The Last Good Owner Effect: Ownership Structure and Environmental Outcomes in Oil and Gas*

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Abstract

The effectiveness of corporate climate initiatives depends not only on firms' commitments but also on existing asset ownership structure. We study this in the context of the World Bank's Zero Routine Flaring (ZRF) initiative, where oil & gas companies made voluntary commitments to reduce flaring. Using asset-level data on ownership structure & flaring, we show that firms committing to ZRF modestly reduce flaring from their assets over time. However, the persistence of these gains hinges on the distribution of committed ownership. When multiple committed firms share control of an asset, flaring remains unchanged even as one committed company exits. In contrast, when the last committed owner divests its stake, flaring rises sharply. This result holds even when the committed company is not the operator of the asset around divestment, suggesting that committed companies put downward pressure on pollution when they are on the board. These results highlight that effectiveness of voluntary environmental initiatives depend on ownership structure.

Keywords: Environmental regulation, corporate social responsibility (CSR), corporate governance

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1 Introduction

Oil and gas production is a major contributor to global greenhouse gas emissions, accounting for approximately 15% of total energy-related emissions worldwide (IEA (2023)). Gas flaring, the burning of natural gas associated with oil extraction, is particularly significant and was responsible for nearly 1% of total energy-related greenhouse gas emissions in 2022 (IEA) (2023). Beyond its climate impact, flaring represents a substantial waste of energy resources. In Sub-Saharan Africa alone, approximately 35 billion cubic meters of gas are flared annually, equivalent to half of the continent's total power consumption. The problem is especially acute in regions with weak governance and limited gas infrastructure, where the lack of pipeline networks and processing facilities makes flaring economically rational despite its environmental and social costs.

Oil and gas companies face increasing pressure to reduce emissions from both regulatory and market sources. Recent regulatory initiatives include the U.S. EPA's 2024 rule to curb methane emissions from oil and gas operations under the Clean Air Act and the EU Methane Regulation of 2023, which mandates leak detection and flaring limits for energy producers. Alongside these mandatory regulations, companies are increasingly adopting voluntary climate commitments. As of 2023, 80% of the largest U.S. oil and gas companies voluntarily report their Scope 1 and Scope 2 greenhouse gas emissions (Ernst & Young LLP (2024)). Many also subscribe to voluntary disclosure and decarbonization initiatives. A prominent example is the World Bank's Zero Routine Flaring by 2030 initiative, launched in 2015, which has attracted endorsements from 60 oil and gas companies committing to eliminate routine flaring by the end of the decade.

The effectiveness of such voluntary commitments likely depends on the ownership structure of oil and gas assets and the alignment of incentives among different stakeholders.

Individual assets are frequently owned by multiple companies with varying organizational forms, governance structures, and environmental priorities. Publicly-listed companies face stringent disclosure requirements and investor pressure regarding climate performance. National oil companies (NOCs), which produce 50% of global oil and gas, face less investor scrutiny Cahill and Swanson (2023). Private equity firms control over $1 trillion in energy assets, with 66% in fossil fuels, yet face minimal disclosure requirements Private Equity Stakeholder Project et al. (2024). When assets have mixed ownership, the operator plays a crucial role. The operator is the company that manages day-to-day operations and makes operational decisions, including those related to flaring. Even if an equity owner commits to emissions reduction, it is unclear whether this translates to lower emissions if the operator or other non-operating partners lack similar commitments. Despite the importance of these governance dynamics, the role of ownership structure and mixed incentives in determining the effectiveness of voluntary environmental commitments remains understudied.

This paper examines how ownership structure affects firms' responses to voluntary climate commitments in the global oil and gas sector. We investigate whether flaring decreases after companies commit to the World Bank's Zero Routine Flaring by 2030 initiative and whether this effect depends on whether the committed company is the operator. We also analyze what happens when committed companies divest their assets and examine whether flaring changes depend on the ownership mix of remaining stakeholders. We use comprehensive panel data on the universe of oil and gas fields from Rystad Energy combined with satellite-based flaring measurements from NOAA-VIIRS (2012-2024) and implement a staggered event study methodology to account for the heterogeneous timing of commitments across companies.

The World Bank's Zero Routine Flaring by 2030 initiative, the focus of our empirical analysis, was launched in 2015 at the COP21 Paris Climate Conference. Under this voluntary commitment, endorsing companies pledge to end routine flaring at new oil fields immediately and at existing fields by 2030. Routine flaring refers to the burning of natural gas associated with oil extraction when infrastructure to capture or transport the gas is unavailable or uneconomical. Signatories commit to report annually on their progress and flaring volumes to the World Bank. Since its launch, 60 oil and gas companies have endorsed the initiative, with commitments made at different times between 2015 and 2024. This staggered adoption provides variation in the timing of commitment across companies. The voluntary nature of the commitment creates an ideal empirical setting to examine whether and how corporate environmental pledges translate into actual emissions reductions when ownership is fragmented and operational control may rest with parties that have not made similar commitments.

Our results show that voluntary commitments meaningfully reduce flaring, but only under specific ownership conditions. First, we find that ZRF commitments lead to a sustained decline in flaring among assets that remain continuously owned by committed companies. The event-study estimates show no pre-trends and a gradual but persistent reduction in flaring intensity beginning roughly one to two years after commitment, relative to assets whose owners never endorse the initiative. This effect is concentrated in long-run horizons and is strongest when the committed firm is also the operator, consistent with the idea that operators have greater ability to translate pledges into operational changes.

We then examine what happens when committed companies divest their equity shares. A key distinction emerges between partial and complete divestments. When a committed owner sells its stake but at least one other committed company remains on the management board, flaring continues to decrease following the divestment, although the estimates are noisier and smaller in magnitude. By contrast, when the last committed owner exits an asset—leaving only non-committed firms in control—flaring increases sharply and persistently.

This "last good owner" effect is visible across all specifications: flaring rises immediately when the exiting committed owner was not the operator and rises with a short lag when the committed owner had been the operator. We show that this pattern is not explained by generic divestment dynamics, which have only mild effects on flaring, nor by abrupt changes in facility capital expenditure, which displays no immediate discontinuity. Taken together, these findings suggest that the main driver is a change in management priorities rather than physical or technological constraints. When no committed company remains involved in the asset, the incentives that supported lower flaring weaken, and operational decisions shift in ways that allow higher emissions.

2 Background

2.1 World Bank's Zero Routine Flaring Policy

Policymakers and international organizations have pursued multiple approaches to reduce gas flaring in oil production. Traditional regulatory approaches establish mandatory limits on flaring volumes or rates, enforced through penalties, fines, or production restrictions, as exemplified by the US EPA's 2024 methane rule under the Clean Air Act and the EU's 2023 Methane Regulation. Market-based mechanisms such as carbon pricing and emissions trading schemes create economic incentives for flaring reduction, while technological solutions like improved gas capture infrastructure can make flaring economically unnecessary, though such investments require substantial capital and may be uneconomical in remote locations. Recognizing the limitations of mandatory approaches in contexts with weak regulatory capacity or where international coordination is needed, voluntary commitment frameworks have emerged as an alternative strategy, relying on reputational incentives, stakeholder pressure, and corporate social responsibility to drive behavioral change.

In response to this dual challenge of environmental harm and resource waste, the World Bank launched the Zero Routine Flaring by 2030 (ZRF) initiative at the 2015 Paris Climate Conference (COP21), adopting a voluntary commitment approach. The initiative represents a voluntary commitment framework designed to eliminate routine flaring from oil production operations worldwide by 2030. Under the terms of the commitment, endorsing companies pledge to immediately cease routine flaring at all new oil field developments and to eliminate routine flaring at existing oil fields by the 2030 deadline. Signatories are also required to report annually on their progress and flaring volumes, creating a mechanism for transparency and public accountability. Since its launch, the initiative has attracted 60 oil and gas companies as endorsers, with commitments made on a staggered basis. Table 2 lists the companies that have endorsed the ZRF policy since it was announced.

Unlike mandatory flaring regulations enforced through penalties or legal sanctions, the ZRF relies primarily on reputational incentives and stakeholder pressure to drive compliance. The World Bank publishes annual progress reports documenting each signatory's performance, creating public visibility around companies' environmental commitments. However, there are no binding enforcement mechanisms or financial penalties for companies that fail to meet their pledges. This institutional design reflects both the practical challenges of implementing binding international environmental agreements across diverse jurisdictions and a theory of change that emphasizes the power of public commitments, investor pressure, and corporate reputation in shaping firm behavior. Whether such soft governance mechanisms can effectively reduce emissions in practice, particularly in contexts with weak domestic regulatory capacity, remains an empirical question

2.2 Ownership Structure and Governance in Global Oil and Gas Industry

Oil and gas extraction typically involves significant capital requirements, geological risk, and technical expertise, leading to widespread use of joint venture structures where multiple companies share ownership of individual assets or fields. In these arrangements, equity ownership is distributed among several partners, each holding a percentage stake in the asset. One partner is designated as the operator, responsible for managing day-to-day field operations, making operational decisions, and coordinating activities on behalf of all equity owners. In many cases, the operator is also the majority stakeholder. However, operator selection may also be based on technical expertise, regulatory requirements, or contractual arrangements. The remaining partners are non-operating equity owners who share in production revenues and costs proportional to their ownership stakes but do not control operational decisions. This separation between operational control and equity ownership creates a principal-agent relationship where the operator's decisions may not fully align with the preferences of non-operating partners Hart (1995) and Shleifer and Vishny (1997a).

The operator's authority extends to critical decisions affecting environmental performance, including flaring practices. Operators determine day-to-day operational practices, establish field-level environmental management procedures, and decide when flaring is operationally necessary. However, major capital investments, such as gas capture infrastructure or flare reduction equipment, typically require approval from joint operating committees where non-operating equity owners have representation and voting rights proportional to their ownership stakes. Non-operators can leverage these governance mechanisms to influence flaring decisions, including by building consensus around reduction targets, exercising approval rights over budgetary decisions, and advocating for emissions reduction investments Clean Air Task Force (2025). While industry reports recognize the potential for non-operator influence, existing academic research has largely focused on operator behavior, with limited empirical evidence on whether non-operating equity owners can effectively constrain emissions through governance mechanisms.

