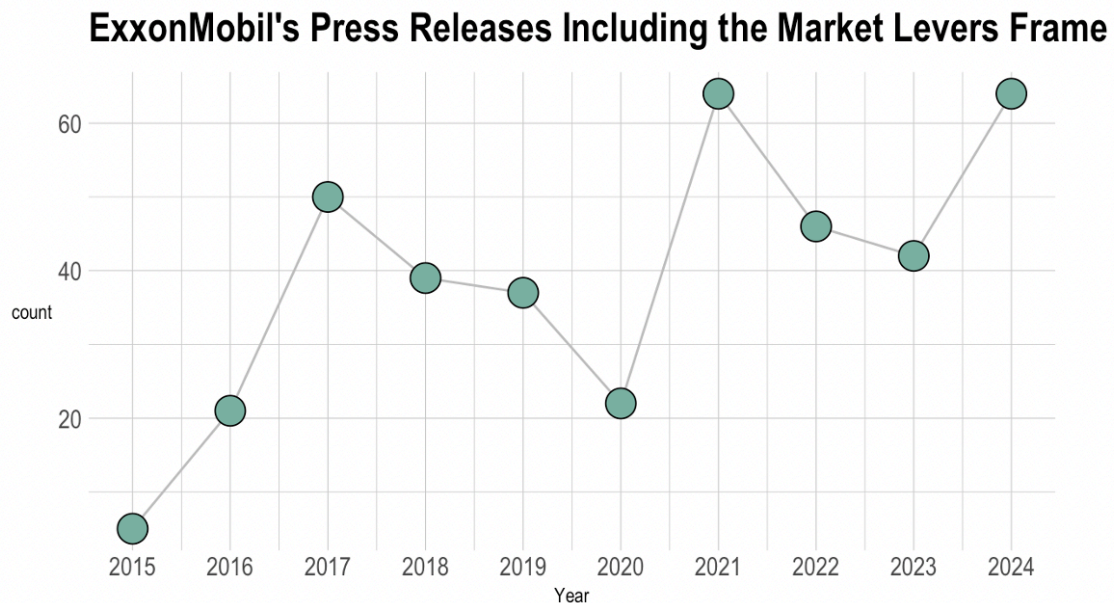

Figure 3. The count of ExxonMobil's press releases that include the "market levers" frame, segmented by year. The year with the most number of press releases that returned a [1] was 2021, while the year with the least was 2015.

Year	Count	Total Number of Press Releases	Percentage of Press Releases Including the Market Levers Frame
2015	5	176	2.84
2016	21	303	6.93
2017	50	534	9.36
2018	39	713	5.47
2019	37	418	8.85
2020	22	278	7.91
2021	64	322	19.88
2022	46	246	18.70
2023	42	157	26.75
2024	64	232	27.59

