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What the Iran War Teaches Us about the Price Elasticity of Oil Supply

Lutz Kilian and Kunal Patel

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What the Iran War Teaches Us about the Price Elasticity of Oil Supply*

Lutz Kilian† and Kunal Patel‡

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Abstract

We draw on evidence from the 2026 Iran War to assess the validity of estimates of the short-run price elasticity of oil supply reported in the literature. Our analysis confirms that the one-month and one-quarter U.S. oil supply elasticity is effectively zero, consistent with estimates in Newell and Prest (2019). The data strongly reject the much higher elasticity estimates reported by more recent studies. This finding is consistent with evidence from surveys of oil company executives and with industry data about how long it takes to complete a well and start pumping oil. It is also consistent with theoretical arguments that the short-run oil supply elasticity is zero if adjusting oil production is costly, as is the case in practice. Our results have important implications for the construction and credibility of structural VAR models of the global oil market.

JEL Codes: Q43, C32, C33

Keywords: Iran War, oil price, supply elasticity, oil production, well completions, shale oil

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†Correspondence to: Lutz Kilian, Federal Reserve Bank of Dallas, Research Department, 2200 N. Pearl St., Dallas, TX 75201, USA and CEPR. E-mail: lkilian2019@gmail.com.

‡Kunal Patel, Federal Reserve Bank of Dallas, Research Department, 2200 N. Pearl St., Dallas, TX 75201, USA. E-mail: Kunal.Patel@dal.frb.org.

1. Introduction

There has been much debate about the magnitude of the short-run price elasticity of oil supply. This parameter not only summarizes how strongly oil production is expected to respond to unexpected increases in the price of oil, but also plays an important role in modeling the global oil market (see Kilian 2022). The global supply elasticity in recent years has depended largely on the price elasticity of U.S. shale oil producers, given pervasive evidence that the supply elasticity for conventional oil is zero. We draw on evidence from the 2026 Iran War to assess the validity of estimates of the short-run U.S. price elasticity of shale oil supply reported in the literature. This event may be viewed as a natural experiment involving a large and exogenous shift in the price of oil that allows the estimation of the monthly and quarterly price elasticity of shale oil supply. Existing panel regression estimates of this elasticity based on well-level data from U.S. oil basins differ substantially depending on the regression specification. In contrast, our approach is model free and allows us to externally validate these estimates based on the responsiveness of U.S. oil production to the oil price surge in 2026. Our analysis supports estimates of the one-month and one-quarter U.S. oil supply elasticity that are effectively zero, as reported by Newell and Prest (2019), while rejecting the much higher elasticity estimates reported in Bjørnland et al. (2018) and Aastveit et al. (2026).

We further corroborate our findings with a range of new data not utilized in the estimation of the oil supply elasticity including surveys of oil company executives and industry data about how long it takes to complete a well and start pumping oil. Our findings are also consistent with theoretical arguments in Anderson, Kellogg and Salant (2018) who show that the short-run oil supply elasticity is zero if adjusting oil production is costly, as is the case in practice. We conclude that recent estimates of the short-run price elasticity of shale oil supply have greatly exaggerated the responsiveness of oil producers to price signals. We explore how these diverging supply elasticity estimates can be reconciled with our evidence. Our results are shown to have important implications for structural VAR models of the global oil market.

The remainder of the paper is organized as follows. Section 2 provides background on the 2026 Iran War and its impact on the global oil price, reviews previous estimates of the U.S. price elasticity of oil supply, and describes the data underlying our analysis. Section 3 reviews the construction of the price elasticity of oil supply, presents our estimates of this elasticity, and compares them to earlier estimates. In Section 4, we discuss a range of evidence from oil industry data that corroborates our elasticity estimates. Section 5 discusses implications for structural VAR models of the global oil market. The concluding remarks are in Section 6.

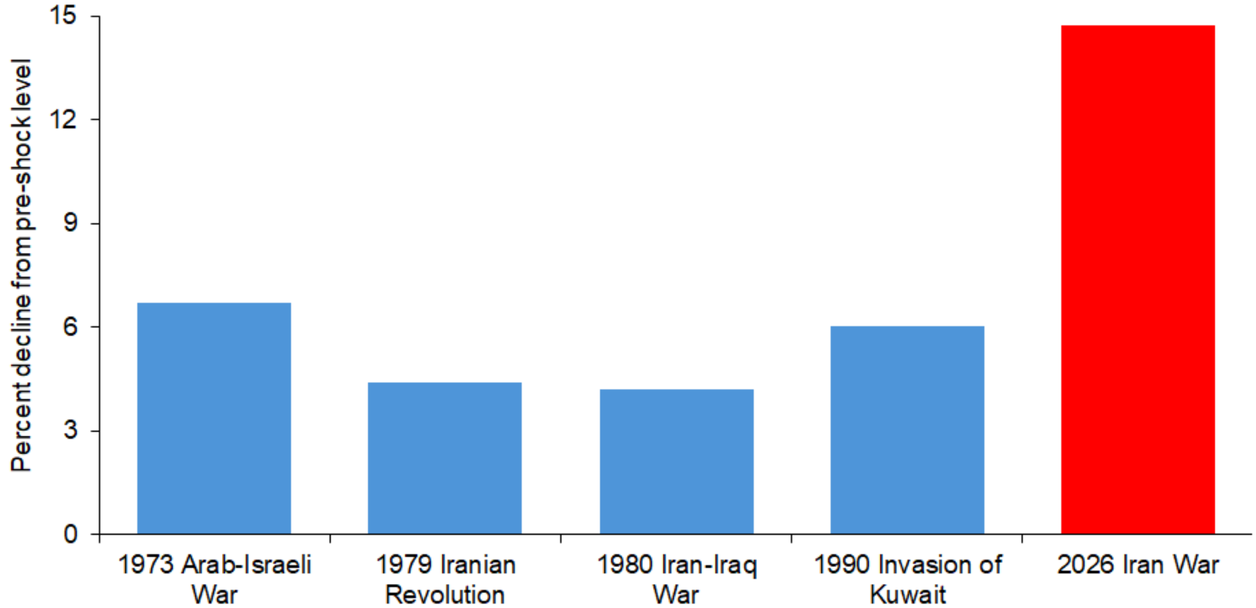
2. Background and Data

2.1. A Natural Experiment

On February 28, 2026, Iran was attacked by the U.S. and Israel, resulting in the closure of the Strait of Hormuz through which about 20% of global oil supplies flow. While some of this oil could be redirected by pipeline to ports on the Red Sea and the Gulf of Oman, the war resulted in about 15% of global oil supplies being removed from the market. The 2026 disruption of global oil supplies has been more than twice as large as the peak disruption during the 1973 oil crisis, which previously was the largest geopolitical oil supply shortfall on record (see Figure 1).

