Passing the Torch: Climate Activism, Asset Sales, and Natural Gas Flaring*

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Abstract

We study how oil well transactions between public and private firms affect carbon emissions. Using precise geographic coordinates to link wells to gas flaring events detected in satellite imagery, we show that wells sold by public firms to private operators experience increased flaring intensity relative to geographically adjacent, non-transacted control wells. Further tests suggest that this increase is unlikely to reflect the selection of increasingly polluting wells, and is more consistent with private acquirers, who face weaker environmental scrutiny, raising flaring at the wells they purchase. Our findings suggest a novel channel through which environmental shareholder pressure can prove counterproductive: porous firm boundaries facilitate the transfer of polluting assets to operators willing to increase emissions.

JEL codes: G34, Q52, Q53, Q54

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1 Introduction

There is a well-established literature on how investors with non-pecuniary objectives can use their portfolio allocation decisions and corporate governance engagement to effect social and environmental change (Heinkel, Kraus, and Zechner, 2001; Pástor, Stambaugh, and Taylor, 2021; Oehmke and Opp, 2025; Berk and Van Binsbergen, 2025). On the issue of protecting the environment, political economy constraints have limited collective action efforts to enact and enforce policies that hold firms accountable for their pollutive externalities, making targeted action through investor and corporate governance initiatives an attractive alternative avenue for effecting environmental change.

While leveraging shareholder power has become increasingly popular in the environmental movement, it is often applied unevenly, with a focus on larger, more visible, publicly traded firms. This asymmetry raises the possibility that high-externality economic activities may shift toward less scrutinized segments of the economy, with a key mechanism being the transaction market for polluting assets. In a key study, Duchin, Gao, and Xu (2025) find that firms facing greater environmental pressure from investors tend to divest their more heavily polluting plants to operators facing less pressure. However, they find that the transfer of assets to firms facing weaker environmental scrutiny does not result in any detectable changes in toxic pollution intensity.

In this paper, we examine whether asset transactions between publicly traded companies and private entities result in changes in carbon emissions in the U.S. oil and gas sector. Climate-related investor and corporate governance initiatives have grown rapidly in recent years, as many view them as a potentially effective substitute for political solutions to combating climate change, particularly in the U.S., which has been relatively slow to adopt carbon-related policies. In comparison to the toxic chemical releases studied by Duchin et al. (2025), carbon emissions face weaker legal and regulatory restrictions. In the United States, heavy emitters of toxic chemicals face the possibility of harsh enforcement action by regulatory authorities and lawsuits by nearby property owners and environmental groups,

potentially explaining Duchin et al.'s null findings on post-transaction changes. In contrast, the regulatory framework and tort liability surrounding carbon emissions are relatively weak. This raises the possibility that private pressure from climate-minded investors directed at public firms may unintentionally induce the transfer of carbon-emitting assets to operators that have the willingness and legal scope to increase emissions.

We focus our analysis on carbon emissions from natural gas flaring, examining whether the frequency of flaring changes when oil wells are transacted between public and private firms. Gas flaring is a common practice in crude oil extraction, used to dispose of associated natural gas created as a byproduct of production. It is an economically meaningful source of carbon emissions, with global oil production sites flaring 151 billion cubic meters of gas in 2024 according to the World Bank.[1] Importantly, flaring can be measured reliably using satellite imagery, mitigating concerns about potential bias in self-reported emission figures.

We further seek to understand the underlying channel driving any potential changes in gas flaring following a transaction between oil and gas firms. First, the choice of which wells to buy and sell may be endogenous to well characteristics related to emissions trajectories. For example, public operators may choose to sell wells with increasing methane flows that will require higher rates of future flaring. Under this selection channel, a well transaction helps the seller address climate-related pressure from its investors, but overall emissions are transferred rather than reduced. On the other hand, a post-transaction flaring increase may stem from a treatment effect, in which the private buyer of the well operates it under fewer environmental constraints than in the counterfactual case where the public seller keeps the well.

While both the selection ("dirty well") and treatment ("dirty operator") channels should interest climate-motivated investors, as they both circumvent investors' intentions, the treatment channel is more environmentally pernicious, as it implies a counterproductive increase

[1] This represents roughly 400 million tons of CO_2-equivalent emissions, more than the annual emissions of the entire Egyptian economy. Abatement technologies, such as gas capture and re-injection, are available but costly to deploy, with estimated global costs exceeding $100 billion. See `https://www.worldbank.org/en/programs/gasflaringreduction/gas-flaring-explained`.

in overall emissions. We emphasize that we do not claim to fully separate the selection and treatment channels; instead, we assemble several pieces of complementary evidence indicating that the dirty operator channel is an important driver of our results. We also note that the treatment channel interpretation can hold even if operators select high-flaring wells to sell (a sensible strategy for firms seeking to reduce their overall carbon footprint). The competing selection channel in our case is second-order in nature, as it involves firms selecting wells to sell based on predicted *changes* in flaring. Nevertheless, we design our empirical tests to probe this selection channel.

As a starting point, we match transacted wells to a set of control wells that are geographically adjacent and hence should be subject to similar geological constraints. While this matching absorbs geological determinants of flaring shared by nearby wells, it does not by itself rule out the possibility that sellers select which wells to divest based on their emissions trajectories. We address this residual selection concern in two ways. First, we use a dynamic event study to check whether flaring, as well as oil and gas production, diverges before ownership changes hands. Second, we check whether our main findings are more pronounced for transactions where selection is more likely to play a role—i.e., deals involving few wells, deals in which wells are sold at a discount, and deals in which the seller faces more intense environmental pressure from shareholders.

Our analysis brings together well-level data on U.S. oil well assets, satellite-based measurements of natural gas flaring, and firm-level measures of environmental shareholder pressure. We use the precise geographic locations of individual wells to measure monthly flaring frequency from satellite readings. Matching transacted wells to geographically adjacent non-transacted control wells, we track the flaring activity of matched well pairs in a $\pm$24-month event window around the transacted well's transaction date, using a matched-pairs difference-in-differences (DiD) estimation approach. We conduct this analysis separately for public-to-private, private-to-public, public-to-public, and private-to-private transactions.

We find that wells transferred from public to private operators experience more than a 100

percent increase in flaring relative to geographically matched control wells. We do not find any significant change in flaring in private-to-private or public-to-public transactions, and only a statistically weak decline for private-to-public deals that can be attributed to a noisy flaring increase at control wells. A dynamic event study shows that flaring at transacted wells does not diverge from flaring at matched control wells until after the transaction. We also find no evidence of different pre-transaction trends in oil production and gas production between transacted and control wells, which goes against the selection channel.

Conducting heterogeneity tests in our analysis of public-to-private transactions, we find that the flaring increase is concentrated in liquid-producing wells, where gas is largely a byproduct of production, while wells producing primarily dry gas, where gas is the product and does not require disposal, show no response. The effects are also more pronounced in shale formations, particularly in the Bakken Shale, where flaring is a key operational lever for maintaining the production capacity of hydraulically fractured wells. Additional heterogeneity tests show that our findings are concentrated in the period following the 2015 Paris Climate Agreement, a catalyst for climate-related investor initiatives, though this may be driven by the smaller volume of deals and noisier satellite detection in the pre-Paris period. We also find that acquisitions by private equity (PE)-backed operators account for the increase in flaring following public-to-private sales, suggesting that our findings are not explained by public firms offloading environmental liabilities to small, poorly capitalized operators—a phenomenon documented in Armitage, Boomhower, and Hausman (2026).

To further disentangle the potential selection and treatment channels, we conduct a heterogeneity test by comparing public-to-private deals in which sellers face varying degrees of intensity in environmental shareholder pressure. If our baseline finding is driven by selection, we should expect flaring increases to be more pronounced in well transactions involving public sellers facing direct shareholder pressure in the form of environmentally related proxy-vote proposals. However, we find no evidence that such transactions are associated with larger positive flaring effects. Moreover, we find that the flaring increase in public-to-private trans-

actions is larger in deals involving a higher number of transacted wells and higher payments on a per-well basis, which goes against the idea of pressured sellers quietly disposing of a few select wells at a discount to offload environmental liabilities.

We further explore the selection angle by conducting a separate analysis at the firm level, focusing only on publicly traded firms. Specifically, we aggregate well-level flaring associated with transactions to the firm level and study how environmental shareholder proposals relate to (a) the number of wells bought and sold, and (b) the flaring characteristics of the wells bought and sold. In terms of transaction volume, we find that firms sell roughly 50% more wells after facing an environmental shareholder proposal, but we do not find any significant relationship with the number of wells they buy. We also find suggestive evidence that facing environmental shareholder proposals is associated with firms selling wells that flared more frequently pre-transaction, but the estimate is not statistically significant. Importantly, we find no evidence that they sell wells that *increase* flaring intensity post-transaction, consistent with our well-level results.

Our study builds on several strands of research, particularly the recent literature on how environmental factors affect divestment of polluting assets. Most notably, Duchin et al. (2025) show that firms facing environmental pressures from various stakeholders are more likely to divest their polluting plants. Similarly, Berg, Ma, and Streitz (2023) show that heavy emitters became more likely to divest polluting assets after the Paris Agreement. In contrast, Kahn, Matsusaka, and Shu (2023) find that green pension fund ownership reduces firms' emissions directly rather than through the divestment of polluting facilities. With respect to regulatory compliance risks, Armitage et al. (2026) find that oil and gas operators sell polluting wells to undercapitalized firms that use limited liability protection to avoid the enforcement penalties associated with environmental violations.

While our research relates to these studies on how firms divest polluting assets in response to shareholder pressure, our contribution is to show that carbon emissions—which face weak regulatory and legal constraints—increase when ownership passes from pressured

operators to less-pressured ones, in contrast to the insignificant change in toxic chemical releases documented by Duchin et al. (2025). In this respect, our paper relates closely to Bellon (2025), who finds that PE-backed operators reduce the pollution of assets they acquire from relatively less well-capitalized private firms. Notably, we find that sales from public operators to PE-backed private operators drive our findings of increased flaring in public-to-private transactions, suggesting that asset acquisitions by PE-backed oil and gas operators may play a role both in mitigating pollution and in exacerbating it. We note, however, that Bellon (2025) also focuses on toxic release pollution rather than carbon emissions.

Our finding that flaring increases following public-to-private transactions connects to a growing literature on the unintended consequences of sustainable investing. Gupta, Kopytov, and Starmans (2026) theoretically show that socially responsible investors can slow environmental reform by inducing brown firms to sustain high-emission production in anticipation of trading by prosocial investors. Hartzmark and Shue (2022) provide empirical evidence that sustainable investment strategies that raise the cost of capital for polluting firms can, counterintuitively, increase aggregate carbon emissions. We contribute to this literature by providing suggestive evidence that environmental investor pressure can counterproductively increase emissions by inducing operators to sell assets to more willing polluters.

Our study also connects to a broader literature on sustainable investing and ESG-focused capital. Prior work has developed theoretical frameworks for how sustainability-targeted investing can achieve social or environmental objectives (Heinkel et al., 2001; Pástor et al., 2021; Oehmke and Opp, 2025; Berk and Van Binsbergen, 2025), but these models generally abstract from transfers of polluting assets between firms facing varying degrees of exposure to pressure from environmentally conscious investors. Empirical evidence on the impact of green investing is mixed. Some studies find that green investors induce their portfolio firms to reduce emissions (Naaraayanan, Sachdeva, and Sharma, 2021; Azar, Duro, Kadach, and Ormazabal, 2021; Busch, Scheitza, Bauckloh, and Klein, 2023; Kahn et al., 2023), while others conclude that the impact of ESG-oriented investing is limited (Heath, Macciocchi,

Michaely, and C. Ringgenberg, 2023; De Angelis, Tankov, and Zerbib, 2023; Diaz-Rainey, Griffin, Lont, Mateo-Márquez, and Zamora-Ramírez, 2024). Our findings suggest that the active market for oil and gas assets may partially explain why climate-minded shareholders have experienced limited success in achieving meaningful reductions in global greenhouse gas emissions.

Our paper also contributes to a literature comparing the real and environmental behavior of public and private firms. Specific to the U.S. energy sector, Gilje and Taillard (2016) find that private firms respond less than public firms to changes in investment opportunities. Most closely related to our study is Shive and Forster (2020), who compare pollution across ownership types and find private firms do *not* pollute more than public ones.[2] Our study, however, focuses on a different measurement: rather than emissions that firms self-report to the EPA, which depend on reporting thresholds and incentives, we observe well-level flaring from satellite imagery, which should be unaffected by whether an operator is public or private. Moreover, their sample ends in 2016, largely predating the rapid expansion in environmentally motivated investment following the 2015 Paris Climate Agreement, when environmental pressure placed on public and private firms diverged. Consistent with this reading, our own estimates are concentrated in the post-Paris period. Outside of the environmental context, prior research has also found public firms to comply with regulations more than private ones (Slutzky, 2021).

Finally, our paper relates to an extensive literature on carbon leakage, which examines the transfer of emitting assets across national borders in response to environmental regulation. For example, Aichele and Felbermayr (2015) find that binding commitments under the Kyoto Protocol increased committed countries' carbon imports from non-committed countries, Bartram, Hou, and Kim (2022) show that firms shift emissions and output from California to other states in response to a cap-and-trade program, Ben-David, Jang, Kleimeier, and Viehs

[2] Specifically, they find that independent private firms are *less* likely to pollute and to incur EPA penalties than observably similar public firms, while sponsor-backed private firms are statistically indistinguishable from public firms.

(2021) show that firms headquartered in countries with strict environmental policies tend to concentrate polluting activities abroad, and Känzig, Marenz, and Olbert (2024) document that multinational firms shift emission-intensive activities to affiliates located in developing countries with less restrictive environmental standards. Our paper highlights that carbon leakage can occur not only across national borders but also across firm boundaries when firms face varying degrees of environmental pressure.

2 Institutional background

2.1 The M&A market for upstream oil and gas assets

The market for oil and gas assets in the United States is active, with transaction volumes sensitive to commodity price cycles and technological shocks. Periods of high oil prices tend to stimulate deal activity due to higher asset valuations and expanded financing capacity, whereas oil price downturns often trigger consolidation and asset divestitures. Technological innovation plays a central role in shaping upstream M&A deals,[3] with horizontal drilling and hydraulic fracturing representing particularly notable technological developments that greatly expanded the set of economically recoverable reserves and resulted in a sustained boom in upstream investment and asset transactions beginning in the mid-2000s.

U.S. oil and gas M&A activity is geographically concentrated. Most transactions occur in a small number of high-volume regions, including the Gulf Coast, the Midcontinent, the Rockies, and the Permian. These regions contain favorable geology for extracting hydrocarbons and feature extensive infrastructure and a large installed base of oil and gas wells, resulting in highly liquid markets for upstream assets. In general, deal activity tends to cluster in regional waves that reflect the staggered development of production assets. For

[3] In the context of oil and gas, upstream assets refer to those used in the exploration and production of hydrocarbons, midstream assets refer to those used in the gathering and transportation of hydrocarbons, and downstream assets refer to those used to convert raw or semi-processed hydrocarbons into consumer and industrial products.

example, transaction intensity in the Barnett Shale formation, located in the mid-continental Fort Worth Basin, peaked earlier, coinciding with its role as one of the first large-scale shale gas developments, while deal activity in the Bakken Shale formation, located in the Williston Basin, emerged later, tracking the region's development and production timeline (Hsu, Wright, and Zhu, 2017).

2.2 Gas flaring in U.S. oil and gas production

Upstream oil and gas operators drill wells (bored holes) from which they extract hydrocarbons through a variety of methods. A well typically produces a mixture of crude oil, methane, and natural gas liquids, with the relative composition determined by local geology and production technology. Flaring arises from this joint production of multiple hydrocarbons at the wellhead, where operational and infrastructure constraints create a need for operators to dispose of the associated natural gas (i.e., methane) that is created as a byproduct of liquid production.

Gas flaring is particularly common in U.S. upstream oil and gas operations due to the rapid expansion of shale production and the geographic concentration of oil-rich basins. Advances in horizontal drilling and hydraulic fracturing expanded production in oil-rich shale plays over the past two decades, increasing the prevalence of associated gas in regions where gas takeaway infrastructure was initially limited. The majority of U.S. flaring occurs in the Permian Basin and the Bakken Shale, where growth in oil production has outpaced the development of gas gathering, processing, and transportation capacity. According to the World Bank, nearly half of the global increase in flaring between 2017 and 2018 was concentrated in U.S. oil basins.[4]

The geology of shale production makes the link between shale wells and flaring particularly tight. For shale wells designed to produce liquid oil or condensate, which commonly use hydraulic fracturing to inject high-pressure liquids to create cracks in deep-rock shale

[4] See https://www.worldbank.org/en/news/press-release/2019/06/12/increased-shale-oil-production-and-political-conflict-contribute-to-increase-in-global-gas-flaring.

formations, the associated gas that surfaces is a byproduct that cannot easily be stored or transported as the production profile is too front-loaded to justify connecting the well to gathering infrastructure. In contrast, dry gas wells, where gas is the product being sold, are connected to pipelines as a condition of operating, resulting in little gas to dispose of outside of safety events. Flaring is therefore concentrated in liquids-rich shale plays, and largely absent from dry-gas production—a distinction that motivates the geological heterogeneity analysis in our empirical analysis.