The potential for governance conflicts becomes particularly acute when joint venture partners have heterogeneous environmental commitments or face different stakeholder pressures. A publicly-listed operator facing intense investor scrutiny over ESG performance may prioritize flaring reduction even when non-operating partners, such as National Oil Companies or private equity firms with weaker disclosure requirements, might prefer to minimize costs. Conversely, a committed non-operating equity owner may struggle to influence an uncommitted operator's environmental practices, especially if flaring reduction requires capital investments that reduce short-term profitability. These conflicts are further complicated by the fact that infrastructure investments in gas capture benefit all equity owners collectively, creating potential free-rider problems where individual partners may prefer others to bear the costs of emissions reduction Grossman and Hart (1980) and Olson (1965).

Ownership changes adds more complexity to these governance dynamics. When a committed company divests its stake in an asset, the environmental implications depend critically on who acquires that stake and whether any remaining equity owners maintain climate commitments. Strategic divestitures may allow companies to improve their portfolio-level environmental metrics while actual emissions at divested assets persist or increase under new ownership. If the exiting company was the operator, operational control transfers to a new entity that may have different environmental priorities. Even if the divesting company was a non-operating equity owner, its departure may shift the balance of influence within joint management committees. These ownership transitions create natural experiments for examining whether voluntary climate commitments reflect genuine environmental preferences or merely respond to external pressures. If non-operating committed owners exercise meaningful governance influence over emissions, their exit from joint ventures may lead to deteriorating environmental performance at the divested assets.

2.3 Descriptive Example: TotalEnergies' Divestment in Gabon

To illustrate how ownership changes can affect environmental outcomes in jointly-owned oil and gas assets, we examine TotalEnergies' gradual exit from its operations in Gabon. TotalEnergies (then Total) has been a major oil and gas operator in Gabon for over 90 years, dating back to the 1950s when the company discovered major offshore deposits including the Anguille, Torpille, and Grondin fields that would become central to Gabon's oil industry. TotalEnergies, one of the largest international oil companies, is an early signatory to the World Bank's Zero Routine Flaring initiative, endorsing it in 2015. The company committed to ending routine flaring at new oil fields immediately and at existing fields by 2030, with annual public reporting on progress toward this goal.

TotalEnergies began a strategic portfolio restructuring in the late 2010s; in Gabon, they exited several offshore fields where production had plateaued and operational costs were increasing relative to output. Total originally owned a 83% interest in these fields, the remaining 17% being owned by the Gabonese State. The divestment occurred in two stages. In 2017, TotalEnergies sold a 35% interest in four oil fields to Perenco, an Anglo-French independent oil and gas company specialized in mature fields in Africa. Crucially, this transaction also transferred operatorship of these fields from TotalEnergies to Perenco, though TotalEnergies retained a 49% stake as a non-operating partner. Four years later, in 2021, TotalEnergies, along with the State of Gabon, completed its exit by selling its remaining equity interests in these mature offshore fields to Perenco, fully relinquishing its involvement in these assets. Critically, Perenco is not a signatory to the Zero Routine Flaring initiative and, as a private company, faces substantially less disclosure pressure than publicly-listed international oil companies.

This sequence of transactions provides a particularly clean setting to examine how ownership structure affects flaring outcomes. The staggered nature of the divestment allows us to separately observe the effects of committed operator change (2017) versus complete equity exit by the committed non-operator (2021), while the transfer from a committed, publicly-listed major to an uncommitted private operator creates sharp variation in governance incentives. Figure 1 tracks annually flared volumes and oil production across these four marine fields in Gabon that experienced ownership transitions: Barbier Marine, Gonelle Marine, Grondin Marine, and Mandaros Marine.

The pattern is striking. After the first divestment when TotalEnergies gave up operatorship but held partial ownership, and Perenco was the new operator (2017-2021), flaring remained relatively stable or declined slightly. However, following TotalEnergies' complete exit in 2021, flaring increased sharply across multiple fields, even though TotalEnergies was only a non-operating owner of the asset. The effect is most dramatic in Gonelle Marine, where flaring intensity more than doubled from approximately 3 mmscf/d to over 7 mmscf/d within two years of TotalEnergies' departure. This divergence between falling or stable production and rising flaring indicates that the changes reflect operational and investment decisions rather than increased production activity, suggesting that the presence of a committed equity owner had been constraining flaring even without operational control. This increase occurred despite declining or stable oil production, suggesting the flaring results are not driven by higher production; rather this shows that *flaring intensity* changes.

This example illustrates the central questions we address in this paper. First, we examine whether committed non-operating equity owners can constrain emissions even without operational control, as suggested by the relative stability of flaring while TotalEnergies remained a minority partner. Second, we investigate whether complete exit of committed owners leads to environmental deterioration at divested assets, as evidenced by the sharp post-2021 flaring increases across all four fields. We examine these questions systematically using the universe of global oil and gas assets, exploiting variation in the timing of ZRF commitments, asset transactions, and governance structures of jointly-owned fields.

3 Data

In this section, we describe our data sources and how we combine it to create a novel dataset. We also present descriptive evidence on committed and uncommitted asset ownership, flaring and other key indicators in the oil and gas industry.

3.1 Oil and gas assets

Our primary data source is the UCube database on upstream oil and gas industry obtained from Rystad Energy (hereafter Rystad). It reports annual data on over 25,242 commercial assets (i.e., a specific area or field where companies have the rights to explore or produce) spanning over 129 countries from 2012 to 2024. The dataset contains information on annual production sold and outages by oil and gas type. We define oil as any of the following: crude oil, NGL, and condensate. Since volumes reported corresponds to production reaching the market, no recorded gas volumes does not necessarily mean no associated gas was produced. It rather means that the asset is not connected to the local gas market or does not possess gas liquefying plants that would allow selling the gas.

The dataset also reports annual cost data disaggregated into categories[1]. The types of cost we use are well CAPEX and facility CAPEX. The former corresponds to "capitalized costs related to well construction, including drilling costs, rig lease, well completion, well stimula-

[1]Available categories are: production OPEX, transportation OPEX, selling, general & administrative OPEX, well CAPEX, facility CAPEX, exploration CAPEX, taxes reported as OPEX, royalties, government take in nature, and income tax.

tion, steel costs and materials", while the latter includes "costs to develop, install, maintain and modify surface installations and infrastructure".

From the same source, we also retrieve information on the ownership structure and operatorship of each asset, and its evolution through time. The operator of an asset is generally a single company among the owners, although in certain cases joint ventures are created between different owners to operate the asset. Only one operator is reported per year, corresponding to the company having operated the asset for the largest share of the year in the case of changing operatorship. Participation per company is reported as a percentage interest in the asset. For years during which a transaction occurs, the value reported is proportional to the share of the year during which the company held the percentage interest in the asset. This allows us to identify the exact timing of the transaction within the year. In some cases, the dataset contains

On top of volumes, economic and ownership data, we need geographical information about assets in order to match flaring satellite observations to assets responsible for it, as described in section 3.3. We thus compliment data retrieved through Rystad's UCube with geographical data and information on wells drilled obtained in 2022 through the WellCube, from Rystad too. This dataset contains the number of wells drilled per year per asset and the purpose of the well (production, injection, or exploration). The associated shapefile contain geographical shapes of assets when available, and a generic one when not (i.e. a circle). For assets existing in the production dataset described above absent from the shapefile, a generic shape was created based on the centroid of the asset shape (available in the first dataset). Among all assets with at least one existing well in the 2012-2024 period, xxx % have a generic shape. Finally, we use data made available by Rystad on wells locations to improve the precision of the matching of satellite flares observations. It contains the geographical location of more than 1,700,000 wells drilled since 2000. In some countries, the locations reported correspond to the centroid of the asset shape, while for others such as the US and Canada, each well has a unique location[2].

3.2 Commitments by companies

The World Bank's Zero Routine Flaring by 2030 provides the list of companies that endorsed to the initiative. By using the Wayback Machine, we search through all snapshots between the commencement of the program and the end year of our analysis to identify when the companies committed to the initiative. We then scrape through the past versions of the website and note the year in which the company's name appears for the first time, and we use this as the year the company endorsed to the program.[3] We link this to the Rystad database using the company names and use various sources to ensure that the names are consistent across both the data sources. Table 2 lists the companies and their endorsement years. Manual corrections were performed to account for joint ventures in which committed companies were involved.

3.3 Flaring

We obtain the flaring data from the Colorado School of Mines' dataset on Global Gas Flaring Observed from Space. The data is collected by the National Oceanic and Atmospheric Administration (NOAA) using the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument aboard three satellites. It can record a wide range of electromagnetic spectral bands between the wavelengths $0.412\mu m$ and $12.01\mu m$. Elvidge et al., 2015; Zhizhin et al., 2021 develop a methodology that exploits specific shortwave infrared wavelengths during nighttime satellite observations, commonly used for fire detection, to detect active flares and

[2]Onshore US (except Alaska) and Canada only containing generic shapes, this data on wells precise location is crucial.

[3]The same information can be found on the World Bank's ZRF reporting dashboard, however, it appears that only a subset of the companies are reported here. The current list of endorsers can be found at https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030/endorsers, while the dashboard can be accessed from https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030/reporting.

derive estimates of flared volumes. Using the coordinates of the flaring observations, we link this to the Rystad data using the location of the wells or the shape of the assets. The methodology in order to match satellite observations follows a five step process allowing to attribute each flaring observation to a unique asset when possible, or to split flared volumes among nearby active assets when needed. The precise methodology used to perform this matching is described in appendix. Among 141,841 observations over the 2012-2024 period,

3.4 Identifying divestments

From the ownership data described above, we leverage the structure of the data to identify all transactions occurring for each asset and their characteristics. The key feature of the data allowing us to retrieve this information is the proportional nature of participation interests reported. For each company within each asset, we compute the percentage interest sold or bought when possible, or derive it from other companies involved in the transaction if possible. Same goes for the timing of the transaction. Manual corrections were made in three particular cases. For assets located in 2 blocks in Nigeria ("OML 011" and "OML 017"), no transaction was recorded in the data, but a transaction was recorded in older ownership data from the same source extracted a year before. After verification, the older data was used for these assets. Verifying that the operating company was either a company holding shares of the asset or a joint venture led us to manually verify and correct the operator in specific years for 9 assets (7 in Congo, 2 in Gabon). Finally, apparent inconsistencies in the computations of implied shares and transaction timing brought manual verification and correction for 9 assets.

Overall, among the 24,159 assets active during the period, 13,155 experienced at least one transaction. For 747 assets, a large number of simultaneous and/or consecutive transactions made the computation of the share bought and sold by each company unachievable. We drop these assets from our sample. For all other assets, we verify that the computed shares sold and bought by each company, and the computed timing for each transaction, implicates a total percentage available of exactly 100%. 615 assets did not pass this verification process for at least one year, and are therefore dropped from our sample. Finally, restricting to assets that produced and sold any oil during the period leaves us with a sample size of 19,968 assets.