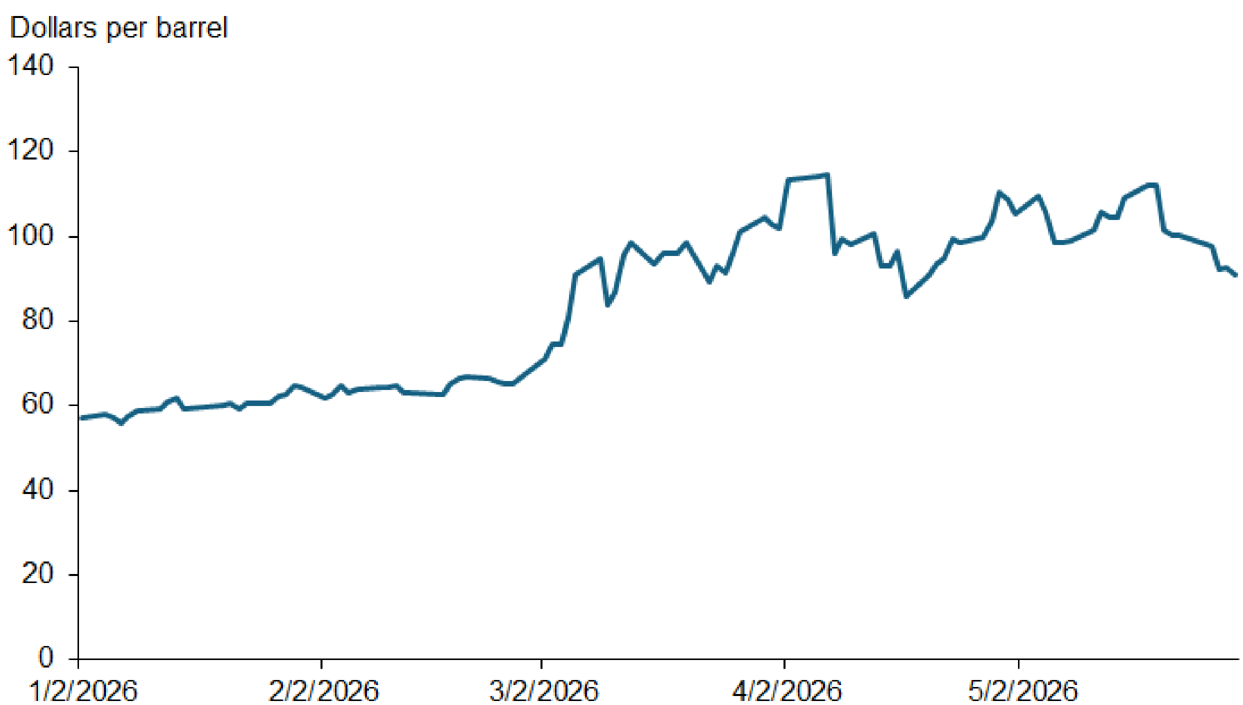
This shortfall of oil supplies resulted in a sharp increase in the global price of oil between March and May 2026, as measured by the price of West Texas Intermediate (WTI) oil, from $61 dollars on average in the months before the crisis to a peak value of $115 (see Figure 2). A question of obvious interest became to what extent U.S. oil producers would be able and willing to respond to this price increase by filling some of the shortfall in global oil supplies.

Figure 1: Peak shortfalls in global oil supply during major geopolitical events



NOTES: U.S. Energy Information Administration. Historical crude oil production data are from the International Energy Statistics database. The 2026 Iran War estimate is based on data in the Short-Term Energy Outlook.

Figure 2: Cushing, OK, WTI spot price, January 2-May 31, 2026



NOTES: U.S. Energy Information Administration

The price elasticity of oil supply provides a measure of how much oil producers' output responds to price signals. It is defined as the percent change in oil production relative to an exogenous percent change in the price of oil over the same period induced either by a shock to the global demand for oil or a shock to the supply of oil elsewhere in the world raising demand for U.S. oil. The geopolitical oil supply disruption associated with the 2026 Iran War provides a clean example of such an event. It not only caused an exogenous and large surge in global oil prices, but it demonstrably raised the demand for U.S. oil. This demand shift is visible in U.S. oil tanker export data. By April 2026, U.S. maritime crude oil exports had increased by 38 percent compared to March 2026, according to the EIA Petroleum Supply Monthly, with most of these additional exports destined for Asia.[1]

The objective of this paper is to assess the responsiveness of U.S. oil production to this oil price surge in the first month and in the first quarter following the outbreak of the war. We construct estimates of the price elasticity of oil supply for shale oil producers and conventional oil producers in the U.S. We then assess the credibility of these estimates using a range of extraneous oil industry data that have not been considered in the academic literature to date.

2.2. Previous estimates of the price elasticity of oil supply

The exogenous oil supply disruption caused by the Iran War lowered global oil inventories and reduced global real activity (see Kilian, Plante and Richter 2026a,b). Drawing down oil inventories helps smooth consumption, while reductions in global real activity are associated with the destruction of oil demand. Caldara et al. (2018) and Baumeister and Hamilton (2019) in recent years made the case that estimates of the price elasticity of oil supply should control for

[1] Exports for March 2026 closely match average U.S. oil exports from the Gulf of Mexico since January 2024 (see TankerTrackers.com). Given the time it took to redirect oil tankers, exports started increasing only in April 2026.

these changes in oil inventories and global real activity. This is indeed correct if the objective is to estimate the elasticity as defined in textbook models.