Figure 4. Table displaying the percentage of press releases, per year, out of the total per year that include the "market levers" frame.
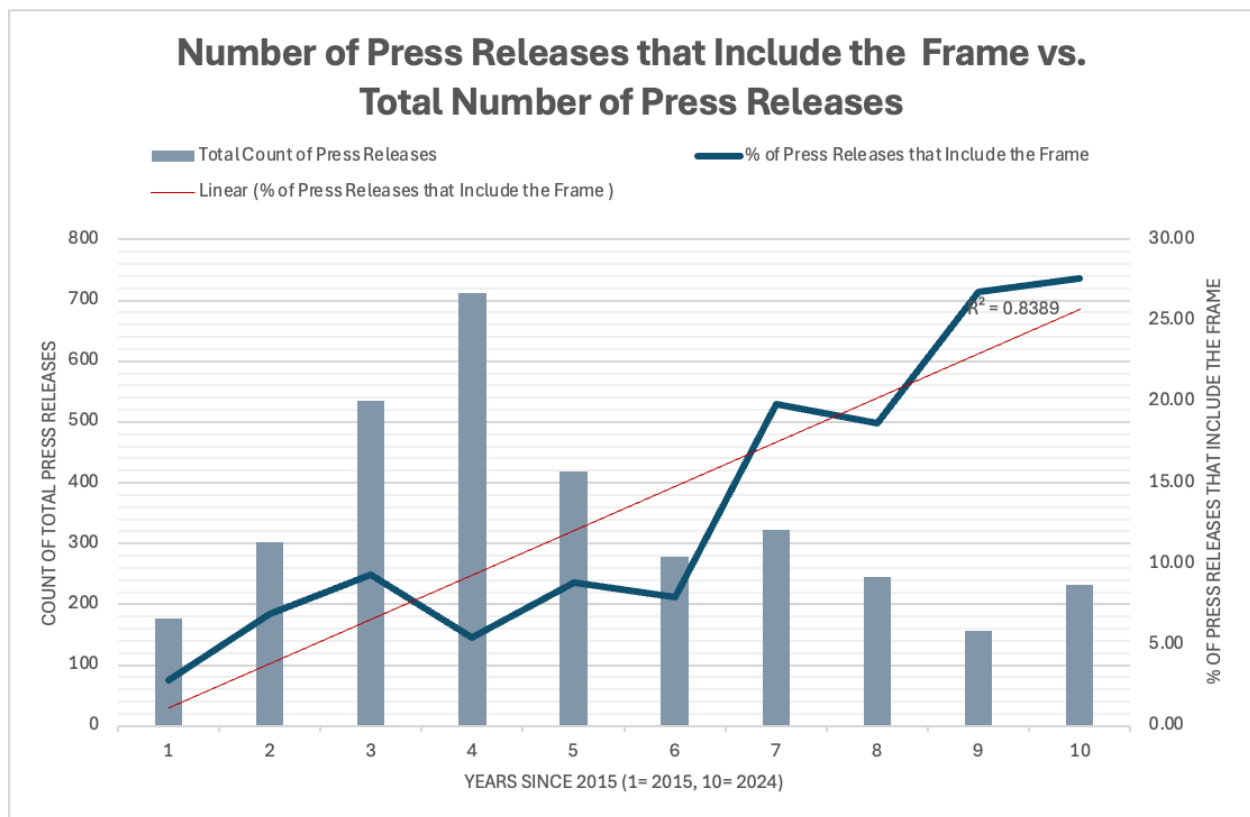
Figure 5. This figure displays the total count of press releases from ExxonMobil on the left axis, while the number of press releases that include the "market levers" frame is on the right axis. The red line is a linear regression equation that reported an R^2 value of 0.84.

Discussion

The goal of this thesis was to establish how ExxonMobil's discussion of climate change through the "market levers" frame over the past decade (2015-2024). As such, the results lean heavily on quantitative measures, furthering the knowledge of climate communicators by using automated text analysis and supervised classification to expand the scope of the research beyond the shorter time frames typically studied. As seen in Figure 3, the lowest count of press releases that include the required frame found in 2015 (5) and the highest count in 2021, which corresponds to a result of 64 press releases. However, a trendline across a 12-month average (included in Figure 1) allows for visualization of the data. One key observation verified by this twelve month rolling average is that the data generally follows a cyclical pattern throughout the months, with peaks and troughs oscillating roughly every 6 months. In the past decade, no year aside from 2015 maintained a count lower than 10 of press releases that included the "market levers" frame. As displayed in Figure 4, the year with the lowest total number of press releases is 2023, and the year with the maximum total is 2018. Interestingly though, 2018's count of less than 6% of press releases containing the required frame is one of the lowest across the 10 year time series, which indicates that the percentage of press releases that include the required frame cannot be justified by the total number per year in isolation. Figure 5 in the results above reiterates this point, as it displays the count of total number of press releases from ExxonMobil on the left axis while the percentage of press releases that contained the "market levers" frame is on the right axis.

Figure 5 includes a linear regression trendline for the data, with an R^2 value equal to 0.8389 (0.84). This R^2 value also highlights another trend found within the data: across the time series studied, there is a generally positive trend in the increase of press releases that include the "market levers" frame. Over the past decade, some of the most influential climate legislation has been passed within the US and beyond.

There are 3 peaks, displayed on Figure 2, in the number of press releases that included the "market" levers frame that are significantly higher than the previous months. These 3 peaks in the count occurred in June of 2019, March of 2021, and March of 2024. What can be assumed as the cause of these stark increases in press releases that include the desired frame? As part of my analysis, I compiled a timeline of major climate change legislation within the US and globally, displayed below.