For the remaining sample, commitment to the ZRF was defined as the commitment by any company owning interest in the asset, or the buying by any committed company of an interest in the asset. The commitment treatment lasts as long as any share of the asset is held by a committed company. Conversely, the divestment treatment is defined as the selling of all shares owned by one or several committed companies in an asset. This means that in the case of a progressive divestment (either a committed company progressively selling its shares, or one committed company fully divesting before the other divests), only the last committed owner exiting leads to a treatment. The divestment treatment lasts as long as no committed company holds any share of the asset. This implies that if a company owning shares in the asset commits later, after the divestment, the asset will stop being considered as treated. We also define an operator divestment treatment, which happens once an operator commits to the ZRF or when the operatorship of the asset is transferred to a committed company.

From these three main treatment variables, we define a variety of refined treatment variables allowing us to better understand the dynamics of divestment and its consequences. We first define an "incomplete" divestment variable, identifying full divestments from committed companies in assets where at least one committed owner stays. We then divide the divestment variable into two separate cases: divestment in assets in which the exiting company is also the operator and transfers operations to an uncommitted firm, and divestment in assets that were already operated by an uncommitted firm. Finally, build a placebo treatments to test the robustness of our findings by identifying all other possible divestments: from uncommitted owners to other uncommitted owners, from uncommitted to committed ones, and finally from committed to committed firms.

	Nb_Assets	N	Mean	SD	Min	Max
World - Oil						
Committed - Divested						
Years in data	676	8,343	12.7	1.3	1	13
Current age (years)	676	8,343	34.3	17.8	1	115
Oil production (kbbl/d)	676	8,343	3.8	12.9	0	226.8
Flared volumes (mmscf/d)	676	8,343	0.6	3.5	0	117.2
Committed - Non-divested						
Years in data	6,752	68,972	11.7	2.6	1	13
Current age (years)	6,752	68,972	28.1	21.9	1	182
Oil production (kbbl/d)	6,752	68,972	8.4	58.6	0	3,435.7
Flared volumes (mmscf/d)	6,752	68,972	0.9	5.8	0	355.2
Uncommitted - Non-divested						
Years in data	12,540	131,762	11.9	2.5	1	13
Current age (years)	12,540	131,762	32.7	24.3	1	166
Oil production (kbbl/d)	12,540	131,762	3.5	17.5	0	628.8
Flared volumes (mmscf/d)	12,540	131,762	0.6	5.4	0	301.4
World - Oil - No gas sold						
Committed - Divested						
Years in data	288	3,575	12.7	1.2	1	13
Current age (years)	288	3,575	36	17.5	1	114
Oil production (kbbl/d)	288	3,575	3.8	14.5	0	223.8
Flared volumes (mmscf/d)	288	3,575	0.7	4.6	0	117.2
Committed - Non-divested						
Years in data	2,267	26,223	12.3	1.9	1	13
Current age (years)	2,267	26,223	34.2	22.4	1	182
Oil production (kbbl/d)	2,267	26,223	6.6	36.1	0	1,272.9
Flared volumes (mmscf/d)	2,267	26,223	1.3	8.6	0	355.2
Uncommitted - Non-divested						
Years in data	4,613	49,014	12	2.4	1	13
Current age (years)	4,613	49,014	33.6	21.4	1	161
Oil production (kbbl/d)	4,613	49,014	4	20.5	0	628.8
Flared volumes (mmscf/d)	4,613	49,014	0.8	6	0	269.6

Table 1: Summary statistics

Table 1 displays summary statistics for the different samples used and main treatment groups. The first half of the table reports averages for relevant variables for the complete sample, comprising all oil producing assets, while the second half restricts the sample to assets with no recorded gas sales (indicating no connection to any gas market). For each sample, our treatment group of interest consists of assets whose owners (at least one) committed to the ZRF initiative before divesting to uncommitted owners: 688 assets fall into this category, of which 288 are not connected to any gas market. Two opposite control groups are then defined: assets that became committed and then remained committed through at least one shareholder until the end of the period (hereafter always-committed assets), and assets who never had any committed shareholder (hereafter never-committed assets).

For both production levels and flared volumes, the distribution is heavily skewed to the right in all groups, with a small number of assets being responsible for most oil production and flared gas. Unsurprisingly, assets unconnected to the gas market seem to produce less oil on average but flare larger quantities of associated gas, highlighting the key benefit of having access to an existing gas market easily.

Although no group seem to differ significantly from one another, it is worth noting that always-committed assets tend to be larger on average than other assets. Two factors can explain this discrepancy: first, larger companies are on average more often committed than smaller ones, and tend to have working interests in larger oil fields. Secondly, large assets ownership is more often split between different firms, increasing the probability that one of them is committed. Contrary to always-committed assets, the never-committed sample display average age, production levels and flared volumes remarkably close to that of divested assets, making it an ideal control group in our setting.

4 Empirical Strategy

4.1 Event Study Approach

We aim to measure how flaring volumes change when there is a shift in an asset owner's commitment to reducing flaring. We use an event study approach to show the effects on flaring in a series of events when the share of ownership by committed firms of an asset change. We exploit two primary sources of change in the share owned by committed firms – if any of the owners endorse to the Zero Routine Flaring initiative, or if any of the owners who are already endorsed sells their share of the asset to a company who is not endorsed. The former examines the effect of commitment, focusing on how the endorsed company seeks to reduce flaring—either by lowering emissions from assets it continues to own or by divesting from them. The latter captures the effect on flaring from assets that committed owners have sold, and which are subsequently owned by less committed or entirely uncommitted owners. However, to purely capture the effects of committed owners, we need to eliminate the effect of potential confounders by omitted variables. We use a combination of high-dimensional fixed effects to account for different sources of unobserved heterogeneity at the asset, year, continent, and operator levels.

We include asset fixed effects to control for time-invariant characteristics that may influence flaring levels. These characteristics include, for example, the initial oil-to-gas ratio, the type of oil extracted, and geological attributes of the reservoir such as depth and rock type. We include continent-by-year fixed effects to absorb time-varying shocks or influences that are common to all countries within a continent in a given year—for example, the effects of global oil price movements or disruptions to international supply chains that may impact continents differently. Ideally, we would prefer to use country-by-year fixed effects to account for country-specific policy shocks. However, doing so would risk absorbing the actions of national oil companies (NOCs) in countries where they own most assets, either directly or through joint ventures. Lastly, operator fixed effects control for the efficiency and environmental outlook of the company in charge of managing the asset.

The advantages of using an event study approach are that it allows us to estimate the dynamic effects of committed owners, as well as the pre-trends, testing whether the outcomes of the assets divested under our specified treatment are likely to have evolved similarly in the absence of the treatment. For asset i at year t, we estimate using the following event study specification:

$$Y_{it} = \sum_{\substack{k=-K \\ k \neq -1}}^{K'} \beta_k \, D_{i,t+k} + \gamma' X_{it} + \alpha_i + \delta_t + \theta_{it} + \varepsilon_{it} \tag{1}$$

Here, α_i denotes the asset fixed effect, δ_t the year fixed effect, θ_{it} the operator fixed effect, and X_{it} a vector of controls with conformable coefficients γ'. The scalar ϵ_{it} represents an unobserved shock that is not correlated with the event and the error term is clustered at the asset level. Y_{it} is the outcome of interest capturing emissions, or other economic variables that may help in explaining the change in emissions. $\sum_{k=-K,\, k\neq -1}^{K'} \beta_k D_{i,t+k}$ captures the dynamic effects of the treatment, and allows us to see the effect on the outcome from $K \geq 0$ years before t and $K' \geq 0$ years after t. The values of K and K' are constrained by the intersection of the data period, the timing of ownership commitments, and the year in which the asset begins or ceases production; thus, making it an unbalanced panel. The estimates $\{\beta_k\}_{k=-K}^{K'}$ are graphically summarized in the event-study plots and are normalize at $k = -1$.

Our main outcome variable is the volume of flaring, measured at the asset–year level in million standard cubic feet per day (mmscf/d), which is the standard reporting unit. To explore potential mechanisms, we also use several additional outcomes. These include annual capital expenditures on facility infrastructure and on drilling new wells, both measured in million U.S. dollars, the total number of wells in an asset in a given year, as well as annual oil production from the asset measured in thousand barrels per day (kbbl/d). The outcome variables contain a substantial share of zero values, with the exception of oil production, since we restrict the analysis to assets that are actively producing. Oil production is also included as a control variable in the specifications where flaring is the main outcome.

Our preferred method for estimating the event-study coefficients is Poisson pseudo-maximum likelihood (PPML). PPML accommodates for the zeros in the dependent variable and it also allows for a proportional analysis that can account for the substantial variation in differences of baseline characteristics arising from differences in oil-field size, firm size and production (Silva and Tenreyro, 2011). It is also the natural choice when the dependent variable is non-negative, as it avoids the issues associated with natural logarithm and inverse hyperbolic sine transformations (Correia et al., 2020). This is particularly relevant when the dependent variable is flaring, investment or production, whereas for the number of wells PPML is especially appropriate because the outcome is a count variable. Another advantage of PPML is that it performs well in the presence of high-dimensional fixed effects (Bergé, 2018; Correia et al., 2020). Under this estimator, the coefficients of interest can be interpreted as semi-elasticities—that is, the percentage change in the outcome induced by a change in ownership structure.

5 Results

5.1 Commitment and Flaring

We first examine whether voluntary commitments to the World Bank's Zero Routine Flaring initiative translate into actual flaring reductions. Figure 2 presents event study estimates comparing flaring trajectories at assets where at least one equity owner commits to ZRF (treatment group) to assets that are never owned by committed companies during our study period. The treatment year is defined as the first instance when the owner of an asset endorses the ZRF initiative. The specification includes asset fixed effects to control for time-invariant field characteristics, year-by-continent fixed effects to absorb regional shocks and trends, and operator fixed effects to account for systematic differences in operational practices across companies. We control for oil production to ensure that changes in flaring intensity reflect operational decisions rather than changes in production volumes. Standard errors are clustered at the asset level to account for serial correlation within fields over time.

The pre-period coefficients provide conclusive evidence of flar pre-trends. This flat pre-trend indicates that assets whose owners would eventually commit to ZRF were not on systematically different flaring trajectories than never-committed assets, conditional on our fixed effects and controls. Following commitment, flaring begins to decline gradually but persistently. The reductions continue to grow over time, and they are economically meaningful reductions in emissions intensity that persist through the end of our observation window. The persistence and magnitude of these effects indicate that voluntary climate commitments can drive substantial emissions reductions when companies maintain continuous ownership of assets. However, this result raises important questions about what happens to flaring when committed companies divest their stakes. If the observed reductions reflect genuine changes in corporate environmental preferences and governance priorities, we might expect flaring to increase when committed owners exit and transfer control to uncommitted parties. We examine this possibility in the following subsection.