From an operational perspective, flaring is done for safety and engineering reasons: releasing or burning gas reduces pressure buildup at the wellhead and stabilizes flow conditions, allowing production equipment to operate within safe and efficient ranges. Nevertheless, these practices impose substantial environmental externalities, with the Intergovernmental Panel on Climate Change reporting that anthropogenic methane emissions have likely contributed to 0.3–0.8 degrees Celsius of global warming (Agerton, Gilbert, and Upton Jr, 2023).

The primary alternative to flaring is to capture and monetize associated gas. However, this requires costly investments in midstream infrastructure such as pipelines and processing plants, which shale well operators often find difficult to justify economically. First, considerable uncertainty about a shale region's long-run production profile makes irreversible midstream investments risky during the drilling stage. Second, the steep production decline rates associated with shale wells mean that takeaway infrastructure built for initial production volumes may quickly become underutilized. Even when takeaway capacity is available, congestion can create segmented local markets in which producers may strategically use flaring to limit output when negotiating with midstream operators.[5]

A range of technological solutions exists to limit flaring when pipeline capacity is unavail-

[5] In an illustrative example from Texas, upstream operator EXCO Resources continued flaring despite being connected to gas-gathering infrastructure operated by midstream operator Williams. When Williams sought to compel EXCO to curtail flaring and utilize gathering services, the Texas Railroad Commission ruled against Williams, framing the dispute as a commercial disagreement rather than a violation of flaring regulations (Agerton et al., 2023).

able or constrained. These include compressing gas at the wellhead for transport by truck to nearby users, deploying modular equipment to convert gas into methanol or liquefied natural gas, or reinjecting gas back into the reservoir. However, these options are typically more costly than simply flaring gas at the wellhead, particularly for smaller operators and short-lived wells.

The regulatory environment governing flaring in the United States is highly fragmented and varies substantially across states. In many producing regions, flaring is weakly regulated or effectively unregulated. Two notable exceptions are Texas and North Dakota, where state agencies require operators to obtain flaring permits and report flared volumes. In Texas, regulators do not impose statutory limits on the volume of gas that may be flared, and upstream flared gas is exempt from state production taxes, creating preferential fiscal treatment for flaring relative to gas capture. North Dakota adopted gas capture targets in 2014, but the targets are permissive in structure and contain numerous exemptions.[6] At the federal level, the Environmental Protection Agency finalized methane and flaring standards in 2016, including Leak Detection and Repair requirements, but these rules were never fully implemented and were subsequently rolled back.[7]

2.3 Shareholder pressure in the oil and gas sector

Over the past several decades, publicly traded firms in carbon-intensive industries have faced growing pressure from a broad set of stakeholders, including the general public, governments, and shareholders, to assess their role in addressing climate change. Following the Paris Climate Agreement in December 2015, the first globally coordinated commitment to limit the increase in average global temperatures to well below 2°C above pre-industrial levels, climate activists have grown increasingly willing to engage with corporations through their

[6] Specifically, the targets are set as capture percentages rather than volumes, compliance is evaluated across an operator's whole portfolio, and the initial horizontal well drilled in each spacing unit may produce at its maximum efficient rate whether or not it is connected to a gathering system. See North Dakota Industrial Commission Order 24665 and its accompanying policy guidance for more details.

[7] More stringent federal regulations were proposed in 2021 and adopted in 2023, but their effects come too late to be captured in our sample period.

roles as shareholders. According to the Sustainable Investment Foundation, mutual funds, private equity funds, and other investment vehicles with climate-related objectives had $3.4 trillion in assets under management (AUM) in the United States in 2022, representing 5.1% of total U.S. AUM (SIF, 2022). That same year, shareholder groups introduced 146 climate-related proposals.[8]

Oil and gas companies have been among the firms targeted by shareholder proposals sponsored by large institutional investors—including CalPERS and the New York State Common Retirement Fund—calling for enhanced disclosure and governance around climate risks. In particular, many proposals have called for firms to assess how long-term climate change and associated policy responses would affect the value of their asset portfolios, often explicitly asking for a "2-degree scenario analysis" grounded in the Paris Agreement's temperature goals. Such proposals often frame climate change not only as an environmental issue but also as a material financial risk with implications for stranded assets, capital allocation, and long-run firm value. Berkman, Jona, Lodge, and Shemesh (2024) show that following the Paris Agreement, climate-focused shareholder proposals experienced a significant increase in their likelihood of success. In response to growing pressure over climate risk, oil and gas firms have issued statements about reducing their carbon footprints. Many oil and gas producers have joined international pledges to reduce routine flaring, such as the World Bank's Zero Routine Flaring (ZRF) by 2030 initiative.[9]

The recent period has also seen the diffusion of standardized frameworks for corporate emissions disclosure, particularly the classification of greenhouse gas emissions into Scope 1, Scope 2, and Scope 3 categories. Scope 1 emissions refer to direct emissions from sources owned or controlled by the firm; Scope 2 emissions capture indirect emissions from purchased energy; and Scope 3 emissions encompass upstream and downstream emissions along the value chain. Compliance with these frameworks has disproportionately affected public firms,

[8] See `https://corpgov.law.harvard.edu/2024/10/10/climate-shareholder-proposals-a-more-sophisticated-discourse/`.

[9] See `https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030/about` for more details about the initiative.

which are subject to greater disclosure requirements, regulatory oversight, and shareholder scrutiny than private firms. Importantly for the oil and gas sector, gas flaring constitutes a Scope 1 emission, making it a highly visible and directly attributable source of carbon emissions. Moreover, because Scope 1 emissions are directly linked to firms' operational decisions and cannot be easily outsourced or reclassified, reductions in flaring are often viewed by investors and regulators as a clear signal of a firm's commitment to emissions mitigation.

Despite recent environmental trends, there is limited evidence that sustainable investment initiatives have translated into substantial reductions in overall carbon emissions (De Angelis et al., 2023). The role of the transaction market for oil and gas assets has recently attracted attention, with the term "brown-spinning" coined to describe public firms divesting polluting assets to private operators facing less shareholder pressure on environmental issues (Gozlugol and Ringe, 2022). Investors are often unaware when firms sell emission-intensive assets to reduce their carbon footprint, as current disclosure requirements around the emissions of divested assets are limited to their own activities (Arnold, Lockman, Toledano, Dietrich Brauch, Sen, and Burger, 2023). In his annual letter to CEOs in 2022, BlackRock CEO Larry Fink argued that "[d]ivesting from entire sectors—or simply passing carbon-intensive assets from public markets to private markets—will not get the world to net zero."

3 Data sources

3.1 Oil and gas well-level data

We compile a comprehensive well-level dataset that combines detailed information on well ownership, transactions, physical characteristics, and production outcomes covering the universe of oil and gas wells in the United States. We obtain the underlying proprietary datasets from Enverus, a data provider specializing in the energy sector. We describe these datasets below.

First, we use the Operator History dataset to track changes in well operators over time. Each record in this dataset marks a new operational event, such as a permit approval, drilling activity, or production start. Using these events, we construct a longitudinal well-level record of operator transitions, which forms the foundation for identifying ownership changes and matching them to transaction events. We then match well-level Operator History records with deal-level records from the Transactions dataset to obtain detailed information on the buyer, seller, date, and other deal-level characteristics for each transaction.

Next, we extract static information on each oil or gas well, including its geographic coordinates (latitude and longitude), basin, region, and other physical characteristics, from the Wells dataset. The spatial precision of these data allows us to merge wells with external geographic information, including satellite-based measures of gas flaring. We restrict the sample to wells located within the continental United States.

Lastly, we obtain monthly production data from the Production dataset, which includes detailed records of gas flaring volumes, measured in thousand cubic feet (MCF). These self-reported well-level flaring records enable us to construct a secondary measure of well-level flaring intensity. The Production dataset also provides detailed production figures, either at the aggregate level, measured in barrels of oil equivalent (BOE) units, or broken down by oil production, measured in barrels (BBL), and gas production, measured in MCF.

3.2 Flaring data

We construct our primary measure of gas flaring using the Visible Infrared Imaging Radiometer Suite (VIIRS) Nightfire data provided by the Earth Observation Group (EOG) at the Colorado School of Mines. The VIIRS Nightfire (VNF) product identifies combustion sources by detecting shortwave and mid-infrared radiation emitted at night. Each satellite pass records the radiance of sub-kilometer pixels, and EOG applies the Nightfire algorithm to estimate the temperature and source area of emitters.

The VNF algorithm uses Planck-curve fitting of the spectral radiance to infer the tem-

perature and emitting area of combustion events. Following the classification criteria in Elvidge, Zhizhin, Baugh, Hsu, and Ghosh (2015), we identify natural-gas flaring events as those with inferred temperatures between 1,300 K and 2,200 K. This restriction serves to minimize contamination from non-flaring sources such as industrial heat sources or biomass burning (e.g., forest fires), which typically produce lower temperatures.

We download daily VNF files from the Colorado School of Mines data server, retrieving daily files starting from 2012, when the data became available. We parse each daily file and retain essential variables such as geographic coordinates, detection date, and the estimated blackbody and background temperatures. We then filter the observations using the 1,300–2,200 K range, producing a dataset that contains all identified flaring detections within the continental United States.

3.3 Firm data

We obtain data on environmental shareholder proposals from the Ceres Shareholder Proposal Database.[10] This dataset contains information on filing year, sponsoring institution, and voting outcomes for shareholder proposals filed with publicly traded U.S. firms. Because Ceres is a climate and sustainability engagement tracker, the proposals in the dataset all pertain to environmental issues, including climate change and greenhouse gas emissions.

We merge the Ceres proposal data with information about publicly traded firms in Compustat to create a firm-year panel for firms that have faced one or more environmental shareholder proposals during the sample period. We then link these publicly traded firms to the well-level data described in Section 3.1 by matching deal-level buyers and sellers to Compustat firms using standardized company names. This enables us to identify wells that were bought or sold by publicly traded companies, while also allowing us to investigate the relationship between environmental shareholder activism and the gas flaring activity for acquired and divested wells at the firm level.

[10] See `https://engagements.ceres.org/`.

4 Gas flaring around well transactions

Our main analysis focuses on how asset transactions—sales from public to private companies in particular—affect the intensity of natural gas flaring at the well level. Below, we describe how we construct our panel of monthly well-level observations, provide summary statistics for our analysis sample, and explain our benchmark findings.

4.1 Sample construction

We begin by identifying well-level ownership changes using the Enverus Operator History data described in Section 3.1. For each well, we observe a sequence of operator records corresponding to discrete operational events (such as permit, drilling, or production updates). We identify an operator change when the operator name differs between two consecutive events. Each operator change is then linked to the Enverus Transactions dataset by matching the pre-change operator to the transaction seller and the post-change operator to the transaction buyer, requiring that the transaction date fall between the two event dates surrounding the change. We drop transactions before 2014, where pre-transaction flaring coverage is incomplete, and transactions after 2020, where uninterrupted control well spells are sparse. The procedure yields 71,676 well-level transfers from 2014 to 2020 covering 67,350 distinct wells.[11]

We further classify each transaction by the ownership status of the buyer and seller, using firm identifiers obtained through name matching between operators and the universe of publicly traded firms. Public companies are the seller in 53,753 of the linked well-level transactions and the buyer in 27,953 transactions. Panel A of Figure I illustrates the time series of linked transactions by buyer-seller type in our sample period. Of note is the pronounced surge in public-to-private transactions peaking in 2016, in the immediate aftermath of the 2015 Paris Climate Agreement. Figure II plots the geographic distribution of all transacted

[11] The pre-2014 restriction is required for outcomes measured using VNF satellite data. For select analyses on flaring or production measures based on regulatory filings rather than satellite images, we extend the data to the full 2002–2020 sample of transfers.

wells, which are concentrated in the Permian, Eagle Ford, Bakken, and other major U.S. shale formations.

To account for the selection of transacted wells based on geological characteristics, we match each transacted well to a geographically adjacent well that was not transacted. To construct the pool of candidate control wells, we first use the Operator History dataset to identify spells in which a single operator has uninterrupted control over a particular well. We then use well latitude and longitude information to match each transacted well to the nearest potential control well (without replacement), conditional on the following criteria:

1. The control well is located within 5,000 meters of the transacted well.
2. The control well is at least 1,000 meters from *any* transacted well. This is to ensure that no control well is contaminated by flaring associated with another transacted well in our sample.
3. The control well's operator is in place at least 730 days before the transaction and no change of operator is recorded within 730 days after it.[12] This ensures that a control well does not change ownership around the transaction date of its matched treated unit within a symmetric window that matches the ±24-month analysis window.
4. Among the control wells satisfying the first three criteria, we match based on the liquid content of the wellhead product. To break ties, we match on shale status, and remaining ties are broken by distance.

Enverus classifies a well's production stream by the share of liquids at the wellhead: *oil* (40% or more wellhead liquids), *liquids-rich gas or condensate* (10–40%), *wet gas* (1–10%), and *dry gas* (0–1%). We use these four categories throughout, and "dry-gas wells" below refers to the last category.[13]

[12] Given that transacted wells are typically active wells, we filter out dormant control wells by requiring control wells to have at least one operational event recorded after the transaction dates.

[13] Transacted wells are matched in order of liquids richness, so the most liquids-rich transacted wells claim their same-type controls first. If no same-type control lies within the ring, the nearest eligible well is used to maintain the match rate. The matching binds for most pairs, with 75% of matched pairs sharing the transacted well's wellhead product type and 87% sharing its shale status.

This ring-based matching procedure yields 10,898 matched treated–control pairs of wells with transaction dates from 2014 through 2020: 4,211 public-to-private, 3,148 public-to-public, 1,946 private-to-private, and 1,593 private-to-public pairs.

For each matched treated–control pair, we classify the pair into one of four categories based on the ownership type of the *transacted* well's seller and buyer: public-to-private, private-to-public, private-to-private, and public-to-public. The control well does not experience a transaction and therefore does not change ownership status; any fixed differences between public and private operators of control wells are absorbed through the well fixed effects and differenced out in the empirical design. In robustness tests, we further restrict to pairs in which the control well's operator has the same public/private status as the transacted well's seller.

Panel B of Figure I illustrates the time series of transactions that are matched to a control well, broken down by buyer-seller type. Note that, relative to those in Panel A, the counts in Panel B decline toward the end of the plotted window for a mechanical reason: our matching procedure requires control wells to exhibit long uninterrupted operator spells, and later-year deals have had less post-transaction data to accumulate the required spell length. Nevertheless, Figure III shows that matched treated and control locations closely track the overall geographic distribution of well transactions in Figure II.

We measure flaring activity using VNF data from the Colorado School of Mines. As described in Section 3.2, flaring detections are inferred from the infrared radiance of nighttime satellite pixels, and we classify pixels with inferred temperatures between 1,300 K and 2,200 K as natural-gas flares following Elvidge et al. (2015). Using well latitudes and longitudes, we spatially join wells to nearby VNF detections within a 500-meter buffer.[14] To capture flaring activity surrounding ownership changes, we retain detections occurring within a symmetric ±24-month window centered on the transaction date. For transacted wells, this window is centered on the well's actual transaction date; for control wells, it is centered on

[14] We use 500 meters to account for the 375-meter fire pixel size from the VIIRS satellite images while allowing for geolocation error and minimizing contamination from neighboring matched control wells.

the transaction date of the matched treated well. We then aggregate all matched detections to the well–month level, summing flaring observations within each month and scaling by the number of days in the month to form average daily flaring intensity. This monthly measure, *Flares/day*, serves as the main dependent variable in our empirical analyses. VNF coverage begins in 2012, so event-window months before 2012 record no detections for either well in a pair; such months are common to both wells within a pair and are absorbed by the fixed-effects structure described below.

We merge our monthly flaring panel with the Enverus Production dataset, which provides well-level measures of monthly oil and gas production volumes. Production is measured in thousands of barrels of oil equivalent (BOE), and gas flaring volume is measured in thousands of cubic feet (MCF). Table AI in the Internet Appendix shows a robust and significant relationship between the two measures: each additional daily satellite detection is associated with roughly 462 MCF of additional reported flare volume per day.

Following prior research that measures flaring using VNF data (Bellon and Boualam, 2024), we use *Flares/day* as our primary measure of gas flaring in our analysis. Importantly, the flaring volume measure provided by Enverus comes from self-reported regulatory filings. Such filings are subject to misreporting, and public and private operators may report their flaring in systematically different ways, potentially confounding our findings. In contrast, the VNF measure does not rely on self-reporting and relies instead on the radiance-to-temperature conversion algorithm rooted in thermal physics. Nevertheless, we also re-estimate our main specifications using the Enverus-based *Flare volume/day* as a robustness check.

Finally, since dry-gas wells sell their gas by construction and have little to flare outside of safety events, flaring outcomes at dry-gas wells should be insensitive to ownership changes. Therefore, we report our main results for both the full matched sample and a sample that excludes pairs in which the transacted well is a dry-gas well.