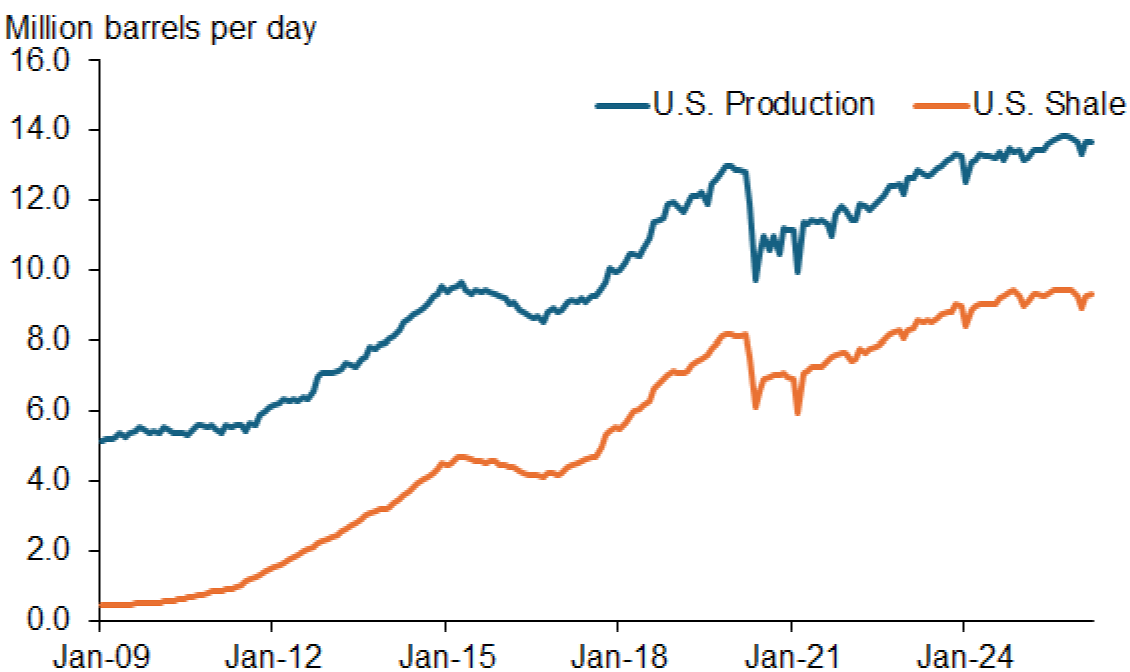
This is not how this elasticity is defined in most empirical work, however, whether at the well level or the aggregate level. Nor is the definition of the own price elasticity of oil supply discussed in Caldara et al. (2018) and Baumeister and Hamilton (2019) the object that policymakers and market observers are interested in. In the real world, the concern is how much more oil producers will be able to supply to the market at various horizons, as the oil price rises, inventories fall, and real activity falls.

There is limited evidence on the short-run price elasticity of oil supply, defined in this manner, at the global level. Kilian and Murphy (2012) show how to bound the global oil supply elasticity based on the historical precedent of 1990 (see also Kilian (2022)). In general, it is difficult to identify the price elasticity of oil supply using global oil market data without relying on extraneous information (see, e.g.. Kilian and Murphy (2014), Foroni and Stracca (2019)). Likewise, estimating oil supply elasticities at the country level has proved challenging. For a review of this literature the reader is referred to Kilian (2022).

An alternative approach has been to estimate the own-price elasticity of oil supply based on disaggregate oil industry data. Most such estimates rely on U.S. data. One reason is that oil production in the rest of the world is run by state-owned or state-controlled companies that do not freely share their disaggregate data. Another reason is that U.S. oil production today consists largely of shale oil, and shale oil producers are thought to be more nimble and more responsive to price signals than producers elsewhere in the world. It is widely accepted that the price elasticity of conventional oil supply is zero. For example, Anderson, Kellogg and Salant (2019) find no evidence that conventional oil producers in Texas materially adjust output to price changes. The finding of an effectively zero price elasticity of conventional oil supply has been confirmed by several more recent studies including Aastveit et al. (2026).

Some observers, however, have conjectured that the price elasticity of shale oil producers could be much higher (see, e.g., Bornstein, Krusell and Rebelo 2021).[2] U.S. shale oil production has accounted for a substantial share of U.S. oil production since about 2010 (see Figure 3). The remaining U.S. crude oil production consists largely of off-shore oil production that is not very responsive to price signals. There are three studies that have provided estimates of the U.S. short-run price elasticity of shale oil supply based on disaggregate U.S. data (see Table 1). Whereas Newell and Prest (2019) concluded that the U.S. short-run price elasticity of shale oil supply is effectively zero based on data from five states, Bjørnland et al. (2021) estimated this

Figure 3: U.S. shale oil production and total oil production, Jan. 2009-March 2026



NOTES: U.S. Energy Information Administration.

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[2] For a review of the U.S. shale oil revolution and its impact on the price of oil the reader is referred to Kilian (2016).

elasticity to be as high as 0.9 using data from North Dakota between February 1990 and June 2017. More recently, using a more comprehensive data set, Aastveit et al. (2026) reported a statistically significant estimate of 0.62 based on data from January 2005 to December 2019, closer to the baseline estimate of 0.6 in Bjørnland et al. (2021).[3]

The differences in these estimates are substantial and matter not only for understanding the responsiveness of U.S. oil production to geopolitical events such as the Iran War, but more generally for the response of world oil production. They are driven largely by the regression specifications employed in these studies. Bjørnland et al. (2021) and Aastveit et al. (2026), in line with Newell and Prest (2019), find effectively zero impact of changes in the spot price on oil production. Their much larger elasticity estimates are driven by the inclusion of the 3-month spot-futures spread, which they treat as a proxy for the expected change in the spot price, in the definition of the price elasticity of oil supply.

Table 1: Estimates of the price elasticity of shale oil supply

	Elasticity of shale oil supply	Implied global oil supply elasticity
Newell and Prest (2019)	0	0
Bjørnland et al. (2021)	0.3-0.9	0.03-0.08
Aastveit et al. (2026)	0.62	0.06

NOTES: Taking account of the 9% share of shale oil in global oil production in 2023, the implied global oil supply elasticity is inferred assuming that the supply elasticity of conventional oil producers is zero, as in Aastveit et al. (2026).

The current paper proposes to validate these elasticity estimates against external evidence from March-May 2026, drawing on the 2026 Iran War as a textbook example for the effects of an

[3] Using data from January 2000 to December 2023, their estimate rises to 0.82 with a 95% confidence interval ranging from 0 to above 1.6.

exogenous oil price shock on U.S. oil production. Since these data were not used by any of the three studies in Table 1, they may serve to externally validate their estimates. We also evaluate these estimates drawing on well-level and producer-level evidence not utilized in the estimation of shale oil supply elasticities.

2.3. Data

Our computation of the price elasticity of shale oil supply relies on data for the monthly and quarterly average of the daily spot price of WTI crude oil available from the U.S. Energy Information Administration (EIA). Shale oil production data are obtained from the EIA's *Short Term Energy Outlook* published in July 2026. Additional data on oil production in Alaska and off-shore oil production in the Gulf of Mexico was sourced from the EIA's *Petroleum Supply Monthly.* We also report selective results involving the spot-futures spread drawing on WTI futures prices at various horizons sourced from Bloomberg and CME. Historical oil production data were obtained from the EIA's *International Energy Statistics* database. The data on U.S. shale oil wells that are drilled, but uncompleted (DUCs) are from the energy intelligence company Kayrros. The production profile of completed shale oil wells in the Permian is based on data from WellDatabase.