5.2 Divestment and Flaring

5.2.1 Full Divestment by Committed Owner

We now examine what happens to flaring when committed companies completely divest their stakes in oil and gas assets, leaving no other committed equity owners on the management board. If committed companies were truly constraining emissions through their equity ownership and governance influence, their complete exit should lead to increased flaring at the divested assets under new, completely uncommitted management board. Figure 3 presents event study estimates comparing flaring trajectories at assets where the last committed owner divests (treatment group) to assets that were never owned by committed companies (control group). The treatment year is the year when the last committed owner divests. The specification includes asset fixed effects, year-by-continent fixed effects, and operator fixed effects, with standard errors clustered at the asset level. Each coefficient represents the difference in flaring intensity between treated assets and control assets at a given event time, relative to one year before divestment, which is normalized to zero.

The results provide strong evidence that losing committed owners is bad for flaring. In the years prior to divestment, we can see that flaring from treated assets are on a downward trend compared to control assets. This is expected, since assets with committed owners reduce flaring after signing onto the ZRF policy. Following divestment, however, flaring increases sharply and persistently for the treated assets. By two years post-divestment, flaring intensity has increased by approximately 0.65 mmscf per barrel of oil produced (PPML) relative to the control group, and this elevated flaring persists through at least five years after the transaction.

The magnitude of this effect is economically substantial. The point estimates in years 2-5 post-divestment suggest flaring increases of 40-70% relative to the pre-divestment mean, indicating that the presence of committed equity owners had been meaningfully constraining emissions even after accounting for operator identity and other asset characteristics. The blue series, which restricts the sample to assets with no natural gas sales infrastructure, shows even larger and more precisely estimated effects. This pattern makes economic sense: assets without gas monetization infrastructure face higher marginal costs of capturing and utilizing associated gas, making flaring reduction particularly dependent on corporate governance and voluntary environmental commitments rather than pure profit motives. The persistence of elevated flaring years after divestment suggests that ownership changes lead to durable shifts in operational practices and investment priorities rather than temporary adjustments.

5.2.2 Incomplete Divestment by Committed Owner

The sharp increase in flaring following complete divestment by committed companies raises an important identification concern: are we capturing the effect of removing all committed oversight, or simply the effect of any divestment by a committed company. If our results merely reflect selection into divestment, with committed companies divesting their worst-performing or highest-emitting assets, we should observe flaring increases even when committed companies partially divest, leaving other committed equity owners on the management board. Figure 4 addresses this concern by examining incomplete divestments where a committed company exits but at least one other committed equity owner remains on the asset's management board. The specification and control group remain identical to the complete divestment analysis. If the previous results simply captured committed companies divesting problematic assets, we should observe similar post-divestment flaring increases here.

The pre-period coefficients shows that treated assets exhibit significantly lower flaring than control assets in the years before divestment, with this gap narrowing over time. The negative pre-trend coefficients, which become progressively less negative approaching the divestment event, suggest that assets experiencing incomplete divestment had been outperforming never-committed assets in emissions intensity, but this advantage was eroding. This pattern is consistent with committed companies beginning to divest from assets where their governance influence was becoming less effective or where operational conditions were deteriorating. Estimates across all post-divestment periods hover around zero or are slightly negative for both the full sample and the sample with limited gas infrastructure.

This finding provides validation for the “last good owner effect” interpretation. In contrast to the previous result on full divestments by committed owners, this result shows that flaring either remains flat or reduces slightly post-divestment by the committed owner. Hence, flaring increases occur specifically when all committed oversight is removed from the management board, not simply when any committed company divests. The continued presence of even a single committed equity owner appears sufficient to arrest the deterioration in flaring and maintain emissions discipline through governance mechanisms. The stark contrast between complete and incomplete divestments indicates that committed non-operators exercise meaningful influence over environmental outcomes, and that this influence persists until the final committed owner exits.

5.2.3 The Role of Operational Control: Divestment by Operators versus Non-Operators

The main divestment results demonstrate that flaring increases when the last committed owner exits. A critical question remains: whether these effects are driven entirely by the exit of committed operators who directly control field operations, or whether committed non-operators also constrain emissions through governance mechanisms. If the baseline results simply capture the transition from committed to uncommitted operational management, we should observe effects only when committed operators divest. However, if committed non-operators exercise meaningful influence through joint operating committees, approval rights over capital expenditures, and board representation, their exits should also increase flaring even when the operator remains unchanged.

To test this, we split the last committed divestment sample by whether the exiting committed company was the operator or a non-operator. The non-operator subsample provides a particularly clean test: here, the same operator remains in control before and after divestment, isolating the effect of removing committed oversight from the management board while holding operational management constant. If committed non-operators constrain emissions, we should observe flaring increases even in this subsample where operational control does not change hands.

Figure 5 presents these heterogeneous effects. The left panel examines divestments where the exiting committed company was a non-operator, while the right panel analyzes exits by committed operators. Both specifications use identical control groups and fixed effects structures. The results reveal striking differences in timing and magnitude. When a committed non-operator exits, flaring increases sharply and immediately, especially for assets with no access to gas infrastructure. These large, immediate increases demonstrate that committed non-operators had been actively constraining uncommitted operators through governance mechanisms, and their exit allows rapid operational changes even without any change in operational management.

In contrast, when a committed operator exits (right panel), flaring increases are small and noisy and the magnitude of increases is also somewhat smaller. The delayed response likely reflects the time required for new operators to assume control and modify established procedures. The stark contrast between immediate increases following non-operator exits and gradual increases following operator exits provides compelling evidence that committed equity owners constrain emissions through multiple channels: non-operators exercise substantial influence through governance mechanisms even without operational control, while operators directly control operational practices and capital allocation decisions but require time to implement changes following ownership transitions.

Figure A.1, which omits operator fixed effects, shows different results. The results for committed non-operator divestment remain nearly identical with or without operator fixed effects, which makes sense because the same operator manages the asset before and after divestment. This reinforces that our results are not driven by certain assets with peculiar operatorship. In contrast, the results for committed operator divestments are highly sensitive to operator controls because divestment necessarily involves a change in operational management. When the event study does not control for the operator identity, flaring is decreasing but noisy. The contrast between immediate, large increases following non-operator exits and modest, heterogeneous increases following operator exits provides compelling evidence that committed equity owners constrain emissions through multiple channels: non-operators exercise substantial and consistent governance influence even without operational control, while the effectiveness of committed operators depends partly on who replaces them, with meaningful heterogeneity across uncommitted operators in their willingness to increase flaring.

6 Potential Mechanisms

We now turn to potential mechanisms that could explain why flaring increases when an asset is no longer partially owned by committed owners. To do so, we examine how operational behavior changes once committed owners divest and the asset comes under the full ownership of uncommitted firms. In particular, we focus on investment and production decisions that may affect the asset's flaring levels.

6.1 How Ownership Changes Affect Investment Decisions

Does the change in ownership type following divestment affect subsequent investment? It is reasonable to expect that when large, committed companies exit an asset, the remaining owners may face capital constraints that influence their investment decisions. If so, which types of investments are most affected—particularly those that help reduce flaring? For example, are projects such as pipeline infrastructure, which enables gas to be transported to nearby markets or stored, scaled back? Or do the new owners instead prioritize cost-cutting and focus on drilling for oil in ways that pay little attention to environmental impacts? Unfortunately, we do not observe investment broken down into categories that would allow us to distinguish "green" from "brown" expenditures. However, we can analyze investment at a more aggregated level using two broad categories: spending on facility infrastructure other than wells, and spending specifically on drilling new wells.

6.1.1 Facility Capital Expenditure

Figure 6 presents the change in facility capital expenditure for assets where committed owners divest to uncommitted companies (the treated group), compared with assets that have always been owned by uncommitted firms (the control group). Like previous specifications, this includes asset fixed effects, continent-by-year fixed effects, operator fixed effects, and controls for oil production. The results indicate no meaningful change in facility-infrastructure investment following divestment, as reflected in the statistically insignificant coefficients. Although this result does not allow us to distinguish between "green" and "brown" types of investment that might affect flaring intensity, the absence of any significant immediate reduction in total facility capital expenditure implies that, if any substitution between brown and green investment is taking place, it remains an implicit choice that is probably influenced by the new uncommitted owners.

6.1.2 Drilling of New Wells

We now investigate whether there is an increased activity in the drilling of wells which could also increase flaring. We use the total number of wells to measure the drilling activity in the assets around the time ownership changes. Well drilling represents a direct measure of ongoing capital investment and operational activity at the asset level. If divestment to uncommitted owners leads to capital starvation or asset neglect, we should observe declining drilling activity following the transaction. Figure 8 present the results on new well drilling.

Throughout the pre-treatment period, treated assets show slightly elevated drilling activity relative to control assets, although it is on a declining trend. Following divestment by the last committed owner, drilling activity increases rather than decreases. By years 4/5 post-divestment, the number of wells drilled has increased by approximately 2 new wells relative to pre-divestment levels, with particularly large effects for assets without gas sales infrastructure (blue series). This pattern indicates that uncommitted acquirers actively invest in production capacity following divestment, maintaining or expanding drilling programs rather than allowing assets to deteriorate. Combined with our main flaring results, this finding suggests that increased emissions following committed owner exits reflect deliberate reallocation of operational priorities rather than capital constraints. New uncommitted owners invest in production-enhancing activities (drilling) while probably reducing investments in emissions-reducing infrastructure, consistent with weaker environmental governance rather than financial distress or operational neglect.

7 Robustness Checks

7.1 Divestment from Uncommitted to Uncommitted

A key concern with our main results is whether we are capturing the specific effects of losing committed ownership, or simply generic divestment dynamics that would occur regardless of the environmental commitments of the transacting parties. If asset divestments inherently lead to operational disruptions, management turnover, or reduced capital investment that mechanically increases flaring, our estimates would conflate these generic divestment effects with the specific role of committed ownership. To address this concern, Figure 9 examines divestments where uncommitted companies sell assets to other uncommitted companies. If our baseline results merely reflect generic divestment dynamics rather than the removal of committed oversight, we should observe similar post-divestment increases in flaring in this placebo sample.