Date	Region/Country	Policy
Aug 2015	United States	Clean Power Plan
Dec 2015	Global	Paris Agreement
Jun 2017	United States	Withdrawal from Paris Agreement
May 2019	United States (Passed in House)	Climate Action Now Act (H.R. 9)
Dec 2019	European Union	European Green Deal
Jan 2021	United States	Rejoining Paris Agreement
May 2021	Washington (State)	Climate Commitment Act
Jun 2021	United States (Proposed)	Recovering America's Wildlife Act
Jun 2021	United States (Passed in House)	Recovering America's Wildlife Act (H.R. 2773)
Jun 2021	European Union	Taxonomy Climate Delegated Act
Jul 2021	European Union	Taxonomy Disclosure Regulation
Jul 2021	European Union	Fit for 55 Package
Nov 2021	United States	Infrastructure Investment and Jobs Act

Nov 2021	United States (Passed in House)	Infrastructure Investment and Jobs Act (H.R. 3684)
May 2022	European Union	Complementary Delegated Act
Aug 2022	United States	Inflation Reduction Act (IRA)
Aug 2022	United States	Inflation Reduction Act (H.R. 5376)
Feb 2023	United States (Proposed)	RISEE Act
Apr 2023	United States (Proposed)	Coastal State Climate Preparedness Act
Nov 2023	European Union	Environmental Delegated Act
Feb 2024	New Mexico	HB 41
Mar 2024	United States	SEC Climate Disclosure Rule
Mar 2024	Michigan	SB 571
Apr 2024	Maryland	DRIVE Act (HB 1256)
Jun 2024	United States (Proposed)	Climate Change Education Act
Jul 2024	United States	Energy Permitting Reform Act
Nov 2024	Costa Rica, Iceland, NZ, Switzerland	ACCTS Agreement
May 2025	Hawaii	Green Fee Legislation

Figure 6. Table displaying the compiled timeline of major or influential climate legislation in the United States and beyond, with particular emphasis on legislation that impacts the fossil fuel industry.

Firstly, research into the timeline of United States climate-related legislation reveals that the Climate Action Now Act (H.R. 09) was passed by the House of Representatives on May 2, 2019. This legislation called for the President to release a nation-wide plan to meet the greenhouse gas emission reduction targets set in place by the Paris Agreement. Specifically, the plan must include how a) the President planned to reduce emissions by 26-28% from 2005 levels by 2025, and b) how the US plans to confirm that other parties subject to the agreement (other

countries) are fulfilling their duties.[32] The legislation was a Democratic bid to require the United

States to stay in the Paris Agreement. However, the bill did not pass through the Senate after

being introduced in early May. The increased attention to the Paris Agreement's emission

reductions targets could have been topical for ExxonMobil, though, as Argentina and the United

States- states from which the corporation heavily extracts fossil fuels- have been involved in the

Paris Agreement proceedings.

From a financial perspective, March of 2021 also is of note as the Climate Risk

Disclosure Act of 2021 (H.R. 2570) was introduced into the House of Representatives. The bill

directs the Securities and Exchange Commission (SEC) to require, within two years of the bill

becoming law, publicly traded companies like ExxonMobil to annually disclose information

related to the Scope 1, 2, and 3 emissions and their relation to climate risk in their 10-K

investment reports. [33] The goal of the bill is to increase transparency for stockholders and

investors around the climate-related financial risk associated with issuers of securities. The

reports, included on the 10-K documents, would require detailed accounts of companies' risk of

natural disasters, rising sea levels, global increases in temperatures, etc. Moreover, the Climate

Risk Disclosure Act would require annual auditing of a corporation's contribution to climate

change, as well as their risks as outlined above. The Act also has a fallback plan in that if the

SEC has not issued regulations within the two year period, regulated entities would be found

automatically in compliance with the Act if the annual reports satisfied the comply with the Act

if their annual reports satisfy the recommendations of the Financial Stability Board (FSB)'s Task

Force on Climate-Related Financial Disclosures (TCFD). The formal commenting period on the

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[32]Congress.gov. (2019). *H.R.9 – Climate Action Now Act (116th Congress).*
https://www.congress.gov/bill/116th-congress/house-bill/9
[33]Congress.gov. (2021). *H.R.2570 – Climate Risk Disclosure Act of 2021.*
https://www.congress.gov/bill/117th-congress/house-bill/2570

bill opened in June of 2021, and continued until early 2022, wherein companies could formally comment on their opinion of the bill and its downstream effects on their business, if any. The SEC received over 24,000 comments on the Act, but to date it has not been passed into law by the Senate. In March of 2024, however, the SEC ruled in-house that these reporting standards be upheld for all publicly traded companies under the SEC's oversight. This could provide an explanation for the uptick in Exxon's press releases that included the "market levers" frame.