4.2 Summary statistics

Table I reports summary statistics for the well–month observations in our matched sample of treated and control wells. Panel A presents descriptive statistics for the full matched sample. The average well produces approximately 818 BOE per month, and publicly traded companies operate approximately 68% of well-months. Oil is the most common wellhead product (55% of well-months), followed by dry gas (20%), wet gas (11%), and condensate (11%); 21% of well-months belong to shale wells. Flaring is rare in the overall sample, with *Flares/day* exhibiting a mean of 0.0014. This stems from the fact that most well pairs in the larger sample never flare inside the event window due to geological and production factors. For example, flaring is unlikely to be necessary for gas wells where gas is the product intended to be stored, transported, and sold, rather than a byproduct requiring disposal. Indeed, when we exclude dry-gas well pairs in Panel B, we observe a higher average flaring intensity. In our analysis, we also examine other geological and production factors (including more granular variation in liquid content and hydraulically fractured shale wells) to better contextualize magnitudes within the population of well pairs with plausible flaring potential.

In Table II, we show comparisons of average pre-transaction flaring between transacted and matched control wells for both the overall sample and the dry-gas-excluded sample. For our primary satellite-based measure, *Flares/day*, there is no detectable difference between transacted and control wells in any of the four buyer–seller categories, in either panel (all p-values exceed 0.29). The Enverus-based volume measure shows higher reported volumes at transacted wells, but the differences are confined to private-to-public deals. These patterns suggest that any selection effects for private-to-public transactions should not operate through pre-transaction flaring frequency. In later robustness tests, we additionally condition on the control well's operator having the same ownership status as the seller, ensuring that differences in pre-transaction operator type do not confound our estimates.

4.3 Well transactions and gas flaring

We begin by documenting the raw evolution of average flaring by event month (i.e., month relative to transaction date). In Figure IV, we plot the average flaring intensity by event month for all matched transacted wells, disaggregated by buyer-seller type. Subfigure (a), which presents public-to-private transactions, shows a clear pattern: flaring is flat in the pre-transaction period and rises persistently after the transaction date. The absence of pre-trends and the pronounced post-transaction increase suggest that the transfer of wells from public to private operators results in increased flaring activity. In contrast, the patterns for the other transaction types in subfigures (b)–(d) are considerably muted.

In Figure V, we present the same plots for the matched control wells, assigning each control well the transaction date of its matched treated well. Importantly, subfigure (a) does not exhibit the same pronounced post-transaction flaring increase for public-to-private transactions as in Figure IV(a). We also observe relatively flat flaring patterns for public-to-public and private-to-private transactions in subfigures (b) and (c). Subfigure (d) shows a more noticeable flaring spike in the later post-transaction months, but it corresponds to a similar, albeit less pronounced, later-month spike in the monthly flaring averages from Figure IV(d).

Next, we formalize our analysis in a regression framework by estimating the following difference-in-differences specification at the well–month level using our matched well sample:

$$Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\ Transacted_i \times Post_{kt} + \epsilon_{ikt}, \tag{1}$$

where $Flares/day_{ikt}$ is the average daily flaring for well i in matched pair k and month t, $Transacted_i$ indicates whether well i is transacted, $Post_{kt}$ indicates that the month occurs after the transaction date for the transacted well within matched well pair k, α_i are well fixed effects, and γ_{kt} are well-pair-by-month fixed effects that flexibly absorb common shocks at the well-pair $\times$ time level. The coefficient δ captures the post-transaction change in flaring at transacted wells relative to their geographically adjacent controls.

We present the estimates from estimating Eq. 1 in Table III. Panel A presents the estimates for the full matched sample. Public-to-private transactions, reported in column (1), result in a statistically significant increase in flaring: *Flares/day* rises by 0.00128, roughly 115 percent of the sample mean of 0.0011. By contrast, columns (2) and (3), covering public-to-public and private-to-private transactions, show effects that are near zero and statistically insignificant. Column (4) shows a negative estimate for private-to-public transactions, but the effect is weak and the raw means in Figures IV and V reveal it is likely driven by noisy post-transaction flaring in the control wells.

Panel B of Table III presents the analysis excluding dry-gas wells. As discussed in Sections 2.2, gas produced by such wells is intended for sale and thus does not require flaring. By removing these wells whose flaring should be unresponsive to ownership changes, the public-to-private estimate increases to 0.00160 (still roughly 125 percent of the sample mean) while leaving the same-type deals at precise zeros.

We repeat our baseline analysis using self-reported flaring volume as the dependent variable.[15] In Table AII of the Internet Appendix, we present the results of re-estimating Eq. 1 with *Flare volume/day* as the outcome. We find that public-to-private transactions raise reported flare volumes by 0.37 MCF per day (0.48 excluding dry-gas pairs). To contextualize the magnitude, the effect represents roughly half of the treated wells' pre-transaction flare volume of 0.73 MCF per producing day (0.93 MCF excluding dry-gas pairs). Expressed as the share of produced gas that is flared, treated wells flared 0.45% of their gas before the transaction (1.42% excluding dry-gas pairs), and the estimated effect adds 0.23 (0.74) percentage points to that share, an increase of roughly half in the flare share. While we rely on *Flares/day* as our primary flaring outcome due to previously discussed concerns with self-reported flaring figures, this result based on Enverus-based flaring volumes corroborates our benchmark satellite-based analysis using an independent measure.

[15] Reported volumes are compiled from operator filings rather than satellite imagery, so they are not subject to the pre-2012 coverage gap that motivates our 2014–2020 restriction; we therefore estimate this specification on the full 2002–2020 sample of transfers.

As previously discussed, our findings for public-to-private and private-to-public deals may be explained by either selection (the "dirty well" channel) or treatment (the "dirty operator" channel), where the relevant selection channel pertains to the predicted *trajectory* of flaring rather than its *level*. To investigate the possibility of public firms selecting wells to sell based on their upward flaring trajectory, we check for pre-transaction trends by estimating a dynamic event-study version of our DiD test:

$$\textit{Flares/day}_{ikt} = \alpha_i + \gamma_{kt} + \sum_{\tau \neq -1} \delta_\tau \; \textit{Transacted}_i \cdot \mathbf{1}\{\text{EventMonth}_{kt} = \tau\} + \epsilon_{ikt}, \qquad (2)$$

where $\mathbf{1}\{\text{EventMonth}_{kt} = \tau\}$ indicates whether month t comes τ months after (before) the transaction date assigned to matched well pair k and each δ_τ captures monthly deviations in flaring relative to $\tau = -1$, the month before the transaction.

Figure VI presents dynamic event-study estimates for the full matched sample, and Figure VII for the sample excluding dry-gas pairs. In both figures, panel (a) shows that public-to-private transactions exhibit flat pre-transaction coefficients and a post-transaction increase that builds over the first year and persists throughout the event window, mirroring the raw averages in Figure IV. The flat pre-transaction dynamics indicate that the selection of wells with upward trends in flaring intensity does not explain our baseline finding for public-to-private transactions. The remaining panels show no comparable post-transaction divergence for the other deal types.

We note that the infrequency of flaring in our sample, which drives the economically small point estimates, stems from the fact that most matched well pairs never register a satellite flaring detection inside the event window. Such wells may not ever need to flare due to inherent geological characteristics or the availability of abundant takeaway infrastructure. To contextualize the economic effect of our findings for wells where flaring is a possibility, we conduct our analysis on a subsample where never-flaring wells are excluded. We present the findings in Table AIII of the Internet Appendix, which yields estimates roughly an order of magnitude larger: 0.0105 per day for public-to-private deals, or about 3.8 additional

detections per year, against a subsample mean of 0.0090.

4.4 Geological heterogeneity in flaring response

We examine differences in geological factors to further contextualize the magnitudes of our findings within subsamples of well pairs where gas flaring constitutes a more realistic operational requirement. We begin by conducting subsample analyses on basins with prominent shale formations. As discussed in Section 2.2, the geological features of shale formations and the hydraulic fracturing technology used to access shale hydrocarbons make flaring operationally necessary in such areas. We present our estimates on the major shale basins in Table AIV of the Internet Appendix.[16] We see that the largest estimate by far arises in the Williston Basin—home of the Bakken shale, where 85% of matched wells are shale wells and which alone accounts for roughly half of the satellite detections in our sample—with smaller but statistically significant increases in the Permian and Appalachian subsamples, which also contain liquid-rich shale areas.[17]

The variation of estimates across basins tracks the relative maturity of their respective gas-gathering infrastructures. As discussed in Section 2.2, the Bakken was developed late and in a remote, sparsely served region, where gathering, processing, and takeaway capacity persistently lagged the pace of oil drilling. Other shale-rich basins, in contrast, developed earlier and contain more mature infrastructure. The Barnett formation in the Fort Worth Basin, for example, was the first large-scale shale development in the United States and is a gas-directed play whose wells were connected to a dense, long-established pipeline network as a condition of production. The insignificant estimates we find in some regions also stem from the prevalence of gas wells that do not need to dispose of associated gas. The estimates

[16] The principal shale plays in each basin are the Wolfcamp, Spraberry, and Bone Spring formations in the Permian; the Marcellus and Utica in the Appalachian basin; the Eagle Ford in the Western Gulf; the Haynesville in Ark-La-Tex; the Barnett in Fort Worth; and the Bakken and Three Forks in the Williston basin. We use the Enverus basin designation of the transacted well. The Permian column, headed "Permian Other" in the table, covers the portions of the Permian outside the Midland and Delaware sub-basins, which have lower observation counts in our sample and fall into the residual "Other" column.

[17] The Appalachian basin is dominated by gas production, and we see the effect is significantly larger for this basin in Panel B, where we exclude dry-gas wells.

are large in the liquid-rich Williston, small but positive in the liquids-heavy portions of the Permian and Appalachia, and indistinguishable from zero in the mature gas basins.[18]

To validate that geological characteristics drive the heterogeneous effects that we observe across basins, we check for differences in our baseline findings between shale and non-shale wells, as well as across wells with varying degrees of liquid content. To this end, we estimate the following interaction specification:

$$Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \phi\, C \times Transacted_i \times Post_{kt} + \epsilon_{ikt}, \quad (3)$$

where C is a well-pair geological characteristic.[19] Throughout the remainder of this paper, we focus on the sample of public-to-private matched pairs, excluding dry-gas transacted wells, unless otherwise indicated.

We present our findings in Table IV. Columns (1) and (2) each include a "Total effect, indicator = 1" row that reports $\delta + \phi$, which captures the transaction's effect on wells with $C = 1$. Column (3) includes two liquids indicators and therefore reports total effects for oil wells and for condensate wells separately. Column (1) shows that the flaring response is exclusive to shale wells: the total effect for shale wells is 0.00913, against a baseline of 0.00012 for non-shale wells that is indistinguishable from zero. This is consistent with operational and technological constraints: flaring is most relevant for hydraulically fractured shale wells producing front-loaded associated gas that operators must either gather or dispose of.

Next, we examine finer variation in the liquid content of the wellhead product, still excluding dry-gas wells. Column (2) shows that the response is confined to wells whose wellhead product is oil or condensate, where gas is the unwanted byproduct. The total effect for these well types is 0.00189, while wells producing wet gas show no response.[20] Column (3) separates oil from condensate by including both indicators, so that the base term is the

[18] This is reflected in the extremely sparse detection of flaring in the Ark-La-Tex and Fort Worth Basins, which register only 49 and 4 satellite detections respectively over the entire matched sample.

[19] Unreported lower-order interaction and level terms are absorbed by the fixed effects.

[20] The comparison group in columns (2) and (3) consists of wet-gas wells together with a small number of pairs (76) whose wellhead product Enverus does not classify. We group these together with wet-gas wells for convenience.

response of wet-gas wells, the first interaction is the increment for condensate over wet gas, and the second is the further increment for oil over condensate. The response rises with liquids richness: it is zero for wet-gas wells, 0.00078 for condensate wells, and 0.00203 for oil wells. The additional increment for oil over condensate (0.00126) is significant only at the 10% level, reflecting the small number of condensate pairs, so we read the oil–condensate difference as suggestive.

4.5 Deal-level heterogeneity in flaring response

Next, we examine heterogeneity in deal-level characteristics. We begin with an examination of temporal heterogeneity, using the 2015 Paris Climate Agreement as a key inflection point in the evolution of environmental shareholder pressure. Under both the dirty wells (selection) and dirty operator (treatment) channels, we should expect our baseline findings to be more pronounced in the post-Paris deals. Under the dirty well channel, increased climate pressure would have induced public operators to sell wells on an inevitably higher flaring path. Under the dirty operator channel, increased climate pressure would have widened the willingness-to-flare gap between public and private operators, and transactions between the two operator types would result in a corresponding change in flaring intensity.

We present our findings in Table V, where column (1) shows that the flaring response is a post-Paris phenomenon: the estimate for pre-Paris deals is near zero, while post-Paris deals exhibit a total effect of 0.002, larger than our baseline estimate. This timing is consistent with the Paris Agreement sharpening the asymmetry in climate scrutiny between public and private operators. We note, however, that the Paris Agreement in 2015 coincided with the crash in oil prices during the 2014–2016 period, which may also have influenced the transaction market for upstream oil and gas assets.[21] The sharp increase in sales from public to private operators that we document in Figure I, for example, may be attributed to public firms reacting more strongly than private operators regarding rebalancing their portfolios of

[21] Relatedly, Shi and Zhang (2026) argue that the higher cost of capital documented for carbon-intensive firms may be attributed to this oil crash rather than the 2015 Paris Agreement.

assets in response to lower oil prices.[22]

Next, we examine the role of private equity (PE)-backed buyers. Using classifications provided in the Enverus Transactions dataset, we further distinguish private operators based on whether they are PE-backed or non-PE-backed. As Armitage et al. (2026) argue, polluting assets are often transferred to thinly capitalized operators positioned to avoid environmental liabilities, but PE-backed acquisitions involve well-capitalized buyers, not judgment-proof shells. Conversely, Bellon (2025) finds that PE ownership can reduce pollution where financing capacity funds abatement. In column (2), we show that the public-to-private transaction effect on flaring is, if anything, concentrated among PE-backed buyers, which weighs against the liability-offloading interpretation of our findings. It also contrasts with the findings of Bellon (2025), but their analysis focuses exclusively on private-to-private transactions, while we examine deals involving publicly traded counterparties.[23]

To further probe the dirty operator and dirty well channels, we conduct additional heterogeneity tests by (a) direct shareholder pressure, (b) the average price paid per well transacted, and (c) the number of wells involved in the transaction. First, if environmental pressure induced firms to offload wells posed to flare, then the effect should be strongest for sellers facing greater direct pressure from shareholders. Column (3) of Table V offers no support for that prediction. If anything, the effect is stronger for deals in which the seller had *not* faced a recent shareholder proposal related to environmental issues.[24] The post-transaction change is 0.00208 for those deals, against a total effect of 0.00056 where the seller had faced one, but the difference between the two is not statistically significant.

Second, if public sellers were seeking to dispose of environmental liabilities, such wells should transact at a discount. Column (4) shows the opposite: the total effect is 0.01 for deals

[22] This is consistent with Gilje and Taillard (2016), who find that private firm investment is less sensitive to commodity prices relative to that of public firms.

[23] In untabulated results, we find suggestive evidence of a reduction in flaring in deals involving private operators selling to PE-backed buyers, in line with Bellon (2025).

[24] We define the shareholder proposal indicator based on whether the firm faced a shareholder proposal on environmental issues in the previous two years. The finding is qualitatively robust to changing the exposure window to the previous one year or three years.

in which the buyer paid an above-median price per well, roughly an order of magnitude larger than our benchmark estimate, while the effect is negligible for deals below the median.[25] This finding that wells whose flaring subsequently rose were not sold cheaply is difficult to reconcile with the quiet transfer of known liabilities, and easier to reconcile with buyers paying up for the option to operate the wells with fewer operational constraints associated with flaring.

Third, selection is easiest when a seller hand-picks a small number of wells, and is less plausible for deals that transfer entire portfolios. In column (5) of Table V, we show that our findings are not concentrated in deals involving few wells. While the positive triple interaction term is statistically insignificant, the total effect for deals with above-median wells transacted remains positive and significant. This suggests that the flaring effect is robust in portfolio-scale transfers, where "cherry-picking" high-flaring-potential wells is more difficult.

Taken together, the deal-level heterogeneity tests give little support to the dirty well channel. These comparisons are, however, cross-sectional in nature. In Section 5 we perform a set of firm-level analyses that exploits within-firm variation over time rather than differences across deals. Specifically, we hold the seller fixed and ask whether a firm's own exposure to environmental shareholder pressure changes its subsequent transaction activity—both the volume of wells it buys and sells, and the flaring characteristics of those wells—to further probe the incentive of firms that face direct shareholder pressure on their environmental performance.

4.6 Energy production and flaring

An important question is whether the observed changes in flaring following ownership transitions are driven by shifts in production volumes rather than by changes in environmental behavior or abatement effort. Shale wells follow steep production curves, with output declining rapidly from an early peak, so a buyer could raise flaring simply by increasing volumes.

[25] We note that some deals do not disclose a transaction value and drop out of this column, which is why its sample is smaller than in the other columns.

Conversely, flaring could rise per unit of output with production unchanged if the new operator gathers less of the associated gas.