The results provide strong validation for our main interpretation. Throughout both the pre and post-divestment periods, the estimated coefficients hover around zero with wide confidence intervals that consistently include zero. In the years following divestment, point estimates fluctuate between small positive and negative values with no clear directional pattern. By years 3–5 post-divestment, coefficients range from approximately -0.1 to -0.4, but remain statistically indistinguishable from zero. Even in the subsample of assets with no gas sales infrastructure (blue series), where operational constraints make flaring reduction most challenging, we observe no systematic increase in flaring following uncommitted-to-uncommitted transactions. This contrasts sharply with our baseline results, where the exit of the last committed owner led to immediate and persistent flaring increases of 40–70%. The absence of meaningful effects in this placebo sample indicates that generic divestment dynamics—such as temporary operational disruptions, integration costs, or management transitions—do not drive substantial changes in flaring intensity. Rather, the increases we document in Section 5.2 are specifically attributable to the removal of committed governance oversight from the management board.Retry

8 Conclusion

This paper examines how ownership structure affects the effectiveness of voluntary climate commitments in the global oil and gas sector. Using comprehensive data on global oil and gas assets, combined with satellite-based flaring measurements, we analyze the World Bank's Zero Routine Flaring initiative and show that voluntary commitments can reduce emissions, but their persistence depends critically on ownership structure.

Our results demonstrate three main findings. First, when companies commit to the ZRF initiative, flaring from their assets declines gradually but persistently over time. This suggests that voluntary commitments have the potential to translate into real emission improvements. Second, these emissions reductions disappear when no committed owner remains on the management board. When the last committed owner exits an asset, flaring increases sharply and persistently, even after controlling for operator identity as well as asset fixed effects and controlling for restrictive time-trends. This "last good owner effect" indicates that the presence of at least one committed equity owner on the management board is necessary to maintain emissions discipline. Third, splitting by committed operator divestments vs non-operator divestments, we find that committed non-operating equity owners exercise meaningful influence over environmental outcomes through governance mechanisms. We find that flaring increases immediately when committed non-operators exit, even though the same operator continues managing the asset, demonstrating that equity owners can constrain emissions without direct operational control.

These findings make several contributions to our understanding of corporate environmental behavior and the effectiveness of voluntary climate initiatives. First, we provide among the first systematic evidence on how ownership structure affects environmental outcomes in jointly owned assets. While prior research has examined how individual firm characteristics affect environmental performance, we show that the distribution of committed ownership across joint venture partners matters as much as whether any single owner has made environmental commitments. Second, we demonstrate that non-operating equity owners can meaningfully constrain emissions through governance mechanisms, not just through direct operational control. This finding challenges the common assumption that only operators determine environmental outcomes in oil and gas assets. Third, we show that voluntary commitments can be effective in reducing emissions, but only when committed ownership persists.

The policy implications are substantial. Our results reveal a significant loophole in voluntary climate frameworks: companies can meet their climate targets by divesting high-emitting assets to private equity firms, national oil companies, or other entities that face less scrutiny. Total emissions remain unchanged or increase, but the divesting company appears to have made progress. Effective climate policy in the oil and gas sector must therefore track asset-level emissions across ownership changes, not just company-level commitments. Voluntary initiatives like the ZRF should require signatories to divest only to other committed companies or mandate transparency about emissions from recently divested assets. For host country governments, particularly in regions with weak regulatory capacity, ensuring that major projects maintain at least one committed equity owner on the management board can meaningfully improve environmental outcomes. Only by addressing these governance challenges and closing the divestment loophole can voluntary climate initiatives achieve their intended environmental outcomes.

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Tables

Table 2: Year of Endorsement to ZRF by Companies

Year	Companies
2015	BG, Eni, Kuwait Petroleum Corp (KPC), PetroAmazonas, Shell, SNH (Cameroon), SNPC (Congo), SOCAR, Statoil/Equinor, TotalEnergies, BP, ETAP (Tunisia), Niger Delta Petroleum Resources Ltd.
2016	Galp Energia SA, KazMunaiGaz, MOL Group, ONGC, Seven Energy Nigeria, Sonangol, Uzbekneftegaz, Wintershall / Wintershall Dea, Repsol, Nigerian National Petroleum Corporation (NNPC), Oil India Limited, Frontier Oil Limited, Pan Ocean Oil
2017	Oando Energy Resources, OMV, Petroleum Development Oman (PDO), Seplat Energy, DEA / Wintershall Dea, Lukoil, Woodside, Nile Petroleum Corporation
2018	Gazprom Neft, Sonatrach (Algeria), Petrobras
2019	KazPetrol Group, Saudi Aramco
2020	Ecopetrol, Occidental, Cairn Energy / Capricorn Energy, ConocoPhillips
2021	EOG Resources, QatarEnergy, Cepsa, Pioneer Natural Resources, Chevron, Harbour Energy, Neptune Energy, Range Resources, Petronas
2022	Hess Corporation, Savannah Energy, ExxonMobil, Vista, Civitas Resources
2024	Santos, Pertamina, Chord Energy, Ithaca Energy
2025	ADNOC

Figures

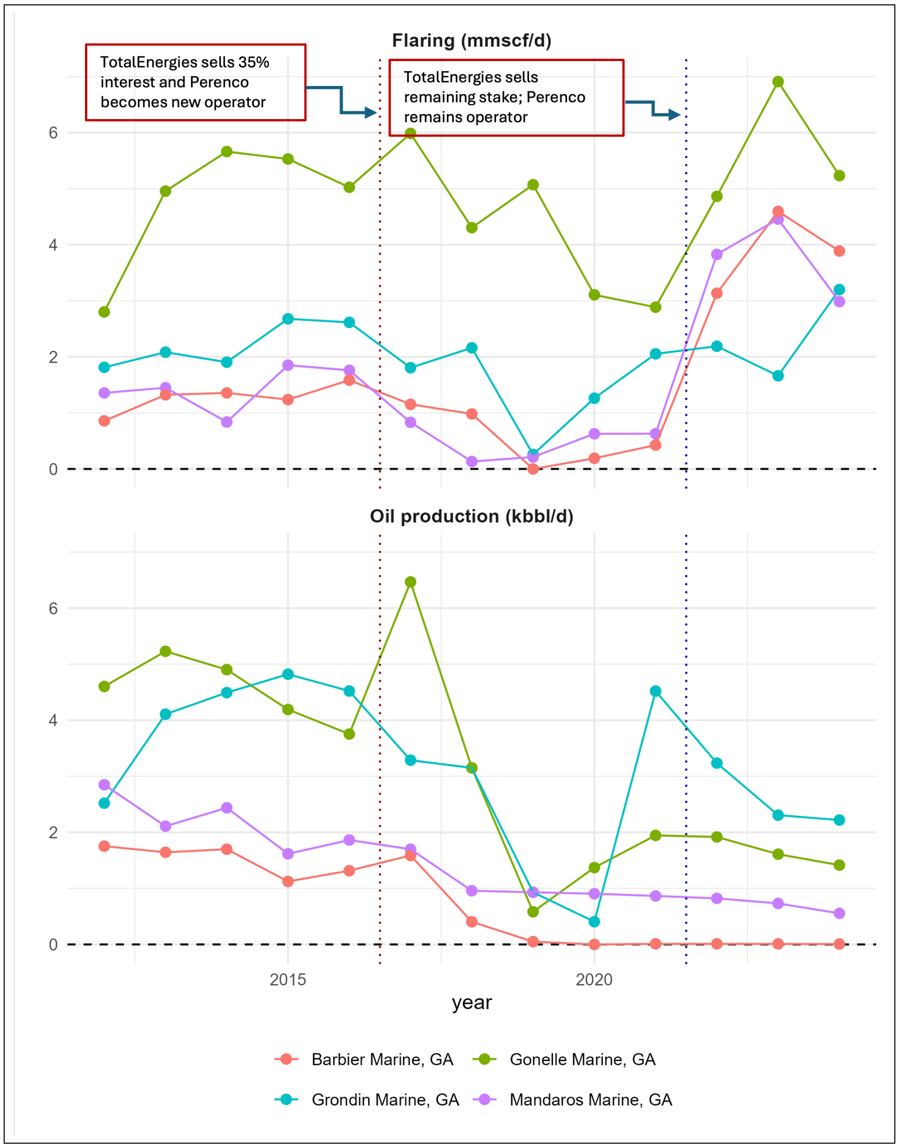

Figure 1: Flaring intensity and oil production in Gabonese marine fields before and after TotalEnergies' divestment. The first vertical line marks TotalEnergies' sale of 35% interest to Perenco and transfer of operatorship (2017). The second vertical line marks TotalEnergies' complete exit (2021).

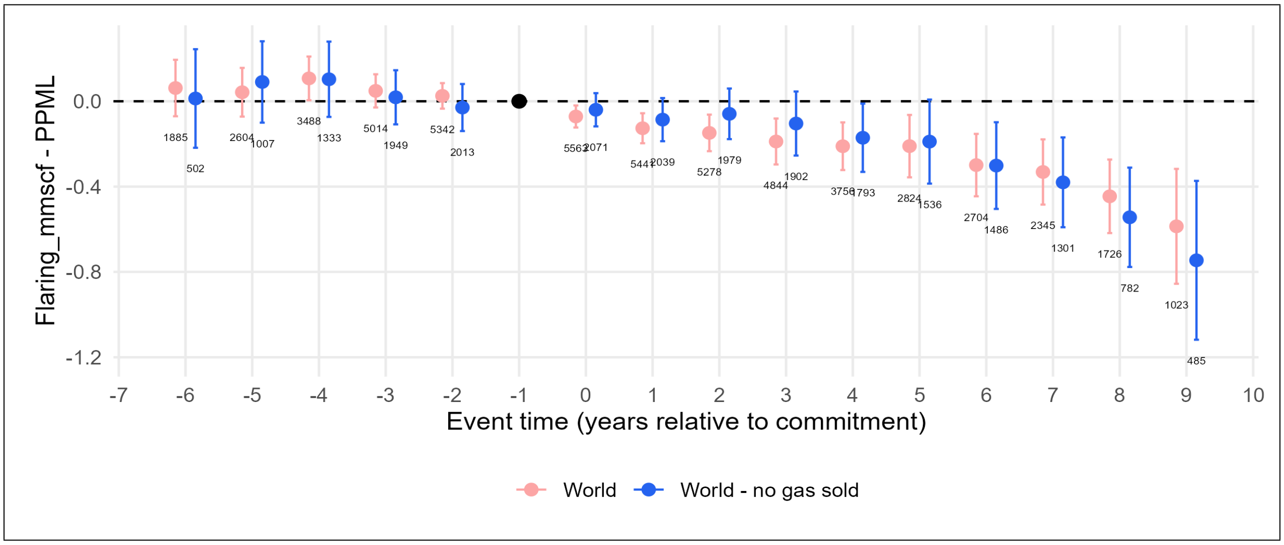

Figure 2: Event Study: World Bank ZRF commitment on flaring

Notes: This figure plots event study coefficients estimating the effect of complete divestment by committed companies on flaring intensity. The treatment happens when the last committed equity owner divests, leaving no committed companies on the management board. The control group are assets which have no committed companies on their board during our study sample. Outcome is flaring intensity (mmscf gas flared per barrel of oil produced). Coefficients are interpreted as the percentage change in expected flaring intensity relative to the year before divestment. Specification includes asset, year-by-continent, and operator fixed effects, controlling for oil production. Standard errors clustered at the asset level.

