Comments on Almond et al. "Favorability towards natural gas relates to funding source of university energy centers"

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Introduction

Almond et al[4] raises questions about the commitment to independent and objective research of organizations that accept funding from fossil fuel companies.

We argue here that the paper's main conclusion—that "fossil-funded centres are more favourable in their reports towards natural gas than towards renewable energy," while "centres less dependent on fossil funding show a reversed pattern"—is not supported by the evidence. Their conclusion rests on at least three flaws. First, the paper uses an algorithmic tool that is incapable of evaluating the sentiment toward natural gas or renewables. Second, the study fails to compare centers that accept funding from oil and gas companies to organizations that do not accept such funding yet conduct similar research, so that the differences across organizations should not be attributed to funding sources Third, the authors fail to mention important findings that contradict their hypothesis.

The analysis is flawed due to deficiencies in the sentiment analysis tool

The tool used in the Almond et al. analysis is incapable of evaluating sentiment toward natural gas and renewables, as its main finding claims.

Almond et al. use a sentiment analysis tool called VADER to determine whether sentences extracted from research reports have a positive, negative, or neutral sentiment toward "natural gas" and other key phrases. VADER is incapable of supporting the conclusions of the paper.

First, VADER cannot evaluate sentiment *towards* natural gas (or other key phrases). Instead, it evaluates the *general overall* sentiment of sentences that include the phrase "natural gas." To understand why this is fatal to the Almond et al methodology, consider the following sentence: "*We are all happy because we got rid of natural gas.*" Any reasonable reading would see it as having a *negative* sentiment toward natural gas. But VADER

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produces a very positive sentiment score for this sentence, which the Almond et al. methodology would misconstrue as a *positive* sentiment towards natural gas.

VADER is a simple rules-based sentiment analysis tool[5]. A state-of-the-art AI model such as ChatGPT produces drastically different results using the same data. Using the authors' dataset, we used ChatGPT to analyze the 1,556 sentences that contain the phrase "natural gas" from reports by Columbia University's Center on Global Energy Policy (CGEP), one of the centers described as "fossil-funded." Specifically, the prompt used in ChatGPT was: "*What is the sentiment toward natural gas in the following sentence?*"—focusing explicitly on sentiment directed toward natural gas itself. While VADER assigned a positive sentiment to 68% of the 1,556 sentences, ChatGPT assigned a positive sentiment to only 24% of the sentences and deemed 65% to have a neutral sentiment.

A second problem is that the authors failed to isolate actual sentences of text from reports. Because the original reports were in PDF format designed for visual presentation rather than structured data storage, the sentences extracted were often fragmented or arranged non-linearly, especially in complex, multi-column layouts common in reports. We found that roughly one-third were not sentences at all, but rather text and data extracted from figures and tables, titles of sections, equations, titles of publications in references, page headers, and page numbers intermingled with text when a sentence carried over to another page, and even nonsensical text extracted from 2-column formatting. These texts provide no useful information about the sentiment of the reports and should have been removed from the dataset. Yet in Almond et al. analysis, they were used, and VADER returned positive sentiment scores for almost 80% of these "sentences".

To convey a more detailed picture of these flaws, we present here examples of sentences or paragraphs from CGEP reports that in the Almond et al. analysis—based on VADER—display a positive sentiment towards natural gas. The first example in Table 1 is an extract from a 2015 report that had the highest positive score for sentiment toward natural gas and the second in Table 2 is the one with the second-highest score from a 2019 report. Other similar examples from Almond et al. analysis can be found on CGEP's website at this LINK.

Table 1: Highest Positive Score

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[5] In addition, Vader was developed with manually curated rules from analyzing a Twitter dataset, but research suggests that there is "poor domain transferability" for sentiment analysis tools developed and validated in a particular study context and applied in other contexts. See: He, Lu, Tingjue Yin, and Kai Zheng. "They May Not Work! An evaluation of eleven sentiment analysis tools on seven social media datasets." Journal of Biomedical Informatics 132 (2022): 104142.