We investigate these possibilities by (a) estimating our benchmark findings with production output measures as dependent variables, and (b) including production measures as control variables in our baseline flaring regressions.[26] Columns (1)–(3) show that total production, oil, and gas volumes all show economically small, statistically insignificant changes after public-to-private transfers. The dynamic estimates, presented in Figure A.I of the Internet Appendix, show no pre-trends in production prior to the transaction. There is also suggestive—but statistically insignificant—evidence that oil production drifts up while gas production drifts down after the transaction, consistent with new operators using flaring to prioritize producing liquids while gathering less gas. Columns (4) and (5) of Table VI show that including contemporaneous production volumes as controls leaves the estimated public-to-private flaring effect essentially identical to the uncontrolled estimate.[27]

Taken together, these findings indicate that production-related operational changes do not drive our findings on flaring responses to ownership transfers. Rather, they suggest that private acquirers tolerate higher flaring for a given production profile.

4.7 Additional robustness tests

Count-model estimates. Since *Flares/day* is a scaled count with a large mass of zeros, we verify that the baseline result is not an artifact of the linear model by re-estimating the public-to-private specification with Poisson pseudo-maximum likelihood. In Table AV of the Internet Appendix, we show that the Poisson estimates are large and precise for both the satellite count and the Enverus volume measure. We note, however, that the Poisson estimator retains only pairs with non-zero outcome variation within the fixed-effect structure,

[26] As with reported flare volumes, the Enverus production series is compiled from operator filings and is not satellite-censored, so columns (1)–(3) of Table VI are estimated on the full 2002–2020 sample of transfers; columns (4) and (5), whose outcome is the satellite measure, retain our 2014–2020 benchmark window.

[27] The controls themselves are informative about mechanics: flaring covaries positively with oil production and negatively with gas production, exactly the signature of associated-gas flaring—gas that surfaces with oil and is burned rather than marketed.

so the implied percentage effects apply to the flaring-active subsample rather than the full panel.

Same-status controls. Because deal types are defined by the transacted well's seller and buyer, a control well may be operated by either a public or a private firm. To control for the pre-transaction status of the well operator, we restrict our sample to well pairs in which the control well's operator shares the seller's pre-transaction public/private status. In Table AVI of the Internet Appendix, we show that this sharpens the public-to-private estimate (0.00219 in the full sample and 0.00275 excluding dry-gas pairs), while all three other deal types remain precise zeros. This indicates that our baseline result is not an artifact of mismatched operator types between transacted and control wells.

Alternative matched samples. We show that our findings are robust to alternative choices related to the matching of the treated control wells. In Table AVII we show estimates that use alternative distance rings, matching with replacement, and matching on criteria beyond the purely geographic. In the first four columns, we vary the inner exclusion ring (1, 1.5, and 2 km) and the outer exclusion ring (2.5, 5, and 7.5 km). In column (5), we redo the matching with replacement, which allows us to expand the number of control wells and overall sample. In column (6), we include pre-transaction production volume and age as additional characteristics in our matching procedure. The estimate is positive and statistically significant in every column. We note that stricter matching requirements shrink the set of deals for which an eligible control exists, with the strictest design retaining barely half the baseline well pairs, which mechanically reduces power.

5 Shareholder proposals and well transactions

To further probe the possibility that public firms select wells to sell based on flaring requirements, we conduct a set of firm-level analyses on the relationship between environmental shareholder pressure and (a) the volume of wells that public firms buy and sell, and (b) the

characteristics of the wells that they transact.

5.1 Sample construction and summary statistics

We construct our firm-level dataset by combining information on shareholder proposals from the Ceres Shareholder Proposal Database with well-level transaction and flaring data from Enverus. From the Ceres data, we identify all shareholder proposals filed against publicly traded U.S. firms between 2013 and 2022.[28] For each firm–year, we define two annual measures of environmental shareholder activism. The first, $EnvProposal_{jt}$, is an indicator equal to one if firm j faced at least one environmental shareholder proposal in year t. The second, $NumEnvProposal_{jt}$, is the total number of environmental proposals filed against firm j in year t.

Restricting to oil and gas firms, we identify a sample of 59 publicly traded companies covered by the Ceres database, corresponding to 590 firm–year observations between 2013 and 2022. These firms represent the universe of publicly traded oil and gas producers in the Ceres database exposed to shareholder pressure on climate and environmental issues. We merge these firm–year observations to the complete set of well-level transactions described in Section 4.1, and compute the number of wells bought and sold as:

$$NumWells^{d}_{jt} = \text{number of wells transferred in transactions of type } d \text{ by firm } j \text{ in year } t,$$

where $d \in \{\text{Sold}, \text{Bought}\}$ denotes the transaction category.

For each well transaction, we measure flaring activity using the VNF-derived flare counts over the 24 months before and the 24 months after the transaction month. We then aggregate flaring across all wells transacted by firm j in transactions of type d during year t. Specifically,

[28] Ceres is a climate and sustainability engagement tracker, so its proposal universe is already restricted to environmental issues; our measures accordingly count all proposals it records against a firm in a given year.

we define

$$FlareAvgPre^{d}_{jt} = \frac{1}{|\mathcal{T}^{d}_{jt}|} \sum_{i \in \mathcal{T}^{d}_{jt}} \sum_{\tau \in \mathcal{P}^{\text{pre}}_{i}} FlareCount_{i\tau},$$

$$FlareAvgPost^{d}_{jt} = \frac{1}{|\mathcal{T}^{d}_{jt}|} \sum_{i \in \mathcal{T}^{d}_{jt}} \sum_{\tau \in \mathcal{P}^{\text{post}}_{i}} FlareCount_{i\tau},$$

where $FlareCount_{i\tau}$ is the number of satellite-detected flares at well i in month τ. The set $\mathcal{T}^{d}_{jt}$ contains the wells transacted by firm j in transactions of type d during year t. The set $\mathcal{P}^{\text{pre}}_{i}$ contains the 24 months before the transaction month for well i, and $\mathcal{P}^{\text{post}}_{i}$ contains the transaction month and the 24 months following it. $FlareAvgPre^{d}_{jt}$ is therefore the average total number of flare detections per transacted well over the two years preceding the deal, and $FlareAvgPost^{d}_{jt}$ the corresponding average over the two years following it.

Our main measure of the average flaring intensity of transacted deals is the pre-transaction average flaring intensity, *FlareAvgPre*, but we also examine the change in average flaring intensity, defined as:

$$\Delta FlareAvg^{d}_{jt} = FlareAvgPost^{d}_{jt} - FlareAvgPre^{d}_{jt},$$

which captures the average change in flaring intensity of a firm's transacted wells from before to after the transaction date.

Table VII reports summary statistics for the firm–year panel used in the shareholder proposal analysis. The mean of 0.35 for $EnvProposal_{jt}$ indicates that, on average, firms in our sample were targeted by at least one environmental proposal in 35% of firm–year observations. The mean for $NumEnvProposal_{jt}$ indicates that firms faced roughly 0.66 environmental shareholder proposals per year during our sample period.

We also observe that $NumWells^{Sold}_{jt}$ is roughly three times as large as $NumWells^{Bought}_{jt}$ (15.6 versus 5.0 wells per firm-year), indicating that firms in the sample tend to sell significantly more wells than they buy. The last four rows show that the average sold well exhibits lower pre-transaction flaring intensity than that of the average bought well, but the

average sold well exhibits a greater post-transaction increase in flaring intensity relative to the average bought well. This is consistent with our well-level evidence of public firms selling wells that subsequently increase their flaring intensity.

5.2 Environmental shareholder proposals and flaring activity of transacted wells

We examine whether environmental shareholder pressure affects firms' decisions to acquire or divest flaring wells. To this end, we estimate regressions of firm-level flaring-related transaction measures on lagged indicators of environmental shareholder proposals. For each firm j and year t, we estimate:

$$Y_{jt}^{d} = \alpha_j + \gamma_t + \beta \, EnvProposal_{j,t-1} + \epsilon_{jt},$$

where Y_{jt}^{d} represents one of three dependent variables for transaction type $d \in \{\text{Sold}, \text{Bought}\}$: (i) the number of transacted wells $NumWells_{jt}^{d}$, (ii) the average pre-transaction flaring intensity across transacted wells $FlareAvgPre_{jt}^{d}$, and (iii) the average pre-to-post-transaction change in flaring intensity across transacted wells $\Delta FlareAvg_{jt}^{d}$. The coefficient β captures whether exposure to shareholder proposals in the prior year predicts transaction volumes and flaring intensity of transacted wells. All specifications include firm fixed effects (α_j) to absorb time-invariant firm characteristics and year fixed effects (γ_t) to control for common shocks such as oil prices and macroeconomic conditions.

Table VIII reports our findings relating shareholder proposals to transaction volumes. Column (1) indicates that firms facing an environmental shareholder proposal sell 8.37 more wells in the following year, which represents a 54% increase relative to the sample mean of 15.6. Column (3) shows a similar positive effect of 9.20 wells sold per additional shareholder proposal. In contrast, we do not observe a significant effect on the number of wells acquired, regardless of whether we use *EnvProposal* (column (2)) or *NumEnvProposal* (column (4)) as the regressor. These findings suggest that shareholder pressure induces firms to sell, but

not buy, more wells.

Because $NumWells^{d}_{jt}$ is a count variable with many zeros and a positively skewed distribution, we repeat this analysis using a Poisson model following the recommendation from Cohn, Liu, and Wardlaw (2022). We report the findings in Table AVIII of the Internet Appendix, which corroborate the OLS results: facing a proposal implies a 66% increase in wells sold, or 19% per additional proposal.[29]

In Table IX, we present our findings on how environmental shareholder proposals relate to the flaring intensity of transacted wells. Panel A shows the results involving average pre-transaction flaring intensities as the dependent variable. The insignificant estimates across all columns indicate little support for firms selecting wells to buy or sell based on pre-transaction flaring intensity. Even if the positive coefficients in columns (1) and (3) and the negative coefficients in columns (2) and (4) reflect actual effects muted by a lack of statistical power in our tests, they would indicate that firms select wells to buy and sell based on the *level* of flaring intensity. As discussed earlier, our main concern about selection involves selection on the *trajectory* of future flaring.

We tackle the selection-on-flaring-trajectory question in Panel B of Table IX, where the change in average flaring intensities acts as the dependent variable. Importantly, there is no evidence that shareholder pressure induces firms to sell wells that are on an upward flaring trajectory. In particular, the estimates in columns (1) and (3) are statistically weak, and, more importantly, negative. The insignificant estimates in columns (2) and (4) further indicate no evidence that shareholder pressure shapes the flaring trajectory of purchased wells. Taken together, these findings are consistent with the seller-side heterogeneity results in Section 4.5: environmental pressure affects *how many* wells firms sell, not *which* wells they sell.

[29] The effective sample drops considerably for the Poisson model because firms that never sell wells are dropped from the estimation. We therefore use the OLS model as our baseline test.

5.3 Robustness of firm-level analyses

We note that our firm-level analysis does not employ a standard difference-in-differences approach, as "treatment" is not an absorbing state. Specifically, the shareholder proposal indicator can switch on and off, and often recurs, as most firms in our sample are targeted in some years and not others. In two-way fixed effects regressions, previously targeted firm-years then serve as part of the implicit comparison group, and if the effect of a proposal persists beyond one year, that comparison is contaminated (de Chaisemartin and D'Haultfœuille, 2020). In this section, we assess how much this concern matters for our analysis, and offer alternative estimators to alleviate econometric concerns.

First, we perform a diagnostic of the baseline regression by implementing the weight decomposition of de Chaisemartin and D'Haultfœuille (2020) and report the results in Table AIX of the Internet Appendix. Under parallel trends, the two-way fixed effects coefficient identifies a weighted sum of the treatment effects across treated firm-years, where some weights can be negative, reflecting contaminated comparisons. For the binary *EnvProposal* treatment, the problem is quantitatively negligible: only 13 of 207 weights are negative, with a combined mass of -0.02, and the effects would need to vary across firm-years with a standard deviation of 12.2 (roughly one and a half times the size of the estimate itself) before the true average effect could be zero, and 87.1 before it could be the opposite sign. The count treatment is more exposed to contaminated comparisons (36 negative weights, mass -0.27), so we treat the indicator specification as the primary analysis.

Since the contamination concern is about proposals in earlier years still affecting current divestments, we include leads and lags of proposal exposure from year $t+1$ through $t-3$ in Eq. 5.2, and present the results in Table AX. First, the lead term is a precise zero, suggesting that activists do not time their filing of proposals at firms already accelerating divestitures. Second, the response is concentrated at t and $t-1$, indicating the effect manifests the year of and the year after the proposal. Third, the deeper lags are essentially zero, indicating that the carryover that would contaminate the two-way fixed effects comparison is weak in

the data.

Finally, we re-estimate the effect with the heterogeneity-robust event-study estimator of de Chaisemartin and D'Haultfœuille (2024), which is designed for non-absorbing, recurring treatments. Specifically, the estimator compares firms whose proposal exposure changes only to firms whose exposure has not yet changed, so previously treated firm-years never enter the comparison group. We present the dynamic estimates in Table AXI and Figure A.II.[30] The estimates point in the same direction as the baseline. On the selling side, the effect three years after exposure first changes is positive and marginally significant under both treatment definitions (16.03 additional wells for the proposal indicator and 6.64 per additional proposal), and the average total effect is positive in both. The placebo estimates show no differential pre-trends, and the estimates for wells bought remain insignificant across horizons.[31]

6 Conclusions

In this paper, we examine how carbon emissions, in the form of natural gas flaring, change when oil wells are transferred between public and private firms facing differing degrees of environmental pressure from investors. Using well-level data linked to satellite-based measures of natural gas flaring, we find that wells sold by public firms to private operators experience large and persistent increases in flaring. The increase is concentrated in regions where the geology of shale production makes flaring an active margin: in hydraulically fractured, liquids-producing wells. Subsequent tests indicate that selection on expected flaring trajectory is unlikely to explain the flaring increases we document in public-to-private deals. At the firm level, we find that companies facing shareholder proposals on environmental issues sell more wells in the following year, but we find no evidence that the divested wells exhibit

[30] We extend the panel back to 2010 (past the sample period for our well-level analysis), so that firms first targeted before 2013 are correctly classified.

[31] We note, however, that the joint test of the event-study effects does not reject ($p = 0.34$ and $p = 0.30$), which is unsurprising given the stricter limits this estimator places on the comparison group.

different flaring levels or trends relative to when they do not face shareholder proposals.

These patterns suggest that shareholder pressure affects firms' asset portfolios but may not reduce aggregate emissions if highly polluting assets are transferred to owners who face weaker environmental pressures. Shareholder pressure may expand the quantity of wells that public firms shed without altering the composition of what they sell. Taken together, our findings highlight how climate commitments and investor pressure can have unintentional and counterproductive effects on the environment when climate pressure is applied unevenly and the boundary between firms is porous.