In addition, we report survey responses from the quarterly Energy Survey conducted by the Federal Reserve Bank of Dallas that is widely read within the energy industry. The Eleventh Federal Reserve District is home to four major oil- and natural gas-producing areas: the Barnett Shale, Eagle Ford Shale, Haynesville Shale and Permian Basin. As a whole, the area produces more oil than many of the world's top oil-producing countries. Additionally, a significant number of U.S. exploration and production companies as well as oil field services companies are located or headquartered in the Eleventh District. This makes the Dallas Fed Energy Survey a useful indicator of sentiment in the U.S. upstream oil sector.

In addition to a number of recurring questions, this survey also includes special questions that vary over time. Notably, the Dallas Fed in its quarterly survey of upstream oil companies in the second quarter of 2022 asked oil company executives directly how many months it would take them to raise production in response to an unexpected increase in the price of oil. Responses to this question were collected when the WTI spot price was $120 per barrel and there was concern about an oil supply shortfall driven by sanctions on Russian oil exports. The survey responses are particularly informative about the price elasticity of oil supply as the survey participants are from Texas, southern New Mexico and northern Louisiana, which includes the most productive and efficient oil producers in the United States. Clearly, no one is in a better position to answer this question than the executives running the oil companies in question.

Finally, we draw extensively on data for well completions in the U.S. compiled by Kayrros, a leading data analytics company. Kayrros collects satellite imagery of U.S. well sites and uses machine learning, natural language processing, and advanced mathematics to accurately monitor well drilling and completion activity in real-time on a well-by-well basis. Using real-time satellite imagery is timelier and generally more accurate in capturing the milestone dates in the drilling and completion process of a well than the data reported in public sources, which suffer from measurement error and respondent bias. Kayrros merges the satellite data with data from public sources to create a more accurate assessment of oilfield activity in all U.S. shale oil basins. Our sample includes 21,299 wells from all U.S. oil basins and their characteristics in 2023-24, which is the most recent data currently available.

3. Oil Supply Elasticity Estimates from the Natural Experiment in 2026

The price elasticity of oil supply is defined as the ratio of the percent change in oil production relative to an exogenous percent change in the price of oil within the same time period, conditional on past information. While much of the work on estimating price elasticities of oil supply has focused on monthly elasticities, elasticities can also be defined based on quarterly data as in Newell and Prest (2019) or based on annual data as in Bornstein, Krusell and Rebelo (2021). One reason empirical research has focused on one-month elasticities is that the identification of exogenous shifts in the price of oil becomes more challenging in lower-frequency data. Another reason is that these elasticity estimates are commonly used in monthly models of the global oil market.[4]

The horizon over which the elasticity is computed matters. As the length of time over which the elasticity is computed grows, the oil supply elasticity tends to weakly increase. This result is intuitive as increasing oil production requires time. An immediate implication is that a finding of a quarterly oil supply elasticity of zero as in Newell and Prest (2019) implies that the corresponding monthly elasticity also must be zero. A finding of a positive annual oil supply elasticity, in contrast, tells us nothing about the monthly or quarterly elasticity. Below we will report estimates of both the monthly and the quarterly price elasticity of oil supply.

3.1. Putting previous oil supply elasticity estimates to the test

The objective of this paper is to externally validate or refute the elasticity estimates in Table 1 by computing how responsive U.S. oil production has been to the oil price surge associated with the 2026 Iran War. The Iran War may be viewed as a natural experiment involving a large and exogenous shift in the WTI price of oil. As the war broke out on February 28, 2026, on a

[4] Whatever the choice of time period, it is essential that the time period over which the percent change in oil prices and the percent change in oil production are computed is the same. The percent response of oil production after three months to an exogenous percent increase in the price of oil in the current month is not an elasticity. Nor is the response of quarterly oil production to an exogenous percent increase in monthly oil prices. While such responses are undeniably of interest to economists, the elasticity concept relates to contemporaneous percent changes.

weekend, effectively we can date the war as starting in March 2026. The advantage of estimating the price elasticity of oil supply based on a natural experiment rather than a panel regression is that the estimate is model free, allowing us to sidestep the debate about how to specify the elasticity in the panel regression. Moreover, whereas linear panel regressions are identified mainly based on marginal changes in the price of oil, the large magnitude of the exogenous oil price increase in 2026 ensures that – if oil producers are responsive – we will see that response in the data. While elasticity estimates based on natural experiments do not lend themselves to the construction of standard errors, panel regression estimates do, so we can judge whether our direct elasticity estimate is consistent with the evidence from panel regressions.

It is useful to start with the monthly oil supply elasticity. Table 2 computes the percent change in the average monthly WTI spot price of oil in March 2026 relative to February. It also shows the percent change in U.S. shale oil production, as reported in the July 2026 EIA Short-term Energy Outlook. Similar estimates are obtained when approximating U.S. shale oil production as total crude oil production excluding production in Alaska and U.S. off-shore production.[5] The implied ratio is 0.02, suggesting a monthly shale oil supply elasticity that is effectively zero. This evidence is sharply at odds with the estimates of 0.62 and 0.3-0.9 reported in Table 1, but similar to the estimate near 0 in Newell and Prest (2019).[6] A different way of contrasting these results is to note that a monthly supply elasticity of 0.62 would have implied an astounding shale oil production increase of 26% (or 2.4 mb/d) in March 2026, and an elasticity of 0.9 would have implied a production increase of 37% (or 3.5 mb/d) in March 2026.

[5] This presumes a baseline of zero growth in U.S. shale oil production in March 2026 in the absence of the Iran War, consistent with projections, as of February 2026, of negligible production increases in March. To the extent that zero growth understates the expected growth, this would lead us to overstate the oil supply elasticity.
[6] This conclusion is robust to starting the estimation in mid-February and computing an elasticity over 1 ½ months, allowing for the anticipation of the war.