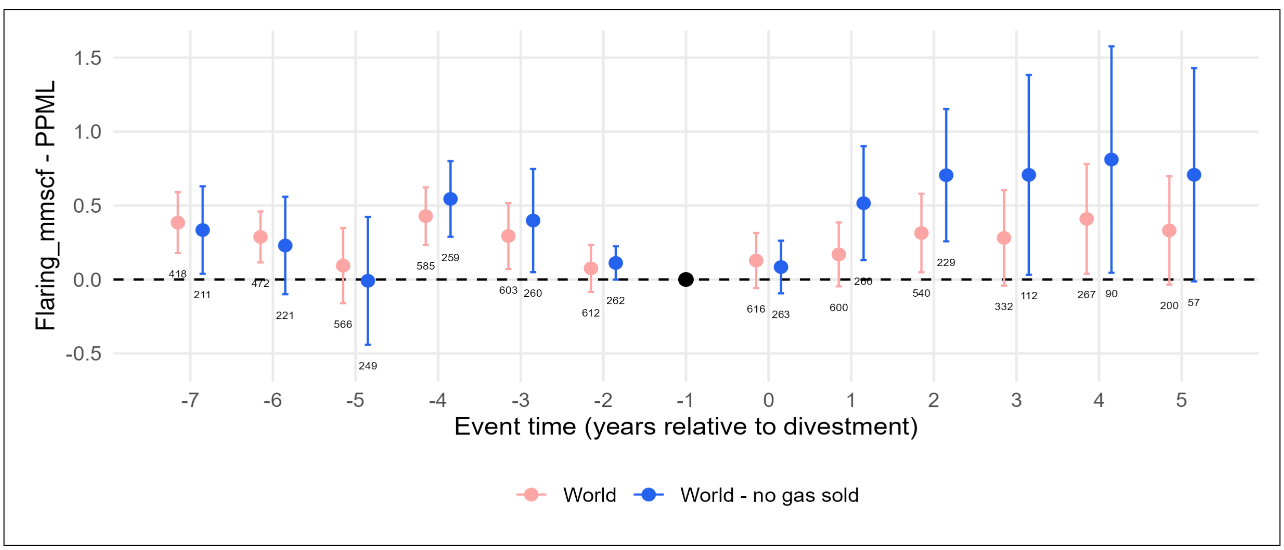

Figure 3: Event Study: divestment by last committed owner on flaring

Notes: This figure plots event study coefficients estimating the effect of complete divestment by committed companies on flaring intensity. The treatment happens when the last committed equity owner divests, leaving no committed companies on the management board. The control group are assets which have no committed companies on their board during our study sample. Outcome is flaring intensity (mmscf gas flared per barrel of oil produced). Coefficients are interpreted as the percentage change in expected flaring intensity relative to the year before divestment. Specification includes asset, year-by-continent, and operator fixed effects, controlling for oil production. Standard errors clustered at the asset level.

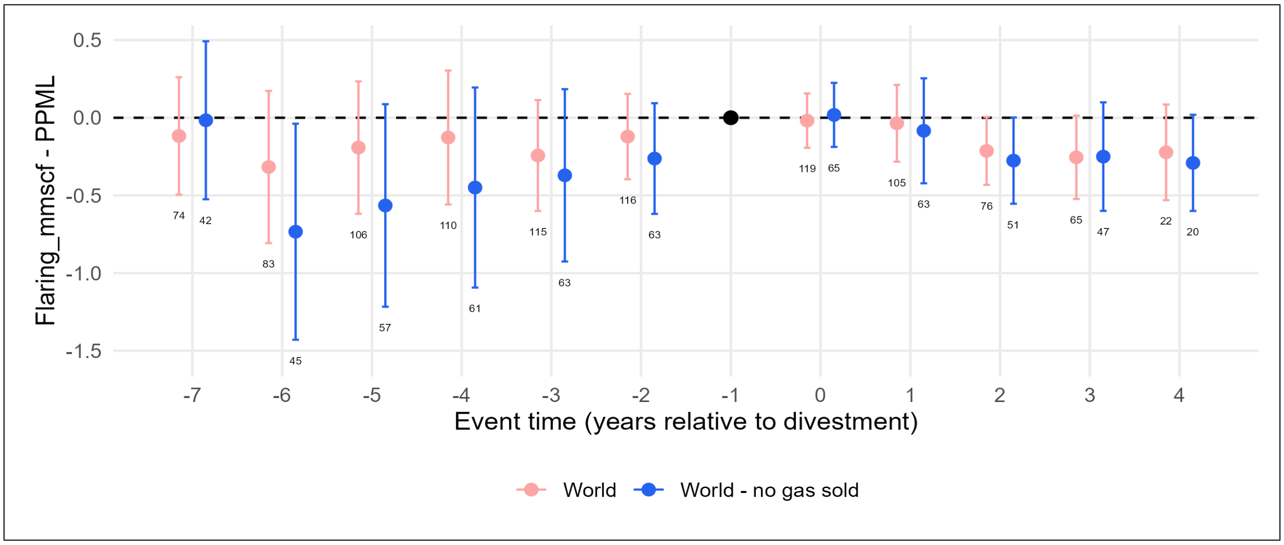

Figure 4: Event Study: Incomplete divestment by committed owner (when other committed owners remain on management board) on flaring

Notes: This figure plots event study coefficients estimating the effect of *partial* divestment by a committed owner on flaring intensity. The treatment occurs when a committed owner divests its equity stake but at least one other committed company remains on the management board. The control group consists of assets that never have a committed company on their board during the study period. The outcome is flaring intensity (mmscf gas flared per barrel of oil produced). Coefficients are interpreted as the percentage change in expected flaring intensity relative to the year before divestment. The specification includes asset, year-by-continent, and operator fixed effects, and controls for oil production. Standard errors are clustered at the asset level.

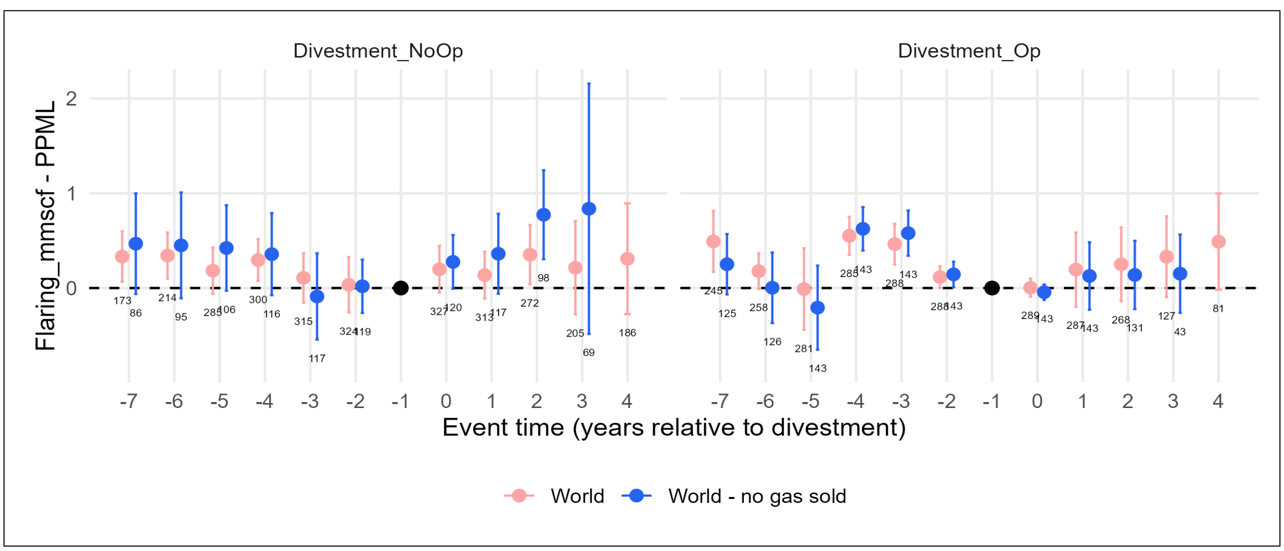

Figure 5: Event Study: Heterogeneous Effects by Operator Status on flaring

Notes: This figure plots event study coefficients estimating the effect of complete divestment by committed companies on flaring intensity, split by whether the exiting committed company was the operator (right panel) or a non-operator (left panel). Control group for both panels: assets never owned by committed companies. Outcome is flaring (mmscf gas flared barrel), estimated using Poisson Pseudo-Maximum Likelihood (PPML). Specification includes asset, year-by-continent, and operator fixed effects, and oil production. Standard errors clustered at the asset level. Pink series: all assets worldwide. Blue series: assets with no natural gas sales infrastructure. Event time $t = 0$ is the year of divestment; $t = -1$ is normalized to zero. Coefficients represent log differences in flaring intensity between treated and control assets relative to $t = -1$. Vertical bars show 95% confidence intervals.