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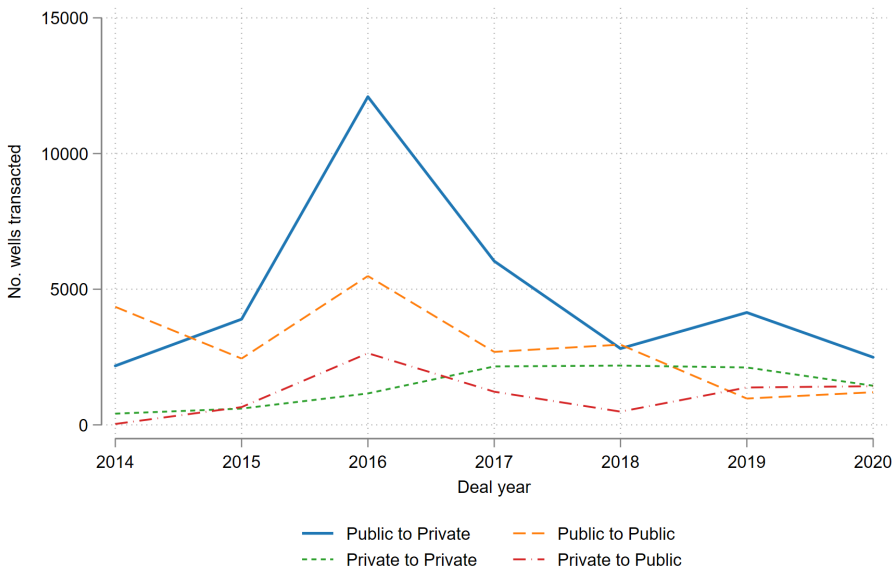
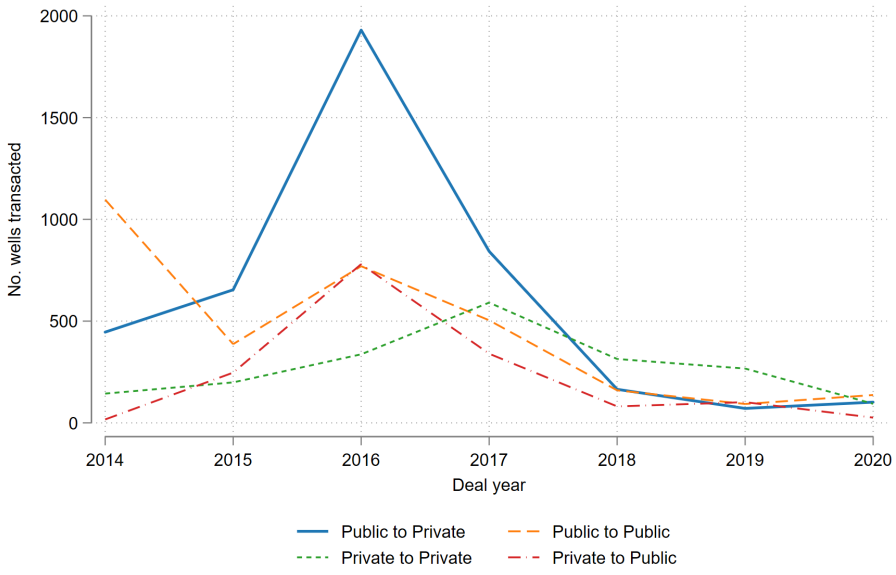
Figure I: Wells transacted by year



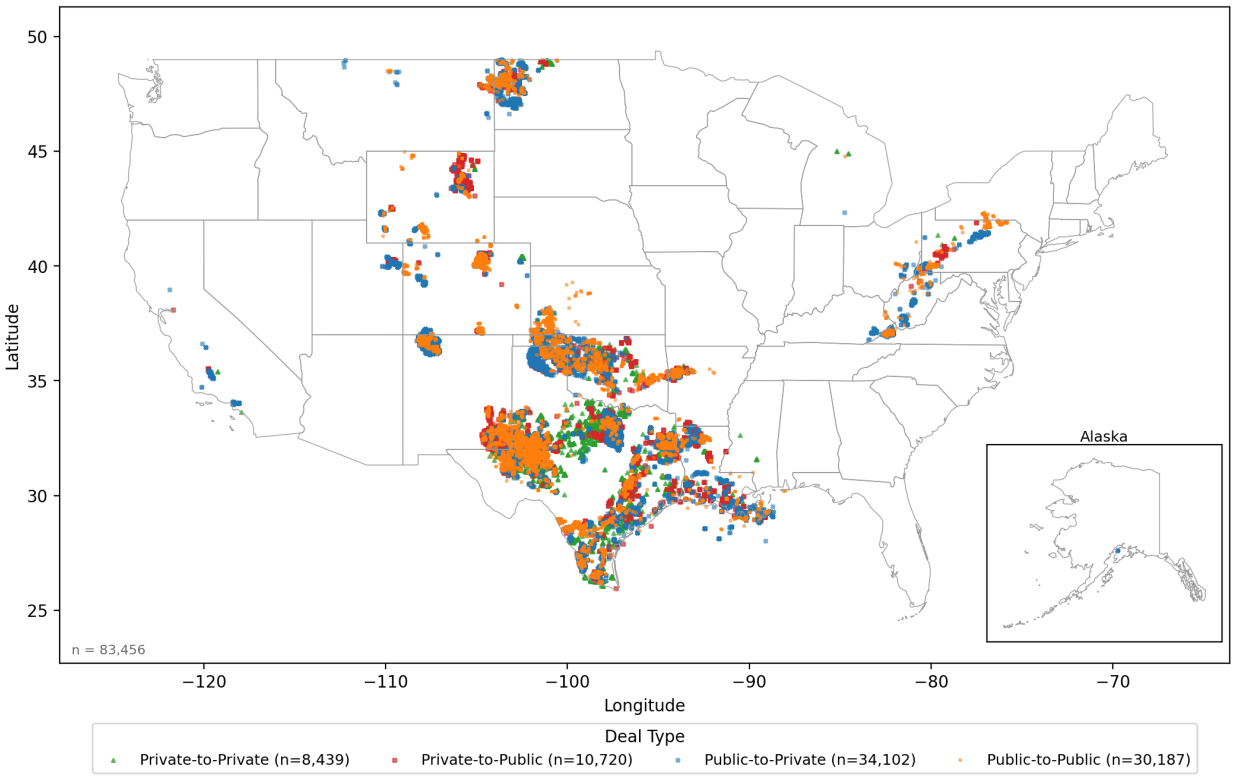
(a) All linked transactions



(b) Matched sample

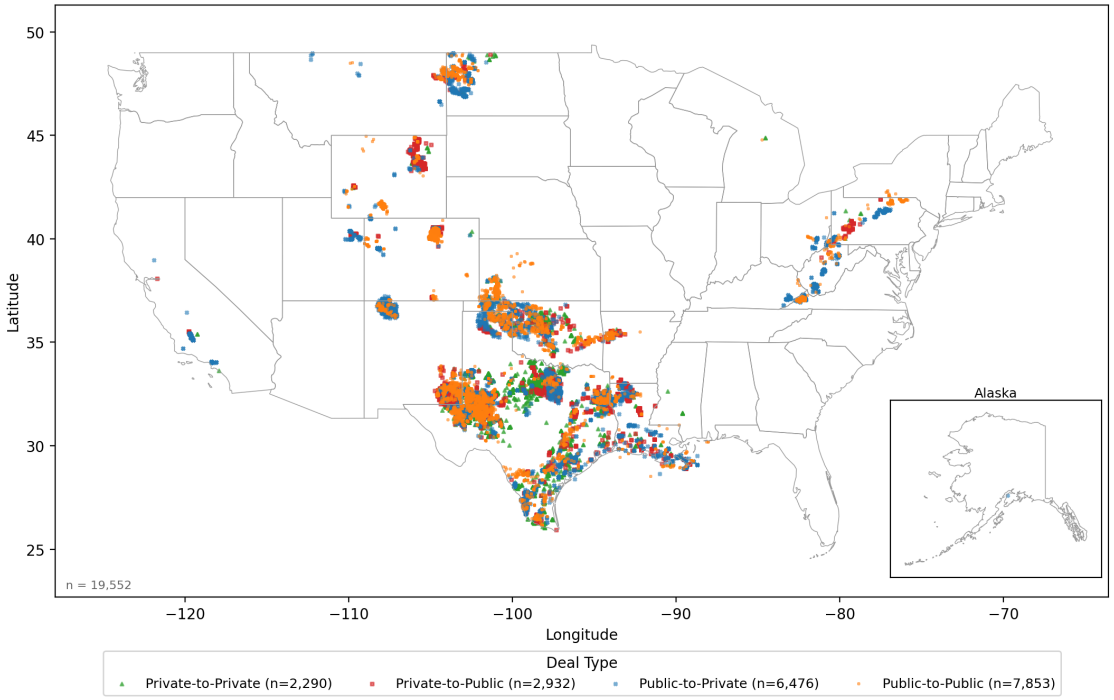
This figure plots the number of wells transacted by deal year, broken down by whether the buyer and seller are public or private companies. Subfigure (a) plots all transacted wells for which both the buyer and seller are linked to an operator profile, and subfigure (b) plots transacted wells in the matched estimation sample. Both panels plot deal years 2014 through 2020.

Figure II: Geographic distribution of all transacted wells

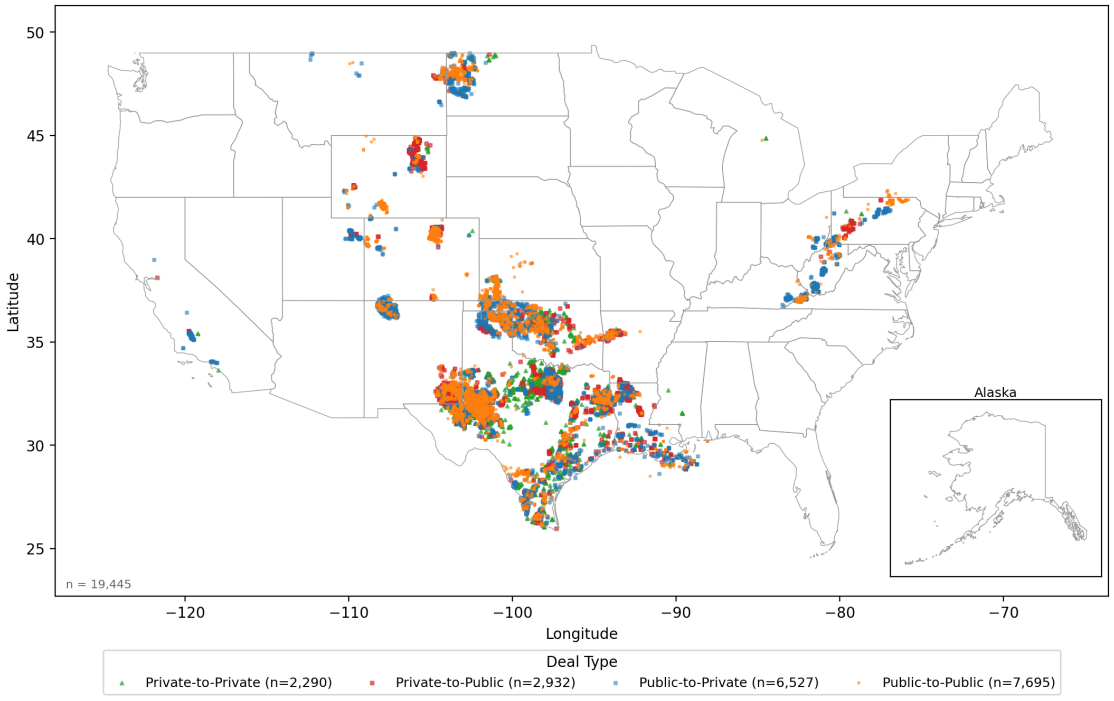


This figure illustrates the geographic location of all transacted wells, broken down by whether the buyer and seller are public or private companies.

Figure III: Geographic distribution of matched transacted and control wells



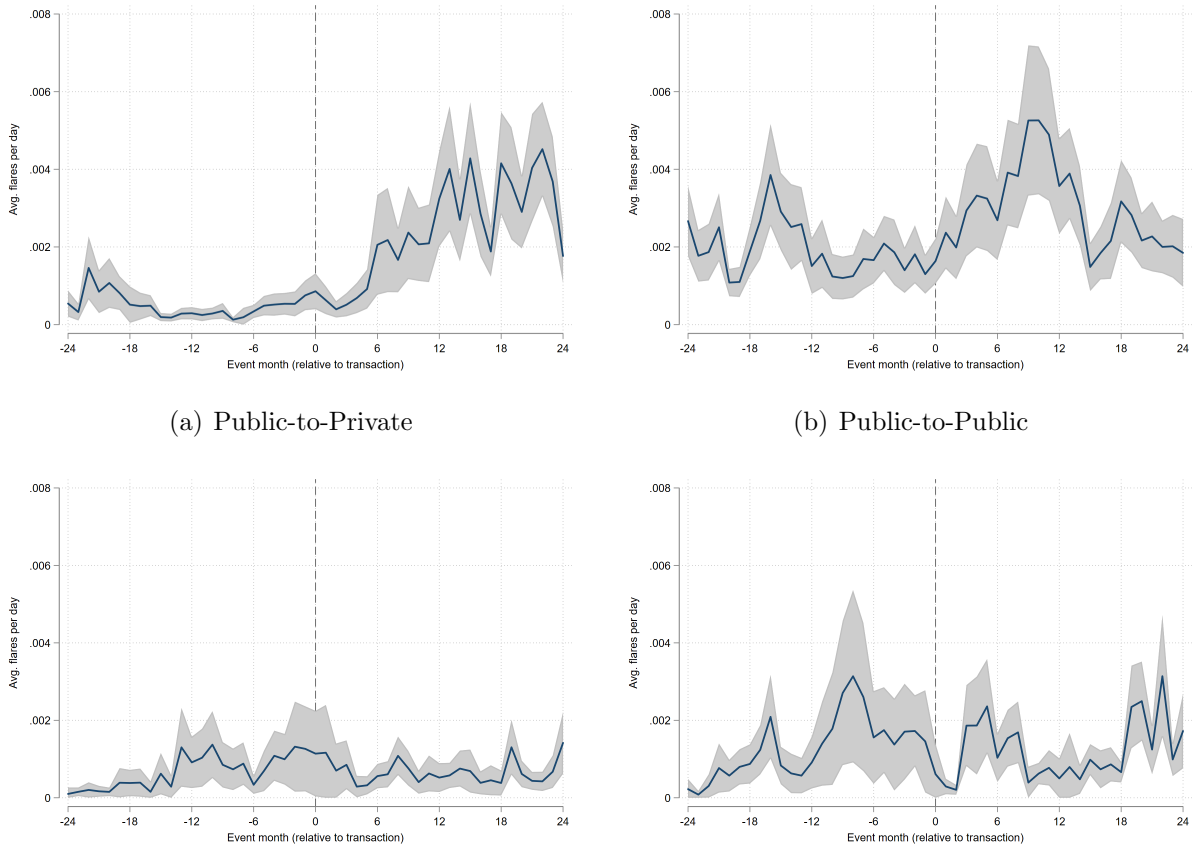
(a) Matched Transacted Wells



(b) Matched Control Wells

This figure illustrates the geographic location of matched transacted and control wells, broken down by whether the buyer and seller are public or private companies. Subfigure (a) illustrates the location of all matched transacted wells, and subfigure (b) illustrates the location of all matched control wells.

Figure IV: Average flaring by event month (matched transacted wells)



(a) Public-to-Private

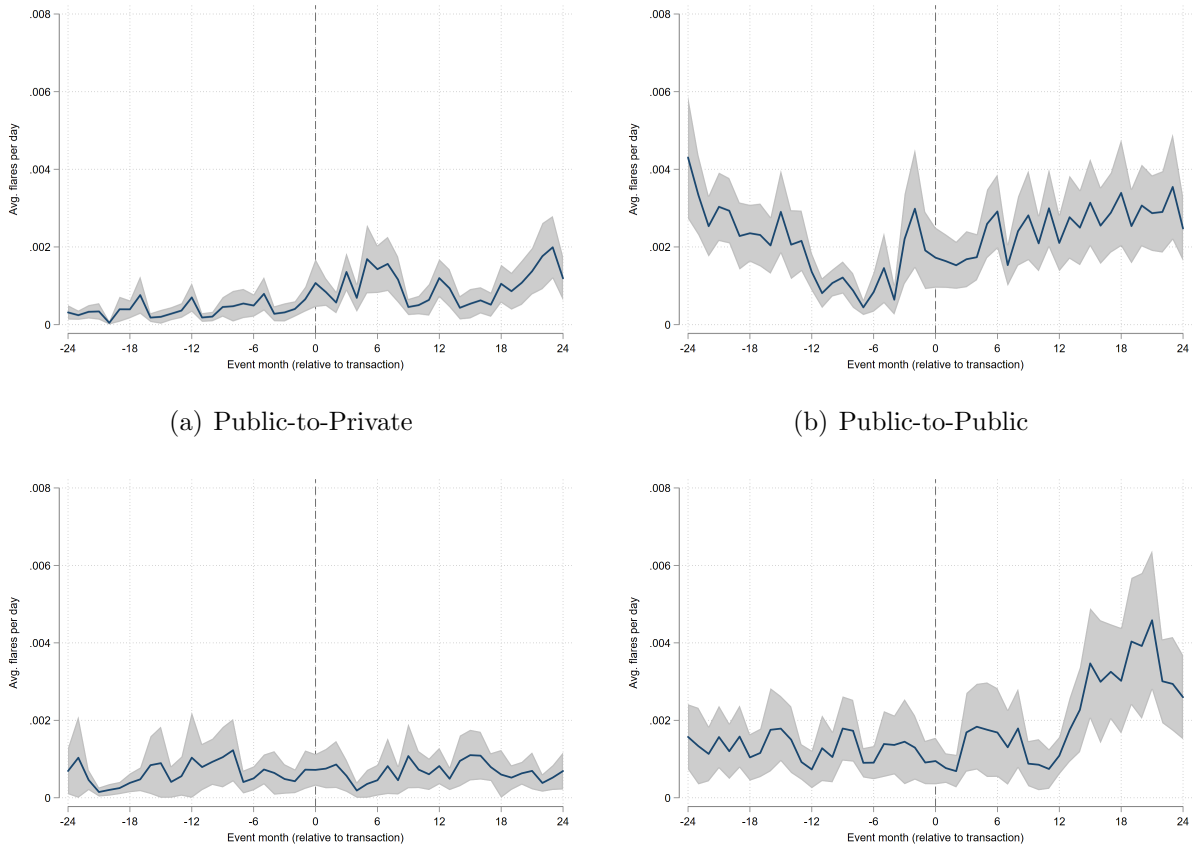
(b) Public-to-Public

(c) Private-to-Private

(d) Private-to-Public

These figures plot the average monthly well-level flaring intensity (*Flares/day*) of all matched transacted wells against the month relative to the well transaction date (*Event Month*) in the ±24-month window around the well transaction, broken down by whether the buyer and seller are public or private companies. Shaded areas indicate 95% confidence intervals around the monthly means.