We also computed the elasticities separately for each U.S. shale oil basin. The Permian alone accounts for 65% of U.S. shale oil production followed by the Bakken with 13%, Eagle Ford with 10%, and Niobrara-Codell with 5%. The remaining shale oil basins account for 1% or less of the 9.3 mb/day of U.S. shale oil production in February 2026. The supply elasticities by basin range from -0.02 to 0.20. The Woodford basin with an elasticity of 0.20 is a notable outlier. Its production response is only 0.006 mb/day, but large in percentage terms, given a production level of only 0.073 mb/day in February 2026. The supply elasticities for the two largest shale oil basins in the Permian and the Bakken are only 0.01. For comparison, we also included conventional oil production in Alaska and off-shore production in the Gulf of Mexico and on the West Coast in Table 2. As expected, these monthly elasticities are effectively zero like the U.S. shale oil supply elasticity.

Table 2: Monthly U.S. price elasticities of oil supply for March 2026

	$d\ln Q_t$	$d\ln S_t^{oil}$	$d\ln Q_t \,/\, d\ln S_t^{oil}$
Shale oil	0.75%	41.65%	0.02
Permian	0.51%	41.65%	0.01
Bakken	0.60%	41.65%	0.01
Eagle Ford	1.85%	41.65%	0.04
Niobrara-Codell	-0.45%	41.65%	-0.01
Austin Chalk	-0.79%	41.65%	-0.02
Mississippian	3.64%	41.65%	0.09
Woodford	8.22%	41.65%	0.20
Rest of Lower 48	1.96%	41.65%	0.05
Alaska	0.24%	41.65%	0.01
Off-Shore	0.55%	41.65%	0.01

NOTES: U.S. Energy Information Administration. S_t^{oil} is the WTI spot price. Except for the last two rows, Q_t is the estimate of tight oil production in the EIA's Short Term Energy Outlook, July 2026. The production estimates for Alaska and Off-shore are from the EIA's *Petroleum Supply Monthly*.

Next, we consider the quarterly shale oil supply elasticity. This involves evaluating the percent change in total U.S. shale oil production in March-May 2026 relative to its value in

December 2025-February 2026 and similarly for the average spot price of oil.[7] Table 3 shows an implied quarterly price elasticity of shale oil supply of 0.02, again close to the estimate reported in Newell and Prest (2019) and inconsistent with the much larger monthly estimates reported in Bjørnland et al. (2021) and Aastveit et al. (2026). For all practical purposes, both estimates are effectively zero. Quarterly elasticity estimates for the U.S. shale oil basins range from -0.03 to 0.21 with the Permian and the Bakken having an elasticity of 0.01 and 0.02, respectively, and then Woodford basin being the largest outlier. The quarterly supply elasticities for Alaskan oil production and off-shore oil production are again near zero.

Table 3: Quarterly U.S. price elasticities of oil supply for March-May 2026

	$d\ln Q_t$	$d\ln S_t^{oil}$	$d\ln Q_t / d\ln S_t^{oil}$
Shale oil	1.22%	60.99%	0.02
Permian	0.87%	60.99%	0.01
Bakken	1.52%	60.99%	0.02
Eagle Ford	3.47%	60.99%	0.06
Niobrara-Codell	-1.93%	60.99%	-0.03
Austin Chalk	-0.53%	60.99%	-0.01
Mississippian	1.21%	60.99%	0.02
Woodford	12.50%	60.99%	0.21
Rest of Lower 48	2.03%	60.99%	0.03
Alaska	-0.01%	60.99%	-0.02
Off-Shore	0.01%	60.99%	0.02

NOTES: U.S. Energy Information Administration. S_t^{oil} is the WTI spot price. Except for the last two rows, Q_t is the estimate of tight oil production in the EIA's Short Term Energy Outlook, July 2026. The production estimates for Alaska and Off-shore are from the EIA's *Petroleum Supply Monthly*.

3.2. The definition of the oil supply elasticity in panel regressions

An obvious question is why the shale oil supply elasticity estimates in Bjørnland et al. (2021)

[7] One challenge is that in January 2026 a winter storm sharply reduced U.S. shale oil production, which could inflate the quarterly elasticity estimate. The December 2026 and March 2026 production estimates are identical at 9.33 and 9.30 mb/day, while January production dropped to 8.93 mb/day. We address this concern by linearly interpolating between December 2025 and February 2026 in constructing the quarterly baseline production level.

and Aastveit et al. (2026) are so much higher than our estimate and the estimate in Newell and Prest (2019). This difference can be traced to the specification of their panel regression model. Traditionally, the price elasticity of oil supply is estimated as the coefficient η_{oil} in the panel regression

$$\ln Q_{it} = \eta_{oil} \ln S_t^{oil} + \ldots + \varepsilon_{it},$$

where Q_{it} is oil production in terms of barrels for well i at time t, S_t^{oil} is the WTI spot price of oil, and all controls have been omitted (see, e.g., Newell and Prest 2019). This definition differs from the way this elasticity is defined in Bjørnland et al. (2021) and Astveit et al. (2026). Here we focus on the analysis in Aastveit et al., but it should be noted that similar comments apply to Bjørnland et al. which uses a similar methodology.

Aastveit et al. postulate that oil producers respond both to increases in S_t^{oil} and in the 3-month spot-futures spread as a proxy for the expected change in the spot price of oil at the three-month horizon:

$$\ln Q_{it} = \eta_{oil} \ln S_t^{oil} + \eta_F \left(\ln S_t^{oil} - \ln F_{t|t+3} \right) + \ldots + \varepsilon_{it},$$

where $F_{t|t+3}$ is the 3-month WTI futures price. The elasticity, as reported in Aastveit et al. (2026) is defined as $\eta_{oil} + \eta_F$, which is an upper bound for the short-run supply elasticity, under the assumption that futures prices do not change in response to the spot price. In practice, it is the η_F estimate that accounts for the difference in the overall elasticity estimate from zero. If $ln(F_{t|t+3})$ changes one for one with $\ln(S_t^{oil})$, as would be the case when the oil price shock is permanent, this elasticity reduces to η_{oil} as in Newell and Prest (2019), creating a lower bound of zero on their short-run supply elasticity estimate. Given that there is no reason to expect the futures price to be unresponsive to changes in the spot price, this means that the 0.62 estimate reported in Aastveit et al. overstates the evidence against an oil supply elasticity of zero.