Aside from legislation and politics, however, there exists an array of factors that could push ExxonMobil towards increasing their discussion of "market levers". Natural disasters and energy security significantly influence how ExxonMobil frames its public discourse around energy, but not all include a discussion of climate change. During periods of geopolitical instability, oil supplies are generally impacted, such as during the Ukrainian energy crisis brought about by the Ukraine War in 2022. ExxonMobil received backlash for the immense profits they turned while the oil prices were at record highs, but continued to emphasize the need for "reliable" and "affordable" energy. Notably, though, their focus on increasing energy security did not acknowledge climate change, rather positioning our planet's undeniable warming as a problem deserving of a long-term, rather than immediate, solution. [34] In the aftermath of extreme weather events—such as hurricanes or wildfires—Exxon has acknowledged climate risks more explicitly, but typically has aligned these acknowledgments with narratives of "resilience" and technological innovation (geoengineering) rather than direct emissions reduction[35]. Similarly, during periods of rising public concern over climate impacts, ExxonMobil has shown a tendency

[34]Global Witness. (2024). *Ukraine war, third anniversary: Record oil profits and dash for critical minerals amid conflict*. https://globalwitness.org/en/press-releases/ukraine-war-third-anniversary-record-oil-profits-and-dash-for-critical-minerals-amid-conflict/

[35]Cherry, T. L., & Sneeringer, S. E. (2021). Institutional trust and climate policy support: The role of transparency and equity. *One Earth, 4*(8), 1072–1081. https://www.sciencedirect.com/science/article/pii/S2590332221002335

to pivot toward emphasizing carbon capture, biofuels, and "lower-emission" terminology rather than explicitly addressing fossil fuel reduction.[36]

Clearly, establishing a causal relationship could be difficult since the variables affecting Exxon's perspective on climate change and the "market levers" are numerous and often hard to quantify, such as public perception. However, the importance of this work lies in its status as *descriptive* research, work that does not aim to answer the *why* but rather the *what*. This type of descriptive analysis is greatly "undersupplied and undervalued", as Kevin Munger, Andrew Guess, and Eszter Hargittai argue in their 2021 article published in the *Journal of Quantitative Description.* [37] Descriptive research provides a baseline of quantitative knowledge for other research, and therefore is critically important for academics in any field. Though this thesis does not answer the "why" directly, it is equally valuable in exploring how ExxonMobil employs the "market levers" frame, and addresses an increasingly neglected mode of analysis.

Limitations

The goal of this study was to identify how ExxonMobil's discussion of climate change via the "market levers" frame has changed over the time period 2015-2024. While my work accomplishes this objective, there remain areas of the study that could be developed. One improvement that could serve this thesis is a refinement of the "market levers" frame and the prompt within the scope of ChatGPT4o-Mini. Using ChatGPT-Mini for prompt engineering has many advantages, as discussed above. One of the advantages is the ability of ChatGPT to interpret and process language on its own as the user is giving the model directions for a task. With that said, there are many opinions and interpretations on the best way to write a prompt,

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[36] Funk, C., & Kennedy, B. (2020). *How Americans see climate change and the environment in 7 charts*. Pew Research Center.

[37] Freelon, D., McIlwain, C. D., & Clark, M. D. (2021). Quantitative description in digital media research. *Journal of Quantitative Description: Digital Media, 1*, 1–13. https://doi.org/10.51685/jqd.2021.000

and every researcher may take a different approach to prompting. As such, my iterative prompting took hours to finally return the required output, and the prompt I created in the end (prompt seen in Methods, Figure 3) may not have captured all the nuance of the data. There could exist a more effective prompt that could capture even more of the ways in which ExxonMobil discusses "market levers" with relation to climate change, but it is impossible to demonstrate that my approach is the best. However, with such a large dataset, it would be next to impossible to verify that every single press release identified as including the "market levers" frame was accurately labelled by the software. To mitigate this problem, I ran code while prompting that provided a random sample of 25 press releases and manually verified that ChatGPT was accurately labelling the text as including- or not including- the "market levers" frame. This verification is outlined in the Methods above.