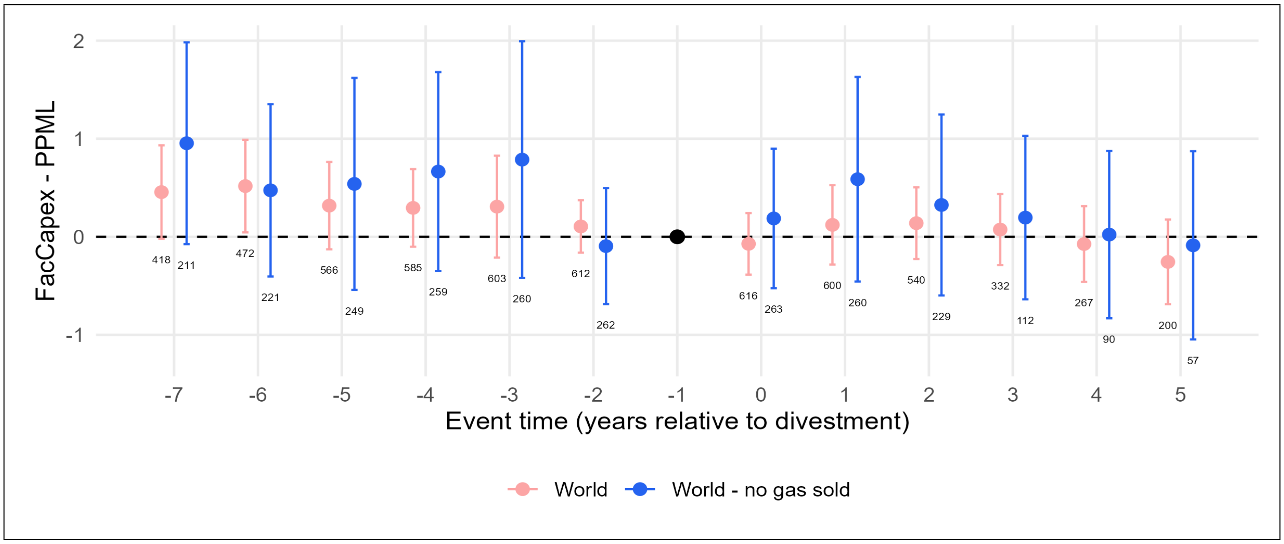

Figure 6: Event Study: Facility capital expenditure

Notes: This figure plots event study coefficients estimating the effect of complete divestment by committed companies on facility capital expenditure. Control group: assets never owned by committed companies. Outcome is facility capital expenditure (Million USD), estimated using Poisson Pseudo-Maximum Likelihood (PPML). Specification includes asset, year-by-continent, and operator fixed effects. Standard errors clustered at the asset level. Pink series: all assets worldwide. Blue series: assets with no natural gas sales infrastructure. Event time $t = 0$ is the year of divestment; $t = -1$ is normalized to zero. Coefficients represent log differences in facility capital expenditure between treated and control assets relative to $t = -1$. Vertical bars show 95% confidence intervals.

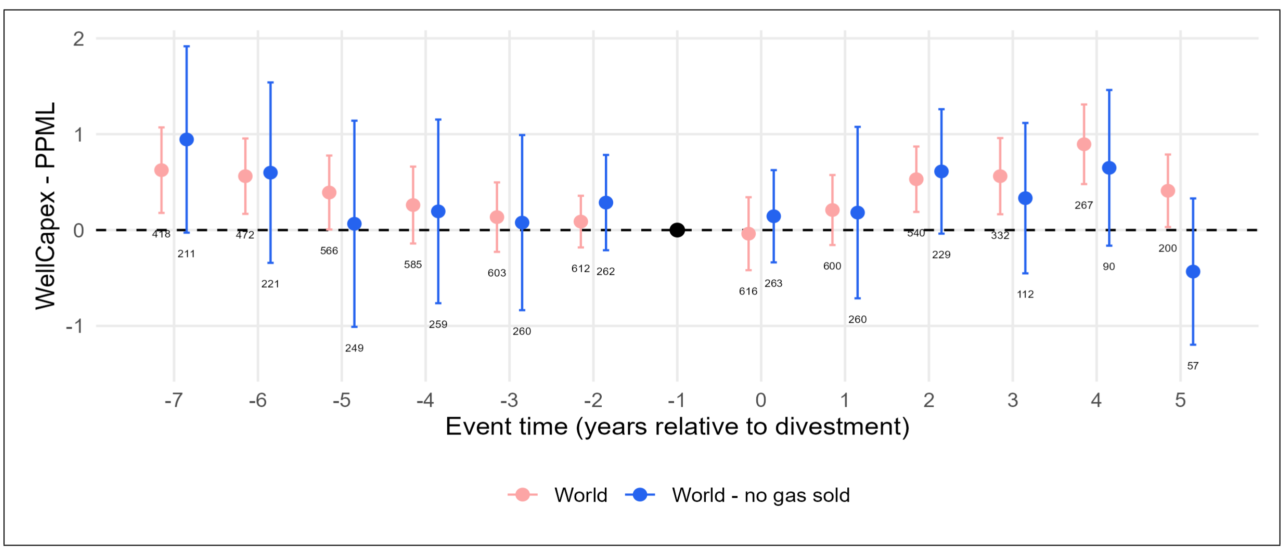

Figure 7: Event Study: Well capital expenditure

Notes: This figure plots event study coefficients estimating the effect of complete divestment by committed companies on well capital expenditure. Control group: assets never owned by committed companies. Outcome is well capital expenditure (Million USD), estimated using Poisson Pseudo-Maximum Likelihood (PPML). Specification includes asset, year-by-continent, and operator fixed effects, and oil production. Standard errors clustered at the asset level. Pink series: all assets worldwide. Blue series: assets with no natural gas sales infrastructure. Event time $t = 0$ is the year of divestment; $t = -1$ is normalized to zero. Coefficients represent log differences in well capital expenditure between treated and control assets relative to $t = -1$. Vertical bars show 95% confidence intervals.

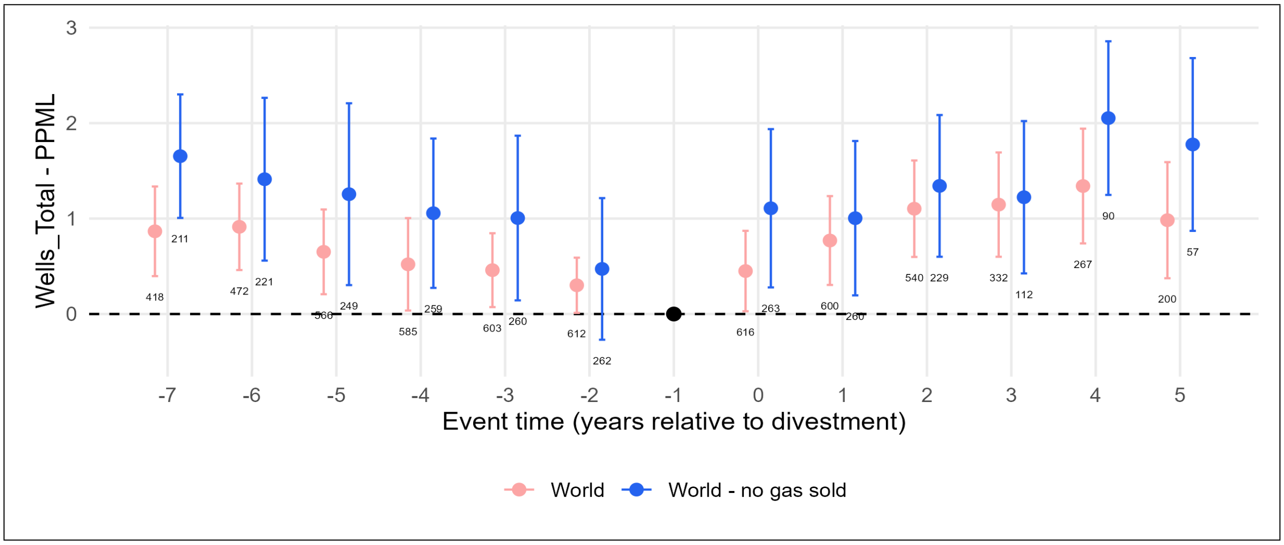

Figure 8: Event Study: Total number of wells

Notes: This figure plots event study coefficients estimating the effect of complete divestment by committed companies on facility capital expenditure. Control group: assets never owned by committed companies. Outcome is well capital expenditure (Million USD), estimated using Poisson Pseudo-Maximum Likelihood (PPML). Specification includes asset, year-by-continent, and operator fixed effects, and oil production. Standard errors clustered at the asset level. Pink series: all assets worldwide. Blue series: assets with no natural gas sales infrastructure. Event time $t = 0$ is the year of divestment; $t = -1$ is normalized to zero. Coefficients represent log differences in facility capital expenditure between treated and control assets relative to $t = -1$. Vertical bars show 95% confidence intervals.

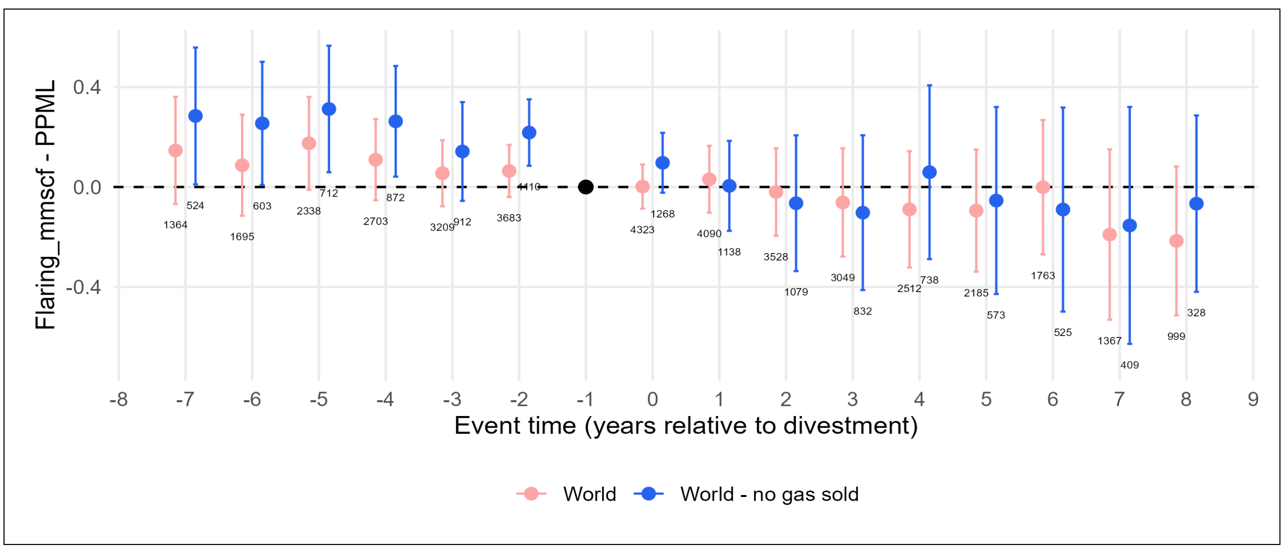

Figure 9: Event Study: Impact of divestment from Uncommitted to Uncommitted Companies on flaring

Notes: This figure plots event study coefficients estimating the effect of divestments between uncommitted companies on flaring intensity. The treatment occurs when an uncommitted equity owner divests its stake to another uncommitted company. The control group consists of assets that never experience ownership transactions and are never owned by committed companies during the study period. The outcome is flaring (mmscf gas flared). Coefficients are interpreted as the proportion change in expected flaring intensity relative to the year before divestment. The specification includes asset, year-by-continent, and operator fixed effects, and controls for oil production. Standard errors are clustered at the asset level. Pink series: all oil assets worldwide. Blue series: assets with no natural gas sales infrastructure. Event time $t = 0$ is the year of divestment; $t = -1$ is normalized to zero. Vertical bars show 95% confidence intervals.