While Astveit et al. acknowledge that the actual oil supply elasticity at a given point in time may differ, they do not report the average price elasticity of oil supply in their sample or the variation in the elasticity over time. Instead, in relating their upper bound to other elasticity estimates in the literature, they effectively treat the upper bound as a point estimate of the average elasticity. This is one reason for the large discrepancy with the estimates in the existing literature. It can be shown that the monthly price elasticity for March 2026 implied by their estimates is approximately

$$\begin{aligned}\text{Oil supply elasticity} &= \frac{d\ln Q_{it}}{d\ln S_t^{oil}} \approx \eta_{oil} + \eta_F\left(1 - \frac{\%\Delta F_{t|t+3}}{\%\Delta S_t^{oil}}\right)\\ &= -0.02 + 0.64\left(1 - \frac{32.66}{41.65}\right) = 0.12,\end{aligned}$$

where we replaced the derivative in the elasticity formula in footnote 17 of Aastveit et al. (2026) by a discrete approximation and substituted their point estimates. This elasticity estimate is far below 0.62, indicating the dangers of relying on the upper bound. In fact, the implied global oil supply elasticity (computed as in Table 1) would be 0.01, well below the upper bound in Kilian and Murphy (2012) and very close to the oil supply elasticity of zero imposed in the Kilian (2009) oil market model.

While this observation goes a long way toward reconciling the supply elasticity estimates in Table 1, the time-varying elasticity estimate for March 2026 is still several times higher than the shale oil supply elasticity estimate of 0.02 in Table 3 and at odds with the independent well-level evidence discussed in the next section, calling into question the regression analysis in

Aastveit et al. (2026). The implied shale oil production response in March 2026 of a supply elasticity of 0.12 is 5% (or 0.5 mb/d), far in excess of what the data show. In the next section, we show that our shale oil supply elasticity estimate is consistent with extraneous evidence on well completion times and on survey responses by oil producers.

4. Supporting Evidence from Oil Industry Data

It is important to be clear about the thought experiment underlying the elasticity estimate. Some observers have focused on the time it takes an experienced crew to drill and complete an oil well. This time has shrunk over time, as shale oil producers have become more efficient. It has been reported that in some cases in recent years, crews were able to drill and complete an oil well in less than four weeks. These reports are not a good guide to the supply elasticity debate, however, because what matters for computing the supply elasticity is the time required between an unexpected oil price increase and the start of production from a new well. This involves identifying the drilling location, procuring and coordinating rigs and workers, setting up contracts, providing the well infrastructure, and arranging for the natural gas takeaway.

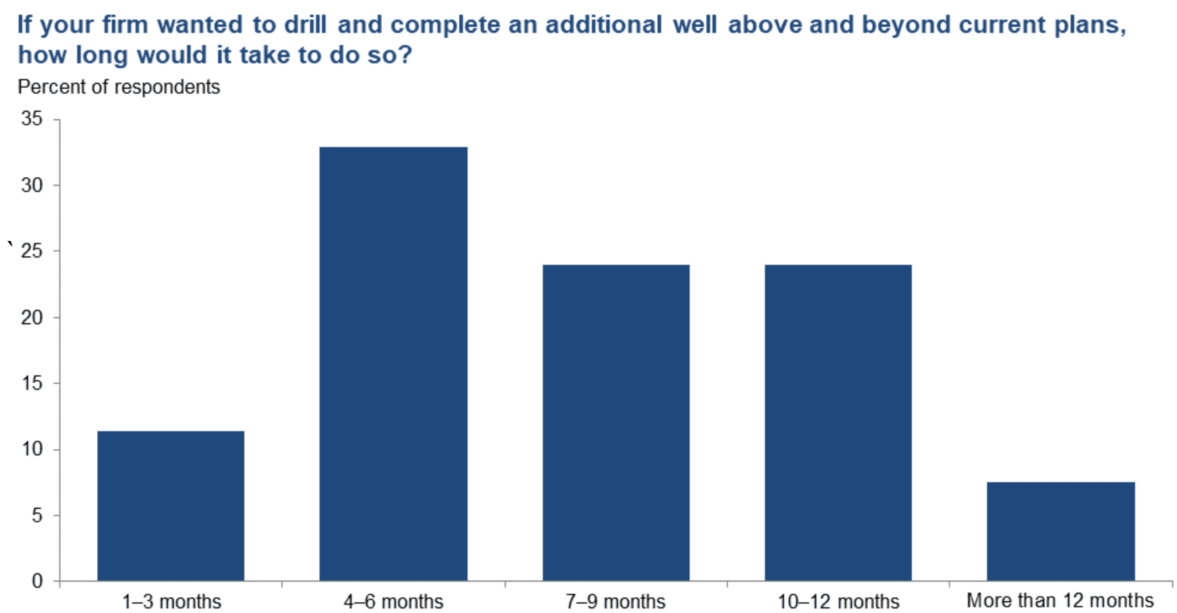
The time required for completing these tasks far exceeds the time required for actually drilling and completing a well. Industry contacts suggest that it takes one to two months alone from when an operator identifies a drilling location and calls an oilfield services company to contract a rig until the rig and workers are sourced and have arrived at the drilling site. Often the challenge is finding a suitable rig and retrofitting or upgrading it. Before drilling can occur, the drilling area must be cleared and leveled, leases and permits must be secured, a drilling plan must be prepared by engineers, access roads must be built, and equipment must be moved in. Once a pad, typically consisting of multiple wells, has been drilled, the rig exits the site and a completion crew enters and completes the well. Lastly, a cleanout of the well is performed and the production infrastructure consisting of storage tanks, separators and treaters is installed. In addition, the company must arrange for pipelines to be built that take away the natural gas that accrues in oil production.

4.1. Survey evidence on responsiveness of oil producers to price signals

One piece of evidence speaking to this point is survey responses from oil industry executives in the Dallas Fed Energy Survey (see Figure 4). Their responses imply that it takes at least one month to drill and complete an oil well in response to price signals. In fact, the modal response is 4-6 months and more than half of firms require more than half a year to complete a new well. These responses imply that the one-month price elasticity of oil supply from new wells is zero, consistent with our estimate and with the evidence in Newell and Prest (2019).