Figure V: Average flaring by event month (matched control wells)



(a) Public-to-Private

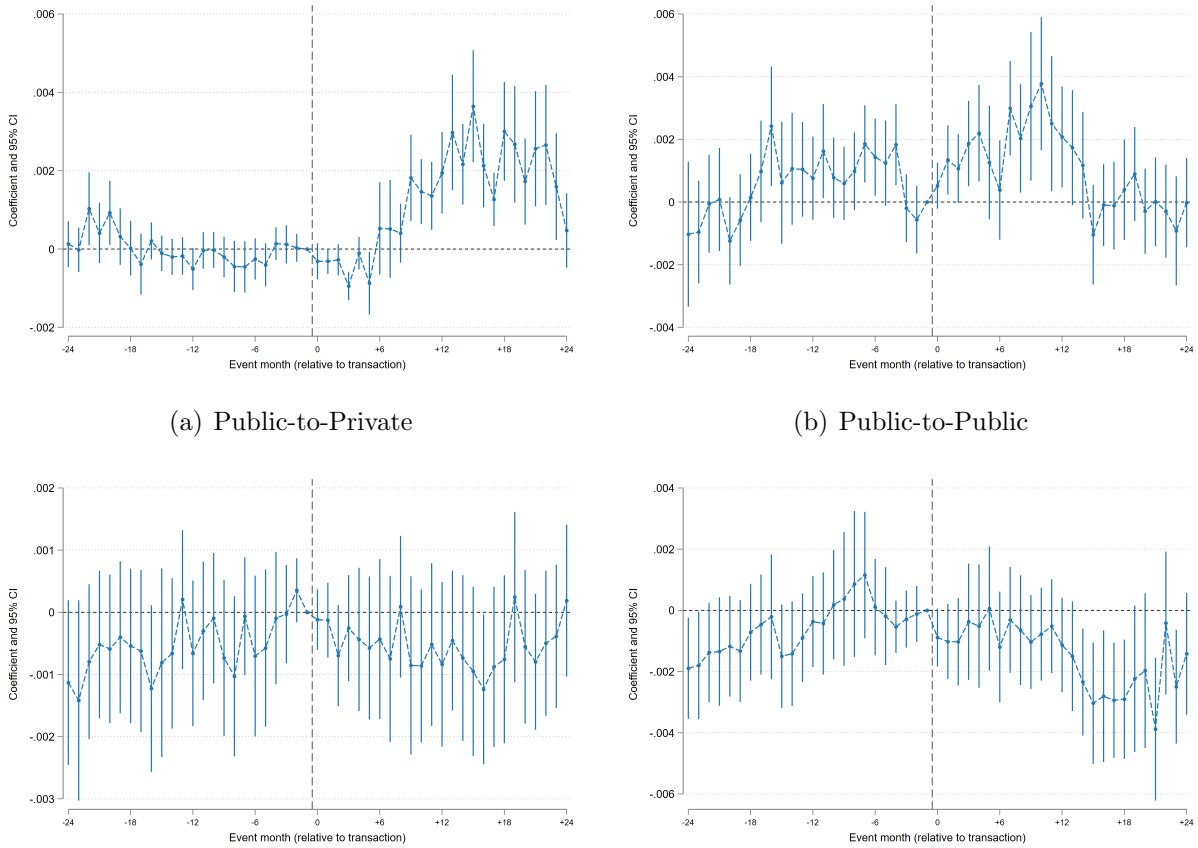
(b) Public-to-Public

(c) Private-to-Private

(d) Private-to-Public

These figures plot the average monthly well-level flaring intensity (*Flares/day*) of all matched control wells against the month relative to the well transaction date (*Event Month*) in the ±24-month window around the well transaction, broken down by whether the buyer and seller are public or private companies. The transaction dates for each control well are defined as the transaction date of the transacted well to which the control well is matched. Shaded areas indicate 95% confidence intervals around the monthly means.

Figure VI: Well transaction flaring event study: full matched sample



(a) Public-to-Private

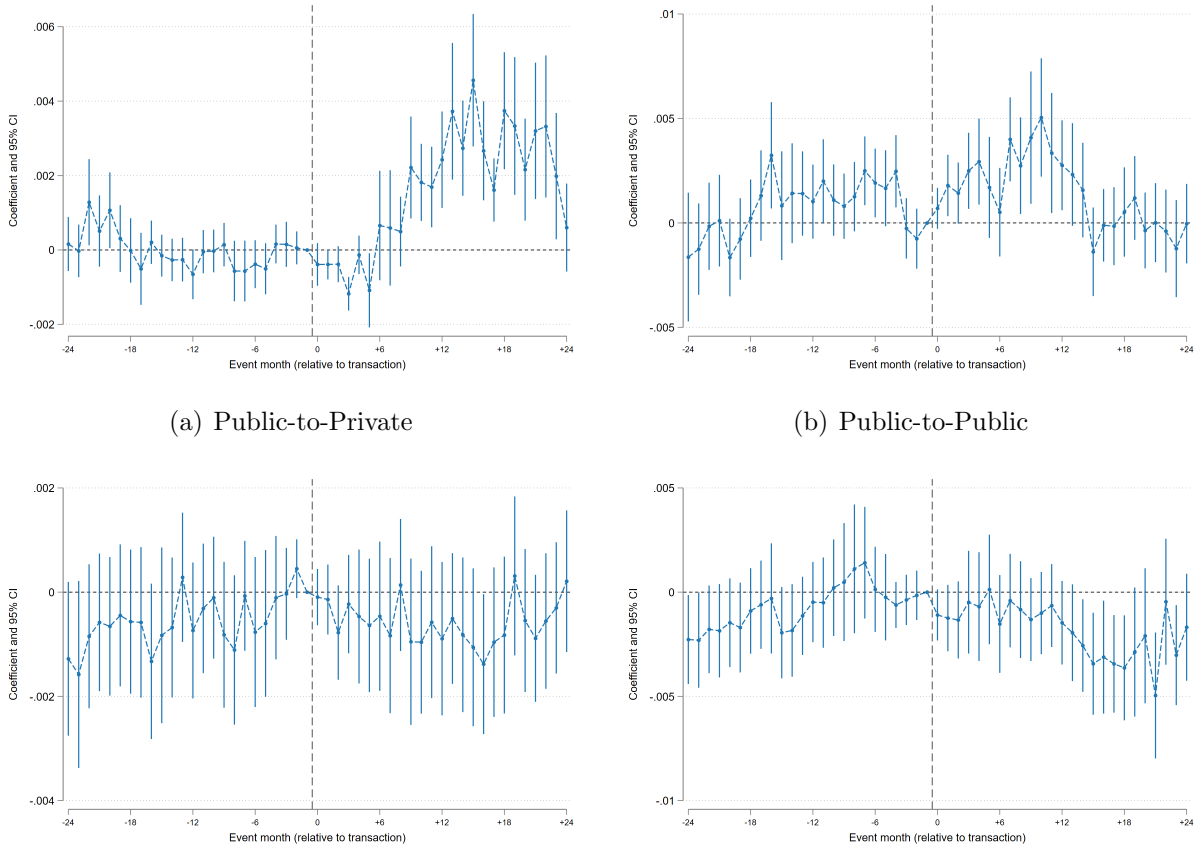
(b) Public-to-Public

(c) Private-to-Private

(d) Private-to-Public

These figures plot the δ_τ estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \sum_{\tau \neq -1} \delta_\tau \cdot Transacted_i \cdot \mathbf{1}\{\text{EventMonth}_{kt} = \tau\} + \epsilon_{ikt}$, where $Flares/day_{ikt}$ is the number of gas flares in month t (scaled by the number of days in month t) for well i within matched well pair k, $Transacted_i$ indicates whether well i is transacted, and $\mathbf{1}\{\text{EventMonth}_{kt} = \tau\}$ indicates whether month t is τ months after (before) the transaction date assigned to matched well pair k. Estimates are normalized to $\delta_{-1} = 0$, the month before the transaction. Vertical bars indicate 95% confidence intervals based on standard errors clustered at the well level. The overall sample consists of all matched transacted and control wells. Each subfigure reports the estimates from a different subsample of matched well pairs, based on whether the buyer and seller are public or private companies.

Figure VII: Well transaction flaring event study: dry-gas wells excluded



(a) Public-to-Private

(b) Public-to-Public

(c) Private-to-Private

(d) Private-to-Public

These figures plot the δ_τ estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \sum_{\tau \neq -1} \delta_\tau \cdot Transacted_i \cdot \mathbf{1}\{\text{EventMonth}_{kt} = \tau\} + \epsilon_{ikt}$, where $Flares/day_{ikt}$ is the number of gas flares in month t (scaled by the number of days in month t) for well i within matched well pair k, $Transacted_i$ indicates whether well i is transacted, and $\mathbf{1}\{\text{EventMonth}_{kt} = \tau\}$ indicates whether month t is τ months after (before) the transaction date assigned to matched well pair k. Estimates are normalized to $\delta_{-1} = 0$, the month before the transaction. Vertical bars indicate 95% confidence intervals based on standard errors clustered at the well level. The sample excludes well pairs in which the transacted well is classified as a dry-gas well. Each subfigure reports the estimates from a different subsample of matched well pairs, based on whether the buyer and seller are public or private companies.

Table I: Summary statistics for well-level data

These tables report summary statistics for the well-month observations used in the well-level analysis of transactions and gas flaring. In both panels, the sample includes monthly well-level observations for matched transacted and control wells within a ±24-month window around transaction dates for wells transacted between 2014 and 2020. Panel A is based on the full matched sample, while Panel B excludes well pairs in which the transacted well is classified as a dry-gas well. *Flares/day* is the number of satellite-detected gas flares in the month, scaled by the number of days in the month. *Flare volume/day* is the Enverus-reported flared gas volume per day (in MCF). Production volumes are monthly totals in thousands of barrels of oil equivalent (total), thousands of barrels (oil), and thousands of MCF (gas).

Panel A: Full matched sample (10,898 matched well pairs)

	Observations	Mean	Std Dev	P25	Median	P75
Flares/day	1,068,004	0.0014	0.0215	0.0000	0.0000	0.0000
Flare volume/day (MCF)	1,068,004	1.7533	30.1454	0.0000	0.0000	0.0000
Production volume ('000 BOE)	1,068,004	0.8177	3.0429	0.0000	0.0607	0.3747
Oil production ('000 BBL)	1,068,004	0.3085	1.3759	0.0000	0.0000	0.0955
Gas production ('000 MCF)	1,068,004	3.0553	14.9008	0.0000	0.0410	0.9890
Public operator (pre-deal)	1,068,004	0.6753	0.4683	0.0000	1.0000	1.0000
Shale well	1,068,004	0.2121	0.4088	0.0000	0.0000	0.0000
Oil	1,068,004	0.5535	0.4971	0.0000	1.0000	1.0000
Condensate	1,068,004	0.1068	0.3089	0.0000	0.0000	0.0000
Wet gas	1,068,004	0.1145	0.3184	0.0000	0.0000	0.0000
Dry gas	1,068,004	0.2009	0.4006	0.0000	0.0000	0.0000

Panel B: Dry-gas wells excluded (8,709 matched well pairs)

	Observations	Mean	Std Dev	P25	Median	P75
Flares/day	853,482	0.0018	0.0240	0.0000	0.0000	0.0000
Flare volume/day (MCF)	853,482	2.1876	33.6942	0.0000	0.0000	0.0000
Production volume ('000 BOE)	853,482	0.6444	2.4213	0.0000	0.0525	0.3381
Oil production ('000 BBL)	853,482	0.3844	1.5290	0.0000	0.0060	0.1630
Gas production ('000 MCF)	853,482	1.5599	8.1449	0.0000	0.0160	0.6230
Public operator (pre-deal)	853,482	0.6585	0.4742	0.0000	1.0000	1.0000
Shale well	853,482	0.1976	0.3982	0.0000	0.0000	0.0000
Oil	853,482	0.6926	0.4614	0.0000	1.0000	1.0000
Condensate	853,482	0.1337	0.3403	0.0000	0.0000	0.0000
Wet gas	853,482	0.1433	0.3504	0.0000	0.0000	0.0000

Table II: Pre-transaction comparison of transacted and control wells

This table compares pre-transaction flaring for transacted wells and their matched control wells. For each well, flaring is averaged over the pre-transaction window ($-24 \leq t < 0$); the table reports one observation per well. Within each buyer–seller category, the columns report the mean for matched transacted wells, the mean for matched control wells, the p-value from a paired test of the within-pair difference, and the number of matched pairs. *Flares/day* is the number of satellite-detected gas flares per day; *Flare volume/day* is the Enverus-reported flared gas volume per day (in MCF). Panel A is based on the full matched sample, while Panel B excludes well pairs in which the transacted well is classified as a dry-gas well.

Panel A: Full matched sample

	Mean(T)	Mean(C)	p-value	N pairs
Priv→Priv				
Flares/day	0.0007	0.0006	0.917	1,946
Flare volume/day (MCF)	0.3140	0.2819	0.809	1,946
Pub→Priv				
Flares/day	0.0005	0.0004	0.292	4,211
Flare volume/day (MCF)	1.0980	0.8986	0.398	4,211
Priv→Pub				
Flares/day	0.0013	0.0013	0.974	1,593
Flare volume/day (MCF)	2.6227	1.5562	0.047	1,593
Pub→Pub				
Flares/day	0.0019	0.0020	0.748	3,148
Flare volume/day (MCF)	4.7262	4.2853	0.415	3,148

Panel B: Dry-gas wells excluded

	Mean(T)	Mean(C)	p-value	N pairs
Priv→Priv				
Flares/day	0.0007	0.0007	0.829	1,746
Flare volume/day (MCF)	0.3499	0.3053	0.763	1,746
Pub→Priv				
Flares/day	0.0006	0.0005	0.300	3,379
Flare volume/day (MCF)	1.3678	1.1168	0.393	3,379
Priv→Pub				
Flares/day	0.0017	0.0017	0.992	1,228
Flare volume/day (MCF)	3.4022	1.9602	0.038	1,228
Pub→Pub				
Flares/day	0.0026	0.0027	0.707	2,356
Flare volume/day (MCF)	6.3147	5.7188	0.410	2,356

Table III: Well transactions and flaring

These tables report the estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \epsilon_{ikt}$, where $Flares/day_{ikt}$ is the number of gas flares in month t (scaled by the number of days in month t) for well i within matched well pair k, $Transacted_i$ indicates whether well i is transacted, and $Post_{kt}$ indicates that the month occurs after the transaction date for the transacted well within the matched well pair. Columns (1)–(4) correspond to transactions involving: (1) public sellers to private buyers, (2) public sellers to public buyers, (3) private sellers to private buyers, and (4) private sellers to public buyers. In both panels, the sample includes monthly well-level observations within a ±24-month window around transaction dates for wells transacted between 2014 and 2020. Panel A reports results for the full matched sample, while Panel B excludes well pairs in which the transacted well is classified as a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Full matched sample

	(1) Flares/day	(2) Flares/day	(3) Flares/day	(4) Flares/day
Transacted x Post	0.00128***	0.00053	-0.00001	-0.00094**
	(0.00037)	(0.00039)	(0.00019)	(0.00044)
Seller Type	Public	Public	Private	Private
Buyer Type	Private	Public	Private	Public
Mean(dep. var.)	0.0011	0.0024	0.0007	0.0015
Well FE	X	X	X	X
Well Pair x Event-month FE	X	X	X	X
Observations	412,678	308,504	190,708	156,114
Adjusted R-squared	0.228	0.191	0.288	0.158

Panel B: Dry-gas wells excluded

	(1) Flares/day	(2) Flares/day	(3) Flares/day	(4) Flares/day
Transacted x Post	0.00160***	0.00072	-0.00001	-0.00109*
	(0.00046)	(0.00052)	(0.00022)	(0.00057)
Seller Type	Public	Public	Private	Private
Buyer Type	Private	Public	Private	Public
Mean(dep. var.)	0.0013	0.0031	0.0007	0.0019
Well FE	X	X	X	X
Well Pair x Event-month FE	X	X	X	X
Observations	331,142	230,888	171,108	120,344
Adjusted R-squared	0.228	0.189	0.288	0.159

Table IV: Well transactions and flaring: geological heterogeneity

This table reports the estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \phi\, C_i \times Transacted_i \times Post_{kt} + \epsilon_{ikt}$, where C_i is the geological well characteristic indicated in the column header: an indicator for shale wells (column (1)) and for wells whose wellhead product is oil or condensate (column (2)). Column (3) includes two indicators, for oil-or-condensate wells and for oil wells, so that the base term is the effect for wet-gas wells, the first interaction the increment for condensate wells over wet-gas wells, and the second the increment for oil wells over condensate wells. $Flares/day_{ikt}$ is the number of gas flares in month t (scaled by the number of days in month t) for well i within matched well pair k, $Transacted_i$ indicates whether well i is transacted, and $Post_{kt}$ indicates that the month occurs after the transaction date. Lower-order interactions are absorbed by the fixed effects. The "Total effect, indicator = 1" row reports the post-transaction change for wells with the indicated characteristic: the linear combination $\delta + \phi$ in columns (1)–(2), and the sum of all three coefficients, i.e., the effect for oil wells, in column (3). The "Total effect, condensate" row in column (3) reports the sum of the base term and the oil-or-condensate interaction, i.e., the effect for condensate wells. The sample consists of matched pairs for public-seller-to-private-buyer transactions, excluding pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) Shale	(2) Oil or condensate	(3) Oil
Transacted x Post	0.00012	0.00000	0.00000
	(0.00011)	(0.00003)	(0.00003)
Shale x Transacted x Post	0.00901***		
	(0.00270)		
Oil or condensate x Transacted x Post		0.00189***	0.00077***
		(0.00054)	(0.00029)
Oil x Transacted x Post			0.00126*
			(0.00067)
Total effect, indicator = 1	0.00913***	0.00189***	0.00203***
	(0.00270)	(0.00054)	(0.00061)
Total effect, condensate			0.00078***
			(0.00029)
Mean(dep. var.)	0.0013	0.0013	0.0013
Well FE	X	X	X
Well Pair x Event-month FE	X	X	X
Observations	331,142	331,142	331,142
Adjusted R-squared	0.230	0.228	0.228

