Green Finance of Oil Production*

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Abstract

In the past decade, a rapidly growing number of investors has committed to stop financing the production of carbon resources. While investors' sacrifice increases the cost of capital for oil production projects, no normative benchmark exists that indicates the financial returns that markets should forego to produce incentives aligned with climate objectives. To fill the gap, we harness economic modeling, empirical calibration, and numerical simulations. We build a model of the oil market in which the industry's cost of capital affects drilling decisions. We calibrate the model using data covering all U.S. oil assets and simulate the dynamic competitive equilibrium in two counterfactual scenarios for the period 2000-2023: one with carbon pricing, and one with "green finance," modeled as an augmented cost of capital. In our setting, a $60 carbon price decreases oil-related emissions by 26%. By contrast, an increase in the cost of capital by 5 percentage points results in an *increase* in emissions by 2%. On the one hand, green finance (slightly) increases the marginal cost of oil production but, on the other hand, it generates short-termism, inducing the industry to exploit oil fields that would have remained untapped otherwise. For moderate increases in the cost of capital, the second effect dominates, making green finance counterproductive. Green finance becomes effective when it makes the net-present value of oil projects negative, which calls for unrealistically high costs of capital.

JEL codes: G1; H21; Q31

Keywords: Cost of capital; Carbon pricing; Oil allocation; Drilling decision; Unintended consequences

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Extended abstract

In the past decade, a rapidly growing number of investors—representing more than $40 trillion in assets as of April 2025—have committed to stop financing the production of carbon resources (Global Fossil Fuel Divestment Commitments Database, 2025). Recent empirical evidence shows that investors' voluntary sacrifice effectively limits the availability or increases the cost of capital for fossil fuel producers, inducing them to scale down operations (e.g., Green and Vallée (2025)). Yet, no benchmark exists to assess whether current commitments are sufficient, nor to indicate the financial returns that markets should forego to produce incentives in line with society's climate objectives.

In this paper, we estimate such a benchmark in the case of oil, by estimating the cost of capital for oil production projects that would be environmentally equivalent to carbon pricing. Since the indirect resolution of the carbon externality through financial channels has no precedent, we rely on economic theory, empirical calibration, and numerical simulations.

Model. We consider the dynamic competitive equilibrium allocation of oil in the U.S. oil extraction industry between 2000 and 2023. Our model of oil supply is inspired by Anderson, Kellogg, and Salant's (2018) empirical evidence showing that oil production is determined by drilling decisions, followed by physically determined extraction over time. Each field is characterized by its reserves, development date, constant marginal cost of production, and binding production capacity. Given prices, each field's drilling date, if any, is determined so as to maximize the net present value of its exploitation. Prices are established on a competitive market, balancing supply and demand at all dates. The theoretical effect of the cost of capital is twofold. First, it raises fields' marginal production costs, making more fields unprofitable. Second, it makes the industry more short-termist, advancing drilling dates of profitable fields.

Data, calibration, and simulations. To calibrate our model, we use Rystad Energy data covering all U.S. oil fields. Besides discovery dates, reserves, and production, we estimate the LCOE of all oil fields, which we use as a proxy for marginal production costs.

In our simulations, we take as given the continued production from all fields that were active before 2000. We build a new algorithm that solves dynamic drilling decisions, determining which

fields are exploited and their respective drilling dates.

We consider two counterfactual scenarios, both assuming perfect competition for comparison purposes. In the first scenario, oil traded is subject to a carbon price of \$60 per ton of CO2. Under this carbon pricing scenario, the cost of capital is taken as the actual cost of capital for the U.S. oil industry (i.e., the weighted average cost of capital, WACC). Our simulation show that a \$60 carbon price reduces emissions by 26% with respect to no carbon pricing.

In the second scenario, we examine green finance: The WACC is augmented and there is no carbon price. We first consider an increase of 5 percentage points in the cost of capital. Perhaps surprisingly, our simulation shows that this increase results in more cumulative emissions! As anticipated, green finance translates into higher marginal cost of production. But this effect is limited, increasing the marginal cost of the median oil asset by only 8%. At the same time, the 5-percentage-point rise in the cost of capital makes the industry significantly more short-termist, inducing it to exploit oil fields that would remained untapped over the period. This latter effect explains why a small increase in the cost of capital is counterproductive at reducing oil production and CO2 emissions. For green finance to be effective, the cost of capital must rise enough to render a significant number of oil fields unprofitable. For instance, achieving an environmental impact equivalent to a \$60 carbon price would require increasing the cost of capital by 80 percentage points, an unrealistically large spread.

Related literature and contribution. Pedersen's (2023) pioneering analysis demonstrates green finance's theoretical potential to address the carbon externality. His simulation of the effect of the cost of capital on the constant marginal cost of coal suggests that the climate-aligned cost of capital would be unrealistically high. However, he left unexplored the equilibrium analysis of green finance, including its inefficiency. Caron and Daubanes (2025) theoretically examine the second-best optimal cost of capital, pointing to the dead-weight loss associated with green finance. Our analysis adds to this strand of literature by modeling and simulating the dynamic oil market using real data.

Recent empirical papers estimate the real effect of concerned investors on the cost of capital of green firms relative to brown firms—a spread called the green premium—see, among many others, Flammer (2021), Green and Vallée (2025), and Eskildsen, Ibert, Jensen, and Pedersen (2024). We

contribute to this literature by providing a normative benchmark against which the green premium can be compared to assess investors' alignment with society's interest. Our finding that moderate green finance is counterproductive in the oil industry is reminiscent of Hartzmark and Shue (2023): They find that a greater cost of capital causes an increase in brown firms' carbon intensity. Our analysis suggests that it may also increase emissions in absolute terms.

The analysis of supply-side climate policies, initiated by Harstad (2012)—see also, e.g., Asheim, Fæhn, Nyborg, Greaker, Hagem, Harstad, Hoel, Lund, and Rosendahl (2019)—has mainly focused on direct regulation of carbon resource reserves and their production. Our paper extends the analysis of supply-side climate policies to financial penalties.

Finally, a set of recent papers has modeled and simulated the oil market using the same data we use here, to study various sources of inefficiency in the actual allocation of oil—see, e.g., Asker, Collard-Wexler, and De Loecker (2019), Coulomb, Henriet, and Reitzmann (2025), and Asker, Collard-Wexler, De Canniere, De Loecker, and Knittel (2024). Our objective is very different: For example, our simulation exercises do not seek to assess the real allocation of oil. Yet, we make a methodological contribution to this literature by developing and solving a model in which oil production is determined by drilling decisions, rather than by the management of fields' reserves, in line with Anderson et al. (2018).

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