A Appendix Figures

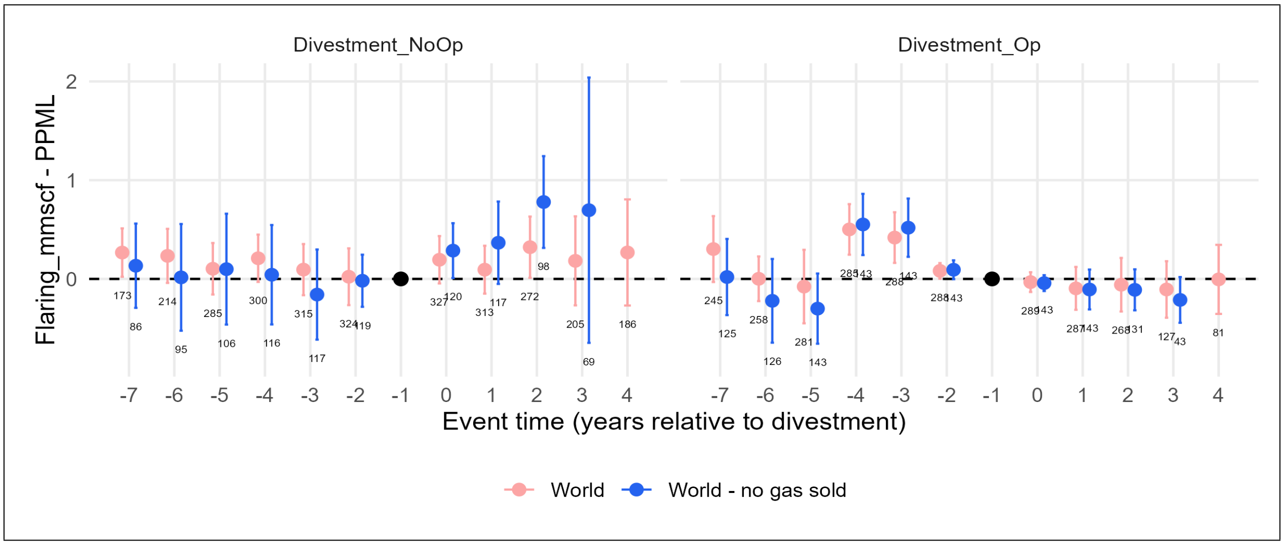

Figure A.1: Event Study: Heterogeneous Effects by Operator Status on flaring

Notes: This figure plots event study coefficients estimating the effect of complete divestment by committed companies on flaring intensity, split by whether the exiting committed company was the operator (right panel) or a non-operator (left panel). Control group for both panels: assets never owned by committed companies. In the left panel, the same operator remains in control before and after divestment, isolating the effect of removing committed governance oversight. Outcome is flaring (mmscf gas flared), estimated using Poisson Pseudo-Maximum Likelihood (PPML). Specification controls for asset fixed effects, year-by-continent fixed effects and oil production. Standard errors clustered at the asset level. Pink series: all assets worldwide. Blue series: assets with no natural gas sales infrastructure. Event time $t = 0$ is the year of divestment; $t = -1$ is normalized to zero. Coefficients represent log differences in flaring intensity between treated and control assets relative to $t = -1$. Vertical bars show 95% confidence intervals.

B Appendix A: Matching satellite flares observations to oil assets.

Rystad UCube database does not contain information on gas flared volumes at the asset level. This is mainly due to the fact that most oil and gas operators do not publicly report this amounts of gas flared. Moreover, under-reporting by fields operators remains an important issue making the use of self-reported flaring less reliable.

To fill this gap, we use geocoded flaring volumes calculated by the Earth Observation Group (EOG) at the Payne Institute for Public Policy, Colorado School of Mines, in partnership with NOAA. The EOG analyzes satellite data from the Visible Infrared Imaging Radiometer Suite (VIIRS), launched in 2012 and 2017, which detects heat from gas flares at night. Flaring volumes are then estimated using the VIIRS Nightfire algorithm (VNF), as detailed by Elvidge et al. (2016) and Zhizhin et al. (2021). We use the 141,841 observations with positive flared volumes between 2012 and 2024 to assign them to specific assets from Rystad's database.

The matching relies on asset eligibility and geographic distance, using the two sources of information at our disposal described in the data section: geographic shapes of assets and geographic locations of wells drilled since 2000 within each asset.

Data on geographic shapes was available for 41,762 assets, among which 16,801 were generic. We added generic shapes for 1,916 missing assets present in our main Rystad dataset on production and ownership, based on their centroid, making the total number of generic shapes 18,785. The distribution of generic shapes is not random. For instance, onshore US (except Alaska) and Canada does not contain any defined shape. Luckily, these two countries (that represent a large share of generic shapes worldwide) are the ones in which data on well location was the most precise, making the use of this secondary database particularly useful. Moreover, some defined shapes overlap, and data on well location helped in many instances to assign flares observations to one specific asset instead of splitting flared volumes between all assets within which shapes the observation falls. The well location dataset contains 1,733,698 wells drilled since 2000, from 39,494 assets, with 857,900 unique locations (some wells being assigned the exact same location in some instances, usually the asset shape centroid).

From these two datasets, two restrictions were added. First, we tagged as ineligible assets defined as subsea tie backs. These oil and gas producing infrastructures being Under water, they cannot possess a flare themselves, and necessarily flare through another producing asset to which they are linked, usually a floating or onshore facility. This restriction removes 2,904 assets and 5,146 wells from our eligible sample. Additionally, for an asset to be eligible in a given year to be assigned a flaring observation, it needs to contain at least one well drilled and completed, whether this well is a producing well or an exploratory/wildcat one.

Once these restrictions are made, geographic distances between each flaring observations and wells or asset shapes were computed. The assignment to specific asset or the split between several follows a 3-phase procedure detailed below. For each of these procedures, a score is computed. For flaring observation o, the score of asset i is computed such as:

$$Score_{oi} = \sum(\frac{10{,}000}{dist_{oiw}})^{\lambda} * n_{iw}^{\kappa} + \sum(\frac{10{,}000}{dist_{oi}})^{\lambda}$$

Each w denotes unique wells locations of asset i, n_{iw} the number of wells in location w. κ is equal to 0.5 if w is generic (i.e. equal to asset's shape centroid) and 1 if non-generic. Finally, λ is an exponent equal to 4/3 in the main specification[4]. I cap the lowest distances to 100m since satellite pixels definition does not allow to be more precise. The first part of the score is thus based on well locations and the second part on proximity to assets boundaries. The rationale behind the first part of the score is that the probability that an asset is responsible for a flare detected by satellite depends on both the proximity and the number of wells of an asset i near the detection location. κ is reduced to 0.5 when multiple wells locations are reported to be the asset centroid since this probably indicate that Rystad does not know the precise locations of these wells.

Attribution follows this 3-phases algorithm:

- ***Phase 1***: for satellite observations with existing wells less than 2km away, only well location was used, this dataset being the most precise one. This means that only the first part of the score detailed above is used. An additional restriction is made: only wells located in a 4km radius are used to compute scores. For a given observation, once scores are computed, each asset scores are ranked from highest to lowest, and consecutive ratios are computed. If a ratio reaches 10, all following assets are eliminated. The rationale behind this selection is that if a ratio reaches such value, the probability that the observed flare actually correspond to an asset with a smaller score is extremely

[4]Robustness checks include flared volumes computed with $\lambda = 1$ and $\lambda = 2$.

low. For approximately half of observations in this phase, this selection reduces the number of assets to which the observation is attributed to only one. In the remaining 50%, flared volumes are attributed to each asset by splitting proportionnally to its score and its oil production capacity.

- ***Phase 2***: for observations with at least one well within a 2km to 10km radius, assets shapes information is also used when possible. If at least one close-by asset has a non-generic shape, both assets shapes and wells locations are used (***phase 2A***). If all surrounding assets have generic shapes, only wells locations are used (***phase 2B***). The same process as in phase 1 is applied, except that the ratio threshold for assets with lower score to be dropped is now equal to 2. This reduction comes from the fact that scores are much lower than in phase 1 (due to the exponential nature of the score), and at these distances a ratio of 2 denotes a large difference in terms of number of wells close-by and distance to the assets' boundaries. Additionally, in phase 2A, if an observation falls within at least one asset boundaries, only these assets are kept (with a 100m tolerance), and the scores are computed among them.

- ***Phase 3***: this stage applies to observation with no well in a 10km radius, but existing wells or asset boundaries in a 20km radius. If non-generic shapes exist near the observation, asset shape only matching is performed, using only the second part of the score (***phase 3A***). If only generic shapes surround the observation (***phase 3B***), the procedure is the same as the one performed in phase 2B.

Table 3 displays the number of observations matched in each phase, as well as the corresponding share of total flaring detected in terms of count and volume (2nd and 3rd columns). Phase 1 allows to match 58.3% of observations, representing 36.1% of the total volume flared. Along with phase 2A, the first phases allow to match over 70% of flaring observations worldwide. 7.261 observations remain unmatched, representing 4.7% of total flared volumes. For these observations, no completed well nor active asset boundaries xas found in a 20km radius. The two last columns report, for each phase, the share of observations attributed to a unique Rystad asset. Overall, 56% of observations could be matched with a unique asset, representing 66% of total volumes.

Phase	Count	Share of total flaring		Attributed to unique asset	
		Count	Volume	Count	Volume
Phase 1	77,040	58.3%	36.1%	48.8%	64.0%
Phase 2A	24,240	18.3%	35.3%	76.6%	78.5%
Phase 2B	9,058	6.9%	5.0%	63.1%	70.9%
Phase 3A	12,088	9.1%	18.3%	49.4%	44.6%
Phase 3B	2,482	1.9%	0.6%	80.0%	80.7%
Unmatched	7,261	5.5%	4.7%	-	-

Table 3: Summary statistics: matching of satellite flares observations to oil and gas assets.