Another limitation encountered within this thesis is presented in the use of ChatGPT4o-Mini vs. the ChatGPT-4o model. ChatGPT4o-Mini generally has a reduced contextual memory and slightly halted analytical depth, which may hinder its ability to detect the nuance required for examining such a large data set (in this case, the 1,165 press releases pulled for this thesis). GPT Mini is lightweight and cost effective compared to 4o,, but is known to be less reliable in maintaining consistency across long or thematically varied documents.[38] However, I chose to employ ChatGPT4o- Mini for this project because despite the large corpus studied, the responsiveness, low price point and ease of use made Mini more practical both for my level of coding expertise and for the budget (both in time and money) that I was provided during this thesis.

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[38] Amity Solutions. (2023). *ChatGPT-3.5 vs. ChatGPT-4: Key differences.* https://www.amitysolutions.com/blog/chatgpt-35-vs-chatgpt-4

<u>Recommendations for Future Research</u>

This thesis provides valuable primary, descriptive data that can be used to build out future climate communications research. The insight into ExxonMobil's press releases and the discussion of climate change via the "market levers" frame addresses a gap in historical literature in that it employs automated text analysis to reach further and probe deeper than manual identification could allow. In the future, I would like to run the same corpus through a Name Entity Recognition (NER) model that could help identify projects and partnerships associated with biofuel, sustainable investments, and clean energy mentioned in the press releases. Then, by following up on those partnerships, I could quantify the extent to which ExxonMobil is falsely advertising their sustainable incentives to their stakeholders. This would be extremely useful for climate communicators to better inform not only their own community but the public on the dangers of "greenwashing". I would also aim to complete this analysis using ChatGPT4o, not 4o-Mini, to provide a deeper understanding of the nuance within each press release and, more globally, the corpus at large. That data would also give insight further into Exxon's public facing discourse, and could shed light on how the energy industry as a whole views sustainable technology.

Given more time, I would also like to study the results of this thesis in conjunction with a third party assessment of what pieces of legislation posed the greatest threat to the fossil fuel industry over the past ten years. The timeline of major climate legislation allowed for an educated assessment of what events might have driven increases in discussions of climate change via the "market levers" frame, but it would be valuable to delve further into what events (legislation or otherwise) did the fossil fuel industry themselves see as the most threatening, as

opposed to my analysis. Exploring this angle could also provide more context as to the *why* with regard to the fluctuations and patterns identified in ExxonMobil's discussion of climate change via the desired frame.

Conclusion

Our warming planet presents humanity with a crisis that is not just ecological, but humanitarian. Climate change affects every facet of our lives, from the food we consume to where we build our homes and whether the air around us is safe enough to breathe. Despite the environmental and financial risks of climate change, Big Oil giants like ExxonMobil have repeatedly shirked their responsibility for the climate crisis, instead embarking on a strategic campaign to disavow science and emphasize the need for affordable energy as an excuse to keep burning fossil fuels. ExxonMobil is navigating competing imperatives: maintaining legitimacy amid a worsening climate crisis while preserving its fossil fuel-centric business model. By employing R and ChatGPT 4o-Mini to study ExxonMobil discusses climate change via the "market levers" frame from 2015-2024, this thesis was able to successfully examine a large corpus of climate change-related passages from ExxonMobil's press releases and identify patterns in how Exxon is framing their public discourse. The data I present in this body of work is descriptive, but lays a critical base for future climate communications research to establish connections between different regulatory frameworks, financial risk, and climate-related communication in the energy industry at large. As Dr. Michael Mann emphasizes, both *urgency* and *agency* are needed to tackle the climate crisis; by understanding how fossil fuel corporations frame factors driving them towards (or away from) sustainability, we can better understand how to target communication in the future that will create positive momentum required to keep Earth's warming below 1.5 degrees Celsius.

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Note: this is an aggregate reference list, with each reference numbered by their appearance in the body of work (by footnote) and not alphabetically.

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