Table V: Well transactions and flaring: deal heterogeneity

This table reports the estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \phi\, D_k \times Transacted_i \times Post_{kt} + \epsilon_{ikt}$, where D_k is the deal characteristic indicated in the column header: an indicator for transactions occurring after the 2015 Paris Climate Agreement (column (1)), for private-equity-backed buyers (column (2)), for sellers that faced an environmental shareholder proposal in either of the two years before the transaction (column (3)), for deals with an above-median transaction value per well (column (4)), and for deals transferring an above-median number of wells (column (5)). $Flares/day_{ikt}$ is the number of gas flares in month t (scaled by the number of days in month t) for well i within matched well pair k, $Transacted_i$ indicates whether well i is transacted, and $Post_{kt}$ indicates that the month occurs after the transaction date. Lower-order interactions are absorbed by the fixed effects. The "Total effect, indicator = 1" row reports the linear combination $\delta + \phi$, i.e., the post-transaction change for deals with the indicated characteristic. The sample consists of matched pairs for public-seller-to-private-buyer transactions, excluding pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) Post-Paris	(2) PE buyer	(3) Shareholder proposal	(4) High value per well	(5) Many wells
Transacted x Post	0.00012	-0.00001	0.00208***	0.00011**	0.00072
	(0.00013)	(0.00025)	(0.00056)	(0.00005)	(0.00086)
Post-Paris x Transacted x Post	0.00188***				
	(0.00060)				
PE buyer x Transacted x Post		0.00210***			
		(0.00064)			
Proposal x Transacted x Post			-0.00152		
			(0.00095)		
High value per well x Transacted x Post				0.01316***	
				(0.00356)	
Many wells x Transacted x Post					0.00095
					(0.00099)
Total effect, indicator = 1	0.00200***	0.00210***	0.00056	0.01327***	0.00167***
	(0.00058)	(0.00059)	(0.00077)	(0.00356)	(0.00049)
Mean(dep. var.)	0.0013	0.0013	0.0013	0.0014	0.0013
Well FE	X	X	X	X	X
Well Pair x Event-month FE	X	X	X	X	X
Observations	331,142	331,142	331,142	280,084	331,142
Adjusted R-squared	0.228	0.228	0.228	0.228	0.228

Table VI: Well transactions, energy production, and flaring

This table reports the estimates from $Y_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \epsilon_{ikt}$, where the outcome Y_{ikt} in columns (1)–(3) is the monthly production volume of well i in matched pair k: total production (in thousands of BOE), oil production (in thousands of barrels), and gas production (in thousands of MCF). In columns (4) and (5) the outcome is $Flares/day_{ikt}$, the number of gas flares in month t scaled by the number of days in the month, with contemporaneous production volumes included as controls. $Transacted_i$ indicates whether well i is transacted, and $Post_{kt}$ indicates that the month occurs after the transaction date for the transacted well within the matched pair. The sample consists of matched pairs for public-seller-to-private-buyer transactions, excluding pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) Production volume	(2) Oil production	(3) Gas production	(4) Flares/day	(5) Flares/day
Transacted x Post	-0.0350	-0.0050	-0.1797	0.0015***	0.0016***
	(0.0511)	(0.0176)	(0.2549)	(0.0004)	(0.0004)
Production volume				0.0045***	
				(0.0008)	
Oil production					0.0078***
					(0.0010)
Gas production					-0.0004***
					(0.0001)
Deal window	2002-2020	2002-2020	2002-2020	2014-2020	2014-2020
Mean(dep. var.)	0.5399	0.2865	1.5199	0.0013	0.0013
Well FE	X	X	X	X	X
Well Pair x Event-month FE	X	X	X	X	X
Observations	489,510	489,510	489,510	331,142	331,142
Adjusted R-squared	0.394	0.530	0.352	0.302	0.328

Table VII: Summary statistics for shareholder proposal analysis

This table reports summary statistics for firm-year observations used in the firm-level analysis of environmental shareholder proposals and transacted well flaring intensity. The sample includes publicly traded oil and gas firms that faced at least one environmental shareholder proposal between 2013 and 2022. Since *EnvProposal* and *NumEnvProposal* are lagged by one year relative to the transaction and flaring measures, the summary statistics for these variables are based on observations from 2012 to 2021. All transaction and flaring measures are constructed as defined in Section 5.1: $NumWells^{d}$ is a count of wells, winsorized at the 1st and 99th percentiles; $FlareAvgPre^{d}$ is the average per-well *total* number of satellite flare detections over the 24 months preceding the transaction month, and $\Delta FlareAvg^{d}$ the corresponding pre-to-post change, where the post window runs from the transaction month through the 24 months following it. Both flaring measures are averaged across the private- and public-counterparty cells, with a zero recorded for a counterparty type against which the firm did not transact that year, which is why their means are small relative to the per-well flaring rates reported in Table I.

	Observations	Mean	Std Dev	P25	Median	P75
EnvProposal	590	0.3508	0.478	0.000	0.000	1.000
NumEnvProposal	590	0.6610	1.358	0.000	0.000	1.000
$NumWells^{Sold}$	590	15.6034	44.608	0.000	0.000	0.000
$NumWells^{Bought}$	590	5.0102	21.040	0.000	0.000	0.000
$FlareAvgPre^{Sold}$	590	0.1470	0.933	0.000	0.000	0.000
$\Delta FlareAvg^{Sold}$	590	0.1006	1.548	0.000	0.000	0.000
$FlareAvgPre^{Bought}$	590	0.2110	1.439	0.000	0.000	0.000
$\Delta FlareAvg^{Bought}$	590	-0.0102	1.426	0.000	0.000	0.000

Table VIII: Environmental shareholder proposals and well transaction volume

This table reports the estimates from regressing Y_{jt} on $EnvProposal_{j,t-1}$ (an indicator for firm j facing at least one environmental shareholder proposal in year $t-1$) or $NumEnvProposal_{j,t-1}$ (the number of environmental shareholder proposals firm j faced in year $t-1$), where Y_{jt} represents the total number of wells sold ($NumWells^{Sold}$) or bought ($NumWells^{Bought}$). Both counts are winsorized at the 1st and 99th percentiles, as defined in Section 5.1. The sample includes publicly traded oil and gas firms that faced at least one environmental shareholder proposal between 2013 and 2022. Standard errors are heteroskedasticity-robust and clustered at the firm level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) $NumWells^{Sold}$	(2) $NumWells^{Bought}$	(3) $NumWells^{Sold}$	(4) $NumWells^{Bought}$
EnvProposal	8.3740**	-0.5872		
	(3.8863)	(1.8438)		
NumEnvProposal			9.2015***	1.5077
			(2.4801)	(1.3038)
Mean(dep. var.)	15.603	5.010	15.603	5.010
Firm FE	X	X	X	X
Year FE	X	X	X	X
Observations	590	590	590	590
Adjusted R-squared	0.221	0.112	0.237	0.114

Table IX: Environmental shareholder proposals and well flaring intensity

These tables report the estimates from regressing Y_{jt} on $EnvProposal_{j,t-1}$ (an indicator for firm j facing at least one environmental shareholder proposal in year $t-1$) or $NumEnvProposal_{j,t-1}$ (the number of environmental shareholder proposals firm j faced in year $t-1$). In Panel A, Y_{jt} represents the average pre-transaction flaring intensity across all wells sold ($FlareAvgPre^{Sold}$) or bought ($FlareAvgPre^{Bought}$). In Panel B, Y_{jt} represents the pre-to-post-transaction change in average flaring intensity across all wells sold ($\Delta FlareAvg^{Sold}$) or bought ($\Delta FlareAvg^{Bought}$). Both counts are winsorized at the 1st and 99th percentiles, as defined in Section 5.1. The sample includes publicly traded oil and gas firms that faced at least one environmental shareholder proposal between 2013 and 2022. Standard errors are heteroskedasticity-robust and clustered at the firm level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Average pre-transaction flaring intensity

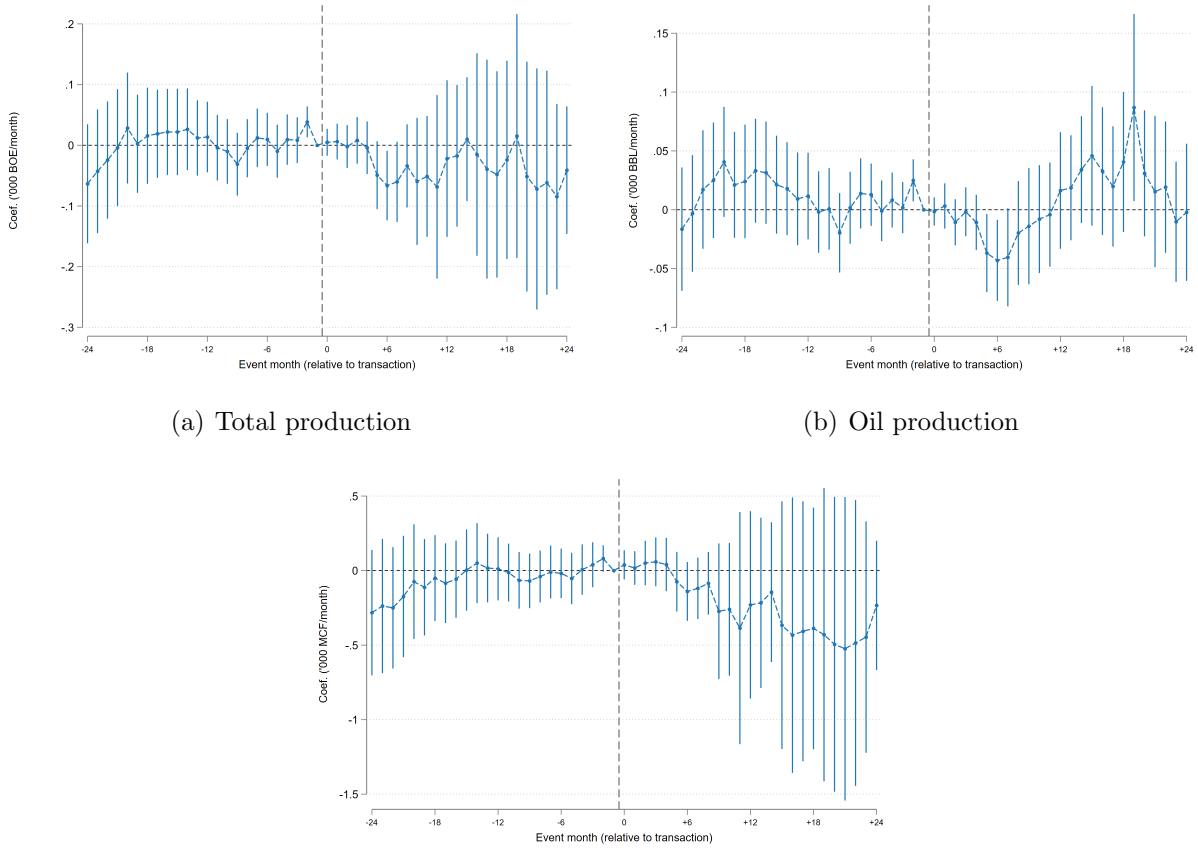
	(1) $FlareAvgPre^{Sold}$	(2) $FlareAvgPre^{Bought}$	(3) $FlareAvgPre^{Sold}$	(4) $FlareAvgPre^{Bought}$
EnvProposal	0.0542	-0.1695		
	(0.0649)	(0.1722)		
NumEnvProposal			0.1337	-0.0498
			(0.0830)	(0.0866)
Mean(dep. var.)	0.1470	0.2110	0.1470	0.2110
Firm FE	X	X	X	X
Year FE	X	X	X	X
Observations	590	590	590	590
Adjusted R-squared	0.020	0.050	0.030	0.048

Panel B: Change in average flaring intensity

	(1) $\Delta FlareAvg^{Sold}$	(2) $\Delta FlareAvg^{Bought}$	(3) $\Delta FlareAvg^{Sold}$	(4) $\Delta FlareAvg^{Bought}$
EnvProposal	-0.0382	0.1057		
	(0.1415)	(0.1358)		
NumEnvProposal			-0.1315*	0.0410
			(0.0772)	(0.0551)
Mean(dep. var.)	0.1006	-0.0102	0.1006	-0.0102
Firm FE	X	X	X	X
Year FE	X	X	X	X
Observations	590	590	590	590
Adjusted R-squared	0.003	-0.038	0.006	-0.038

Internet Appendix A

Figure A.I: Well transaction production event study



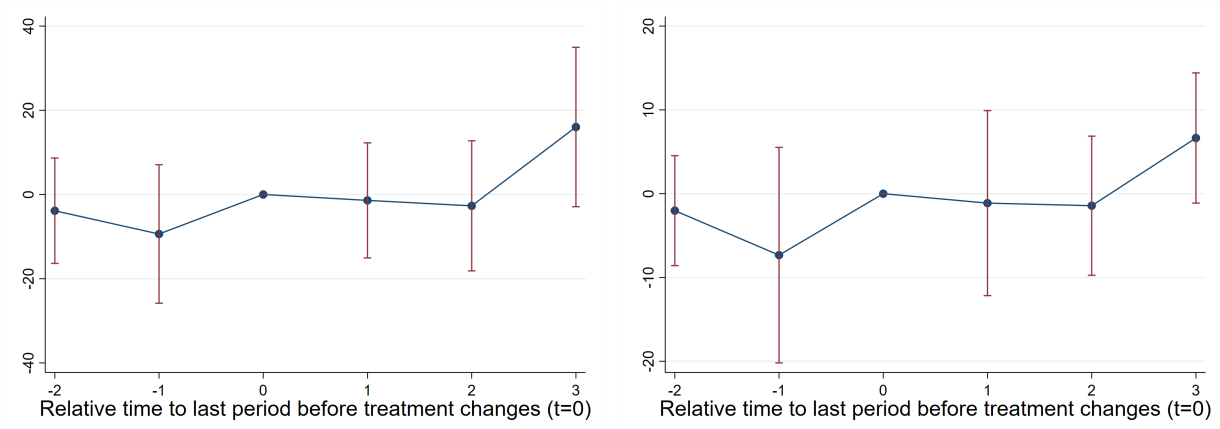
(a) Total production

(b) Oil production

(c) Gas production

These figures plot the δ_τ estimates from $Y_{ikt} = \alpha_i + \gamma_{kt} + \sum_{\tau \neq -1} \delta_\tau \cdot \mathit{Transacted}_i \cdot \mathbf{1}\{\text{EventMonth}_{kt} = \tau\} + \epsilon_{ikt}$, where Y_{ikt} is the monthly production volume of well i in matched pair k: total production in thousands of BOE (subfigure (a)), oil production in thousands of barrels (subfigure (b)), and gas production in thousands of MCF (subfigure (c)). $\mathit{Transacted}_i$ indicates whether well i is transacted, and $\mathbf{1}\{\text{EventMonth}_{kt} = \tau\}$ indicates whether month t is τ months after (before) the transaction date assigned to matched well pair k. Estimates are normalized to $\delta_{-1} = 0$, the month before the transaction. Vertical bars indicate 95% confidence intervals based on standard errors clustered at the well level. The sample consists of matched pairs for public-seller-to-private-buyer transactions, excluding pairs in which the transacted well is a dry-gas well.

Figure A.II: Heterogeneity-robust event studies of environmental proposals and wells sold



(a) *EnvProposal* (binary)

(b) Per proposal (normalized)

These figures plot event-study estimates from the heterogeneity-robust estimator of de Chaisemartin and D'Haultfœuille (2024), which compares firms whose environmental-proposal exposure changes to firms whose exposure has not yet changed, on the extended firm panel (59 firms, 2010–2022). The treatment is exposure to an environmental shareholder proposal in the previous year; the outcome is the number of wells sold, winsorized at the 1st and 99th percentiles. Subfigure (a) uses the binary treatment; subfigure (b) uses the proposal count and normalizes the estimates per unit of treatment. Period 0 is the last year before the firm's proposal exposure first changes; estimates to the left are placebo estimates. Vertical bars indicate 95% confidence intervals.