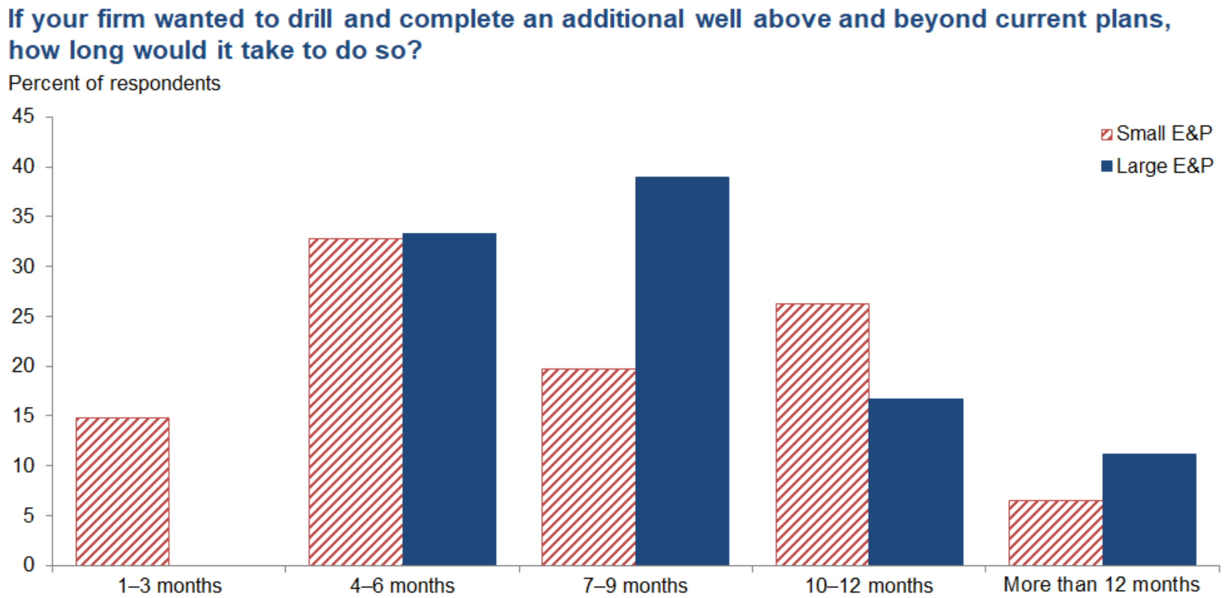
This distribution of responses hides considerable heterogeneity. It is instructive to

Figure 4: Delays in drilling and completing new oil wells



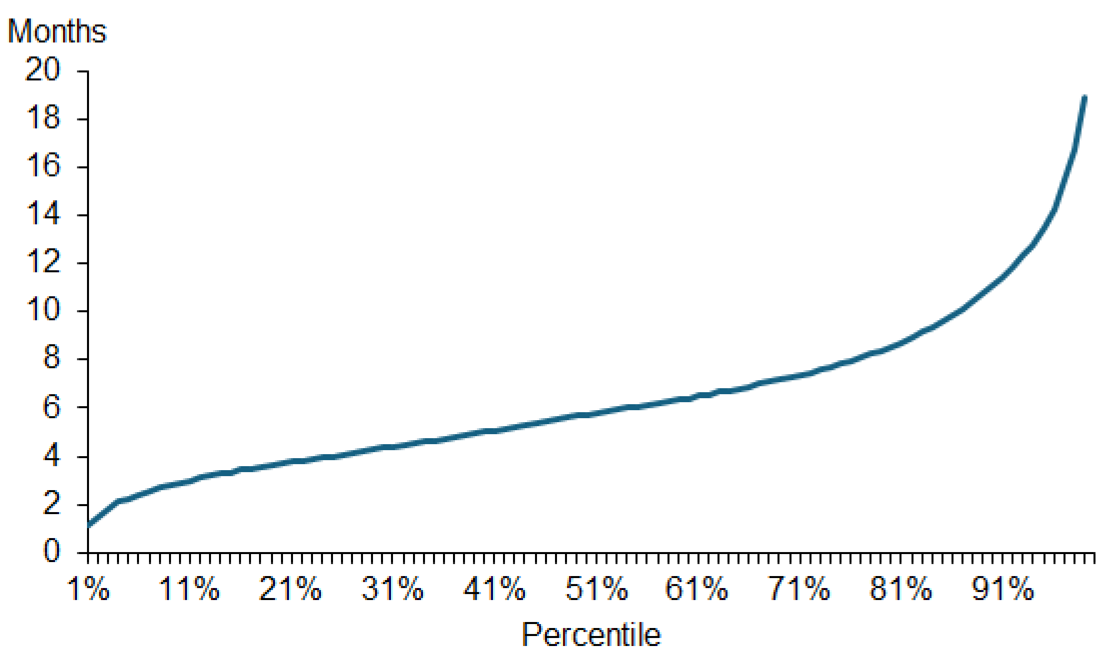
NOTES: Federal Reserve Bank of Dallas. Based on responses of 79 executives from exploration and production companies during the survey collection period, June 8-16, 2022.

Figure 5: Delays in drilling and completing new oil wells by firm size



NOTES: Based on responses of executives of 61 small and 18 large exploration and production companies during the survey collection period, June 8-16, 2022.
our estimate and with the evidence in Newell and Prest (2019).

Figure 6: Number of months from rig arrival to well coming online



NOTES: Kayrros and Federal Reserve Bank of Dallas. Based on 21,299 wells from all U.S. oil basins completed in 2023 and 2024.

disaggregate these responses by firm size. We define small firms as producers pumping less than 10,000 barrels per year in fourth quarter 2021 and large firms as producers pumping at least 10,000 barrels. Figure 5 illustrates that small firms that are typically privately owned tend to respond more quickly to price signals than larger firms that account for the bulk of U.S. shale oil production. A likely explanation is that larger companies are more likely to drill well pads involving multiple wells that take longer to complete.

4.2. Well-level evidence on time to completion

Another way of addressing this question is to look at the time it takes from the arrival of a rig at the well site to the oil well starting to produce. As discussed earlier, this is an underestimate of the actual response time of oil producers to price signals because typically it takes one to two months to prepare the wellsite. Figure 6 shows the fraction of wells that come online in a given number of months after the arrival of the rig. These results were computed based on wells in all U.S. oil basins. The median duration between the rig arrival and the well starting to produce is 5.7 months. Only 0.8 percent of wells in this sample were completed in less than one month. This immediately calls into question the view that the one-month price elasticity of oil supply from new wells is positive, as there is a one or two-month lead time to prepare the drilling.

The left column in Table 4 investigates the heterogeneity of the completion times for new wells, defined as the time it takes from the start of drilling to when the well starts producing. It shows that completion times are 0.9 months longer for wells owned by publicly listed companies. They are not significantly affected by the well being vertical. Completion times are on average 0.5 months longer in the Denver-Julesburg Basin than in the Permian and 2.3 months longer in the Williston basin. Completion times are 0.5 months shorter in the Eagle Ford basin than in the Permian and 0.7 months shorter in Anadarko.