Sentiment	0.980
Year	2015
Report	[The New Geopolitics of Energy](#)
Line Text	Aside from US interests in Middle East peace, America by 2035, but also make North America a hub our alliance with Israel, and the potential reverberations for stability in energy markets that is founded on private of unchecked Islamic extremism in the Middle East and led growth and political stability in democratically elected globally, there is also a sharp security cost to isolationism. states.14 About 85 percent of the oil going through the Strait of Hormuz goes to Asia, and it would be unrealistic to think 8 | ¬≠¬≠ center on Global Energy Policy | Columbia SIPA The new geopolitics of energy that China would not accelerate its investments to develop Natural gas prices present a complicated and regionally a deep-sea fleet to protect transit if the United States does diverse story.
Actual Text	America's energy abundance, supply growth in Canada, and the potential for growth under Mexico's reforms to drive private investment in hydrocarbons not only point to potential oil and gas self-reliance in North America by 2035, but also make North America a hub for stability in energy markets that is founded on private led growth and political stability in democratically elected states. […] Aside from US interests in Middle East peace, our alliance with Israel, and the potential reverberations of unchecked Islamic extremism in the Middle East and globally, there is also a sharp security cost to isolationism. […] Natural gas prices present a complicated and regionally diverse story. As shown in Figure 2, natural gas prices began to diverge regionally in 2008, especially as key markets shifted from oil-indexed prices for gas toward gas-on-gas competition. In the United States, sharp increases in shale gas production drove prices down.
ChatGPT Assessment	The sentiment towards natural gas in the sentence is neutral. The text mentions natural gas prices as presenting a complicated and regionally diverse story, without expressing a clear positive or negative sentiment towards natural gas.
Report Image with Text	

Table 2: Second-Highest Positive Score

Sentiment	0.974
Year	2019
Report	[Guide to Chinese Climate Policy 2019](#)
Line Text	7 Stephen O‚Äô Sullivan, China: Growing import volumes of LNG highlight China‚Äôs rising energy import dependency, Oxford Institute for Energy Studies (June 2019) at p.6; ‚ÄúOutlook Of Liquefied Natural Gas Versus Pipeline Gas In China After LNG 2019,‚Äù Seeking Alpha (April 8, 2019) 8 ‚ÄúChina‚Äôs LNG import terminals and storage facilities‚Äù Reuters (August 16, 2019; ‚ÄúResearch Report on Natural Gas Import in China, 2019-2023,‚Äù Business Wire (May 9, 2019);); ‚ÄúOutlook Of Liquefied Natural Gas Versus Pipeline Gas In China After LNG 2019,‚Äù Seeking Alpha (April 8, 2019); Michael Lelyveld, ‚ÄúChina Revives Oil And Gas Reform Plan,‚Äù Radio Free Asia (March 11, 2019); David Sandalow, Akos Losz and Sheng Yan, A Natural Gas Giant Awakens, Columbia Center on Global Energy Policy (June 27, 2018) < BACK TO TABLE OF CONTENTS 82 GUIDE TO CHINESE CLIMATE POLICY 2019 Figure 11-1: China‚Äôs Natural Gas Pipeline Netwo
Actual Text	Stephen O' Sullivan, China: Growing import volumes of LNG highlight China's rising energy import dependency, Oxford Institute for Energy Studies (June 2019) at p.6; "Outlook Of Liquefied Natural Gas Versus Pipeline Gas In China After LNG 2019," Seeking Alpha (April 8, 2019) 8 "China's LNG import terminals and storage facilities," Reuters (August 16, 2019; "Research Report on Natural Gas Import in China, 2019-2023," Business Wire (May 9, 2019);); "Outlook Of Liquefied Natural Gas Versus Pipeline Gas In China After LNG 2019," Seeking Alpha (April 8, 2019); Michael Lelyveld, "China Revives Oil And Gas Reform Plan," Radio Free Asia (March 11, 2019); David Sandalow, Akos Losz and Sheng Yan, A Natural Gas Giant Awakens, Columbia Center on Global Energy Policy (June 27, 2018)
ChatGPT Assessment	The sentiment towards natural gas in the sentence is neutral, as it simply mentions China's growing import volumes of LNG and provides various sources discussing the outlook of liquefied natural gas and pipeline gas in China.
Report Image with Text	7 Stephen O' Sullivan, China: Growing import volumes of LNG highlight China's rising energy import dependency, Oxford Institute for Energy Studies (June 2019) at p.6; "Outlook Of Liquefied Natural Gas Versus Pipeline Gas In China After LNG 2019," Seeking Alpha (April 8, 2019) 8 "China's LNG import terminals and storage facilities," Reuters (August 16, 2019; "Research Report on Natural Gas Import in China, 2019-2023," Business Wire (May 9, 2019);); "Outlook Of Liquefied Natural Gas Versus Pipeline Gas In China After LNG 2019," Seeking Alpha (April 8, 2019); Michael Lelyveld, "China Revives Oil And Gas Reform Plan," Radio Free Asia (March 11, 2019); David Sandalow, Akos Losz and Sheng Yan, A Natural Gas Giant Awakens, Columbia Center on Global Energy Policy (June 27, 2018)