Table AI: Validation of satellite flare detections against reported flare volumes

This table reports the estimates from regressing the Enverus-reported flared gas volume per day (in MCF), reported as *Flare volume/day*, on *Flares/day*, the number of satellite-detected gas flares in the month scaled by the number of days in the month, with well and well pair × event-month fixed effects. Column (1) uses the full matched sample; column (2) excludes well pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) Flare volume/day	(2) Flare volume/day
Flares/day	461.8105***	462.3476***
	(22.3975)	(22.4900)
Sample	All pairs	Dry gas dropped
Mean(dep. var.)	1.7533	2.1876
Observations	1,068,004	853,482
Adjusted R-squared	0.108	0.108

Table AII: Well transactions and reported flare volumes

This table reports the estimates from $Flare\ volume/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \epsilon_{ikt}$, where $Flare\ volume/day_{ikt}$ is the Enverus-reported flared gas volume per day (in MCF) for well i within matched well pair k in month t, $Transacted_i$ indicates whether well i is transacted, and $Post_{kt}$ indicates that the month occurs after the transaction date. The sample consists of matched pairs for public-seller-to-private-buyer transactions. Column (1) uses the full matched sample; column (2) excludes well pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) Flare volume/day	(2) Flare volume/day
Transacted x Post	0.3736**	0.4847**
	(0.1881)	(0.2435)
Sample	All pairs	Dry gas dropped
Mean(dep. var.)	0.7270	0.9363
Well FE	X	X
Well Pair x Event-month FE	X	X
Observations	633,766	489,510
Adjusted R-squared	0.184	0.183

Table AIII: Well transactions and flaring: ever-flaring well pairs

These tables report the estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta Transacted_i \times Post_{kt} + \epsilon_{ikt}$ on the subsample of matched well pairs in which at least one well flared at least once within the ±24-month event window. Columns (1)–(4) correspond to transactions involving: (1) public sellers to private buyers, (2) public sellers to public buyers, (3) private sellers to private buyers, and (4) private sellers to public buyers. Panel A uses the full matched sample; Panel B excludes well pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Full matched sample

	(1) Flares/day	(2) Flares/day	(3) Flares/day	(4) Flares/day
Transacted x Post	0.01052***	0.00243	-0.00010	-0.00377**
	(0.00298)	(0.00181)	(0.00225)	(0.00177)
Seller Type	Public	Public	Private	Private
Buyer Type	Private	Public	Private	Public
Mean(dep. var.)	0.0090	0.0109	0.0077	0.0060
Well FE	X	X	X	X
Well Pair x Event-month FE	X	X	X	X
Observations	50,176	66,542	16,464	38,710
Adjusted R-squared	0.216	0.168	0.265	0.144

Panel B: Dry-gas wells excluded

	(1) Flares/day	(2) Flares/day	(3) Flares/day	(4) Flares/day
Transacted x Post	0.01105***	0.00258	-0.00016	-0.00364*
	(0.00313)	(0.00187)	(0.00238)	(0.00188)
Seller Type	Public	Public	Private	Private
Buyer Type	Private	Public	Private	Public
Mean(dep. var.)	0.0093	0.0112	0.0080	0.0063
Well FE	X	X	X	X
Well Pair x Event-month FE	X	X	X	X
Observations	47,824	64,484	15,582	36,162
Adjusted R-squared	0.216	0.167	0.266	0.145

Table AIV: Well transactions and flaring by basin

These tables report the estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \epsilon_{ikt}$ estimated separately by basin, for matched pairs from public-seller-to-private-buyer transactions. $Flares/day_{ikt}$ is the number of gas flares in month t (scaled by the number of days in month t) for well i within matched well pair k. The rows below the estimates report the number of matched pairs, the total number of satellite flare detections, and the share of shale wells in each basin subsample; Panel A additionally reports the share of dry-gas wells, which is zero by construction in Panel B. Panel A uses the full matched sample; Panel B excludes well pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Full matched sample

	(1) Permian Other	(2) Appalachian	(3) Western Gulf	(4) Ark-La-Tex	(5) Fort Worth	(6) Williston	(7) Other
Transacted x Post	0.00063***	0.00043**	0.00005	-0.00007	-0.00001	0.01692***	-0.00001
	(0.00020)	(0.00018)	(0.00013)	(0.00007)	(0.00001)	(0.00520)	(0.00011)
Pairs	564	497	143	391	148	287	2,181
VIIRS detections (total)	779	248	163	20	1	10,838	1,665
Mean(dep. var.)	0.0005	0.0002	0.0004	0.0000	0.0000	0.0126	0.0003
Observations	55,272	48,706	14,014	38,318	14,504	28,126	213,738
Adjusted R-squared	0.102	0.111	0.215	0.026	-0.021	0.222	0.155

Panel B: Dry-gas wells excluded

	(1) Permian Other	(2) Appalachian	(3) Western Gulf	(4) Ark-La-Tex	(5) Fort Worth	(6) Williston	(7) Other
Transacted x Post	0.00064***	0.00221**	0.00006	-0.00009	-0.00001	0.01692***	0.00001
	(0.00020)	(0.00107)	(0.00014)	(0.00009)	(0.00001)	(0.00520)	(0.00013)
Pairs	555	82	135	285	114	287	1,921
VIIRS detections (total)	777	191	163	20	1	10,838	1,591
Mean(dep. var.)	0.0005	0.0008	0.0004	0.0000	0.0000	0.0126	0.0003
Observations	54,390	8,036	13,230	27,930	11,172	28,126	188,258
Adjusted R-squared	0.102	0.153	0.215	0.026	-0.021	0.222	0.156

Table AV: Well transactions and flaring: Poisson estimates

This table reports Poisson pseudo-maximum-likelihood estimates of $Y_{ikt} = \exp(\alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt})\,\epsilon_{ikt}$ for matched pairs from public-seller-to-private-buyer transactions. In columns (1) and (2) the outcome, reported as *VIIRS detections*, is the monthly count of satellite-detected flares; in columns (3) and (4) it is the Enverus-reported monthly flared gas volume in MCF, reported as *Enverus MCF*, with well-months with no reported volume set to zero rather than dropped. Both outcomes enter as monthly totals rather than daily rates, since the Poisson estimator requires a count-like outcome. Columns (1) and (3) use the full matched sample; columns (2) and (4) exclude well pairs in which the transacted well is a dry-gas well. The "Implied % effect" row reports $100 \times (\exp(\delta) - 1)$. The estimator retains only observations in fixed-effect groups with non-zero outcome variation, so the retained samples are much smaller than in the OLS tables. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) VIIRS detections	(2) VIIRS detections	(3) Enverus MCF	(4) Enverus MCF
Transacted x Post	1.7159***	1.7404***	1.0328***	1.0337***
	(0.4769)	(0.4770)	(0.1880)	(0.1882)
Sample	All pairs	Dry gas dropped	All pairs	Dry gas dropped
Implied % effect	456.2	470.0	180.9	181.2
Mean(dep. var., retained)	2.8628	2.8949	415.1745	420.7188
Well FE	X	X	X	X
Well Pair x Event-month FE	X	X	X	X
Observations (retained)	2,456	2,416	23,560	23,238

Table AVI: Well transactions and flaring: controls with the same pre-transaction ownership status

These tables report the estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta Transacted_i \times Post_{kt} + \epsilon_{ikt}$ on the subsample of matched well pairs in which the control well's operator has the same public/private status as the transacted well's seller before the transaction. Columns (1)–(4) correspond to transactions involving: (1) public sellers to private buyers, (2) public sellers to public buyers, (3) private sellers to private buyers, and (4) private sellers to public buyers. Panel A uses the full matched sample; Panel B excludes well pairs in which the transacted well is a dry-gas well. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Full matched sample

	(1) Flares/day	(2) Flares/day	(3) Flares/day	(4) Flares/day
Transacted x Post	0.00219***	0.00040	-0.00004	-0.00021
	(0.00063)	(0.00060)	(0.00023)	(0.00049)
Seller Type	Public	Public	Private	Private
Buyer Type	Private	Public	Private	Public
Mean(dep. var.)	0.0017	0.0032	0.0004	0.0011
Well FE	X	X	X	X
Well Pair x Event-month FE	X	X	X	X
Observations	235,102	180,810	124,950	70,658
Adjusted R-squared	0.232	0.197	0.271	0.201

Panel B: Dry-gas wells excluded

	(1) Flares/day	(2) Flares/day	(3) Flares/day	(4) Flares/day
Transacted x Post	0.00275***	0.00052	-0.00003	-0.00009
	(0.00080)	(0.00074)	(0.00026)	(0.00060)
Seller Type	Public	Public	Private	Private
Buyer Type	Private	Public	Private	Public
Mean(dep. var.)	0.0022	0.0039	0.0004	0.0013
Well FE	X	X	X	X
Well Pair x Event-month FE	X	X	X	X
Observations	186,200	147,882	110,838	55,566
Adjusted R-squared	0.231	0.196	0.273	0.207

Table AVII: Well transactions and flaring: alternative matched samples

This table reports the estimates from $Flares/day_{ikt} = \alpha_i + \gamma_{kt} + \delta\, Transacted_i \times Post_{kt} + \epsilon_{ikt}$ for matched pairs from public-seller-to-private-buyer transactions, where the matched control sample is constructed under alternative matching criteria. Columns (1)–(4) vary the distance ring within which control wells are drawn (1–2.5 km, 1–7.5 km, 1.5–5 km, and 2–5 km, versus 1–5 km in the baseline). Column (5) matches with replacement within the baseline ring. Column (6) additionally requires the control well to be balanced on pre-transaction production and well age. Standard errors are heteroskedasticity-robust and clustered at the well level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) Matching ring: 1–2.5 km	(2) Matching ring: 1–7.5 km	(3) Matching ring: 1.5–5 km	(4) Matching ring: 2–5 km	(5) Matching ring: 1–5 km (with replacement)	(6) Matching ring: 1–5 km (production and age matched)
Transacted x Post	0.00049**	0.00080***	0.00131***	0.00162***	0.00287***	0.00106**
	(0.00025)	(0.00027)	(0.00040)	(0.00047)	(0.00052)	(0.00045)
Mean(dep. var.)	0.0006	0.0009	0.0011	0.0012	0.0010	0.0008
Well FE	X	X	X	X	X	X
Well Pair x Event-month FE	X	X	X	X	X	X
Observations	218,050	550,858	349,370	274,596	3,222,877	222,656
Adjusted R-squared	0.201	0.259	0.209	0.207	0.172	0.199

Table AVIII: Environmental shareholder proposals and well transaction volume: Poisson estimates

This table reports Poisson pseudo-maximum-likelihood estimates from regressing Y_{jt}, the total number of wells sold ($NumWells^{Sold}$) or bought ($NumWells^{Bought}$) by firm j in year t, on $EnvProposal_{j,t-1}$ (an indicator for firm j facing at least one environmental shareholder proposal in year $t-1$) or $NumEnvProposal_{j,t-1}$ (the number of environmental shareholder proposals firm j faced in year $t-1$). The "Implied % effect" row reports $100 \times (\exp(\beta) - 1)$, the implied percentage change in wells transacted (per additional proposal for *NumEnvProposal*). The estimator retains only firms with non-zero outcome variation, so the retained samples are smaller than in the OLS tables. The sample includes publicly traded oil and gas firms that faced at least one environmental shareholder proposal between 2013 and 2022. Standard errors are heteroskedasticity-robust and clustered at the firm level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) $NumWells^{Sold}$	(2) $NumWells^{Bought}$	(3) $NumWells^{Sold}$	(4) $NumWells^{Bought}$
EnvProposal	0.5080*	0.0782		
	(0.2716)	(0.3730)		
NumEnvProposal			0.1707*	0.4012
			(0.0903)	(0.2513)
Implied % effect	66.2	8.1	18.6	49.4
Mean(dep. var.)	31.745	11.824	31.745	11.824
Firm FE	X	X	X	X
Year FE	X	X	X	X
Observations	290	250	290	250
Pseudo R-squared	0.370	0.304	0.367	0.322

Table AIX: Diagnostics for the firm-level two-way fixed effects estimates

This table reports diagnostics for the firm-level regressions of wells sold on lagged environmental-proposal exposure (Table VIII). The table reports the weight diagnosis of de Chaisemartin and D'Haultfœuille (2020): under parallel trends, the two-way fixed effects coefficient identifies a weighted sum of the treatment effects in the 207 treated firm-years, where some weights can be negative. It reports the number and total mass of negative weights, the minimal standard deviation of treatment effects across firm-years at which the true average effect could be zero despite the estimated coefficient, and the minimal standard deviation at which the true effect could be of the opposite sign in every firm-year. The sample includes publicly traded oil and gas firms that faced at least one environmental shareholder proposal between 2013 and 2022.

	EnvProposal	*NumEnvProposal*
TWFE coefficient (β_{fe})	8.3740	9.2015
Negative-weight ATTs (of 207)	13	36
Sum of negative weights	-0.0197	-0.2685
$\sigma(\Delta)$ at which the true effect could be zero	12.20	5.53
$\sigma(\Delta)$ for an opposite sign in all cells	87.05	11.08

Table AX: Environmental shareholder proposals and well transactions: distributed lags

This table reports the estimates from regressing the number of wells sold ($NumWells^{Sold}$) or bought ($NumWells^{Bought}$) by firm j in year t on environmental-proposal exposure in years $t+1$ through $t-3$, using the indicator *EnvProposal* (columns (1)–(2)) or the count *NumEnvProposal* (columns (3)–(4)). The lead term $(t+1)$ tests for anticipation; the deeper lags absorb any carryover of past proposals, so that previously treated firm-years cannot contaminate the comparison group. The sample includes publicly traded oil and gas firms that faced at least one environmental shareholder proposal between 2013 and 2022. Standard errors are heteroskedasticity-robust and clustered at the firm level. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) $NumWells^{Sold}$	(2) $NumWells^{Bought}$	(3) $NumWells^{Sold}$	(4) $NumWells^{Bought}$
$EnvProposal_{t+1}$	0.1945	5.7939		
	(4.4543)	(3.5315)		
$EnvProposal_{t}$	10.2696**	-1.6652		
	(4.6735)	(2.4527)		
$EnvProposal_{t-1}$	7.2565*	-0.3379		
	(4.1442)	(2.1895)		
$EnvProposal_{t-2}$	0.2098	1.4611		
	(3.8388)	(2.3171)		
$EnvProposal_{t-3}$	0.1463	-0.8542		
	(4.7866)	(2.1802)		
$NumEnvProposal_{t+1}$			-0.3512	0.7827
			(1.1724)	(0.5264)
$NumEnvProposal_{t}$			3.6889	-1.1107
			(2.7506)	(1.2950)
$NumEnvProposal_{t-1}$			6.7701**	1.4039
			(2.7172)	(1.5621)
$NumEnvProposal_{t-2}$			4.0081	1.3213
			(3.2158)	(1.4615)
$NumEnvProposal_{t-3}$			-2.4120	-0.9577
			(2.1108)	(1.1386)
Mean(dep. var.)	15.603	5.010	15.603	5.010
Firms	59	59	59	59
Firm FE	X	X	X	X
Year FE	X	X	X	X
Observations	590	590	590	590
Adjusted R-squared	0.223	0.118	0.238	0.113

Table AXI: Environmental shareholder proposals and wells sold: heterogeneity-robust event studies

This table reports event-study estimates from the heterogeneity-robust estimator of de Chaisemartin and D'Haultfœuille (2024), which accommodates non-absorbing, repeated treatment by comparing firms whose environmental-proposal exposure changes to firms whose exposure has not yet changed. The panel is extended to 2010–2022 so that firms first targeted before 2013 are correctly classified as switchers. The treatment is exposure to an environmental shareholder proposal in the previous year. Columns (1) and (2) use the number of wells sold and columns (3) and (4) the number of wells bought, each winsorized exactly as in Table VIII, so magnitudes are directly comparable to the panel regression estimates. Within each pair, the first column uses the proposal indicator *EnvProposal* as the treatment, and the second uses the proposal count *NumEnvProposal* as a non-binary treatment, normalizing the estimates per unit of treatment. Effects are reported for the first three years starting from the year exposure first changes; placebo estimates test for differential trends before the change. Standard errors are clustered at the firm level. A Poisson analogue of this estimator is infeasible on this panel: the required saturated specification suffers from separation in most firm-year cells. Standard errors are shown in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
	$NumWells^{Sold}$		$NumWells^{Bought}$	
	EnvProposal	*NumEnvProposal*	*EnvProposal*	*NumEnvProposal*
Placebo ($\ell = -1$)	-9.382	-7.335	10.991	8.593
	(8.392)	(6.561)	(6.694)	(5.238)
Placebo ($\ell = -2$)	-3.861	-2.026	-2.046	-1.073
	(6.382)	(3.348)	(10.765)	(5.645)
Effect ($\ell = +1$)	-1.404	-1.128	-7.265	-5.836
	(6.972)	(5.633)	(6.818)	(5.482)
Effect ($\ell = +2$)	-2.695	-1.436	2.261	1.204
	(7.881)	(4.235)	(4.384)	(2.304)
Effect ($\ell = +3$)	16.028*	6.642*	-2.560	-1.061
	(9.661)	(3.964)	(4.572)	(1.886)
Average total effect	6.096	4.585	-4.124	-3.102
	(10.095)	(7.626)	(5.071)	(3.781)
Joint p: effects	0.339	0.297	0.769	0.769
Joint p: placebos	0.428	0.428	0.254	0.254
Switchers ($\ell = +1$)	49	49	49	49