The research design is flawed due to invalid control groups

To draw useful insights into the connection between funding sources and research outcomes, the Almond et al. framework requires a comparison of research organizations that are similar aside from their funding sources. Absent reasonable control groups, there is no basis for attributing the differences between groups to their funding sources.

One of the centers described as "fossil funded" is Columbia University's Center on Global Energy Policy (CGEP). However, the scope of CGEP's research is very different from the organizations in the Almond et al. control groups. The university centers in the "non-fossil-funded" group include many organizations, like the Johns Hopkins Initiative for Sustainable Energy Policy, that focus primarily or exclusively on climate change and sustainability. In contrast, CGEP studies myriad energy issues including not only climate change but also broader energy-related topics such as geopolitics, markets, economics, and development.

For example, CGEP wrote extensively about the geopolitical and economic impacts of Russia cutting natural gas exports to Europe after it invaded Ukraine, and about the geopolitical implications of negotiations between Russia and China over a major new natural gas pipeline between the two countries. Reports on these topics will clearly discuss natural gas differently than reports that focus solely on the harmful emissions from natural gas. Other university centers, like the Belfer Center at Harvard's Kennedy School, cover topics more similar to CGEP, but they were excluded from the control group.

This research design flaw is even more evident in the second control group, which consists of the Intergovernmental Panel on Climate Change, the Environmental Defense Fund, and the American Council on Renewable Energy. The research focus of these environment and climate-focused organizations is not remotely like CGEP's.

Even if the sentiment analysis in Almond et al. was carried out appropriately (and it was not, as we explain below), the main finding of the paper—that sentiment toward natural gas differs across organizations—can be explained by the different research focuses of these organizations, which has nothing to do with funding sources.

Results are ignored if they do not match the paper's hypothesis

In addition to the above-mentioned flaws in the research design and execution, the Almond et al. study draws its conclusions by highlighting empirical results that support its hypothesis about the connection between fossil fuel funding and research outcomes and ignoring its own results that contradict its hypothesis.

For example, the analysis includes tests of the phrases "natural gas" and "oil". This makes sense as a matter of research design because most oil and gas companies that support energy centers earn far more revenue from oil than from natural gas. The paper's findings

on oil do not support the authors' hypothesis: instead, the results show the "less fossil-funded" centers are more favorable towards oil than the "fossil-funded" centers.

However, the paper only highlights the results for natural gas and does not highlight the results for oil. Similarly, the paper repeatedly highlights the claim that the "non-fossil funded" centers display a more positive sentiment toward renewable energy than toward natural gas. But this is only partly supported by the paper's results, which display a more positive sentiment for solar than natural gas, but a *more* positive sentiment for natural gas than wind. The paper highlights the results for solar and does not highlight the results for wind.