Table 4: Heterogeneity in completion times

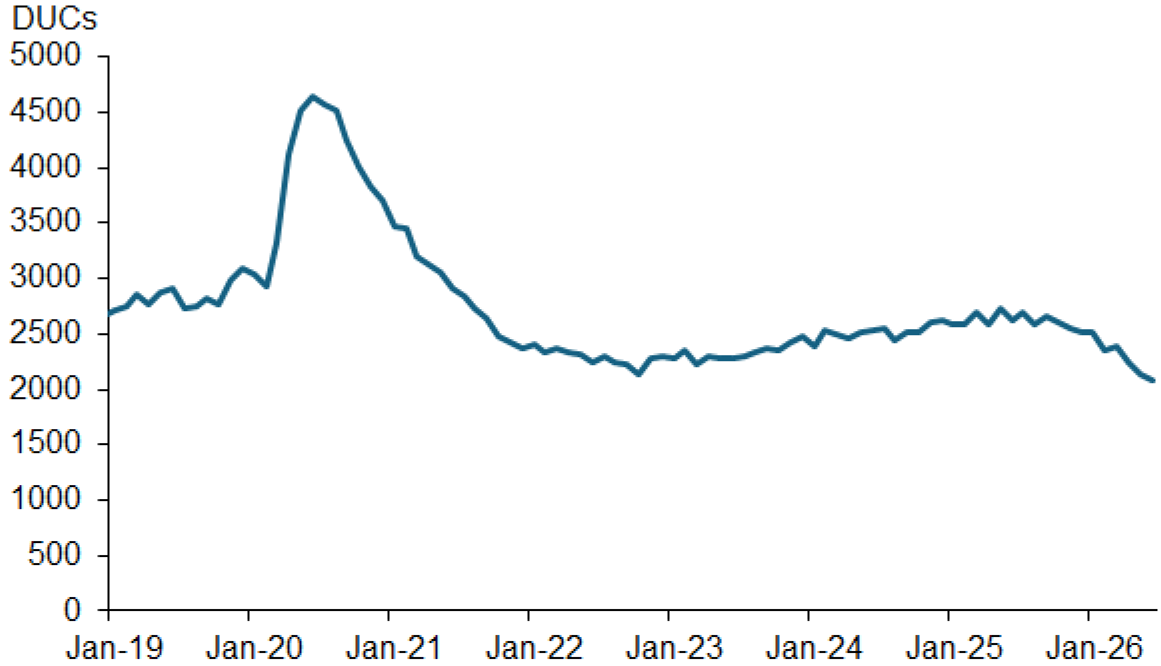
	New wells	DUCs
Permian	0.000	0.000
	(.)	(.)
Anadarko	-0.722**	-0.294***
	(0.316)	(0.079)
Denver-Julesburg	0.523*	0.109
	(0.303)	(0.130)
Eagle Ford	-0.575	-0.287***
	(0.419)	(0.076)
Williston	2.302***	0.329***
	(0.608)	(0.087)
Public well	0.918***	-0.009
	(0.286)	(0.053)
Vertical well	-1.068	0.023
	(1.432)	(0.151)
Constant	6.716***	2.548***
	(0.560)	(0.274)
Controls	Yes	Yes
N	21,299	21,299
R^2	0.033	0.041

NOTES: Kayrros and Federal Reserve Bank of Dallas. Based on wells completed in 2023 and 2024. Controls include well type and start date. Standard errors clustered at the pad group level in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Public well refers to a well owned by a publicly listed company.

Of course, not all oil wells must be developed from scratch. Oil companies have an inventory of wells that are already drilled, but still have to be completed, known as DUCs. The existence of DUCs may reflect delays in the availability of crews or capacity to take away the natural gas that is a byproduct of oil production. All firms have a working inventory of DUCs as part of their normal business operations. Of the 21,299 wells in the sample, about 70 percent have a DUC duration, defined as the time between when a well is drilled and when the completion work starts, of under 3 months and about 90 percent of under 6 months.

Some DUCs, however, may also be used opportunistically to respond to price signals. As

Figure 7: Number of DUCs in major U.S. oil basins, January 2019-June 2026

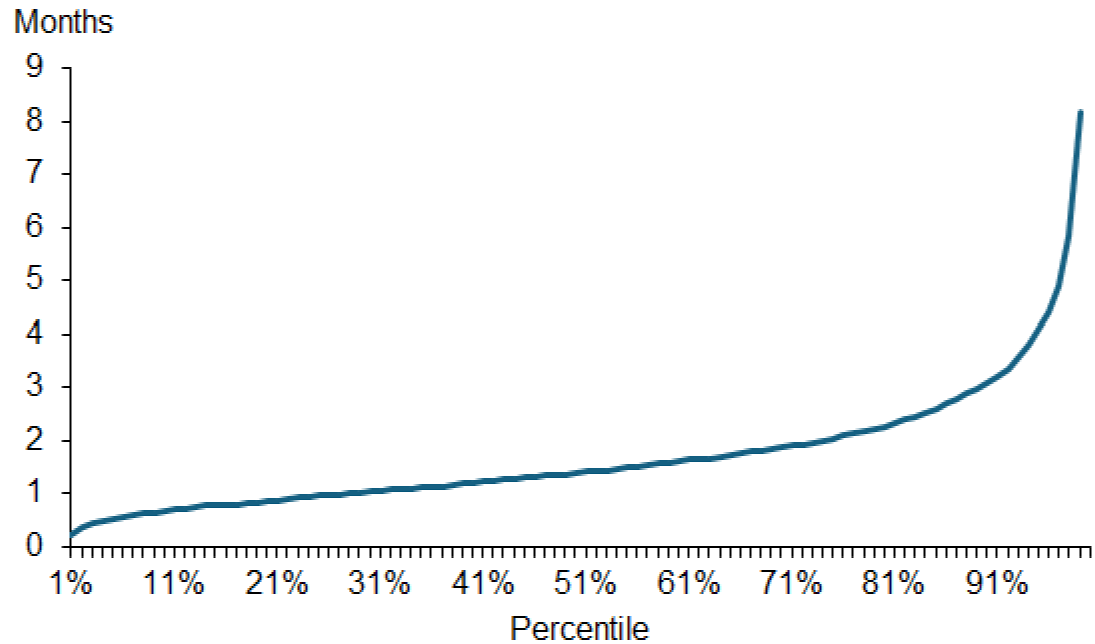


NOTES: Based on Kayrros data.

shown in Figure 7, the number of DUCs in the U.S. has declined to about 2,357 in February 2026. This number consists of DUCs waiting for a fracking crew and DUCs whose completion has been deferred for various reasons.

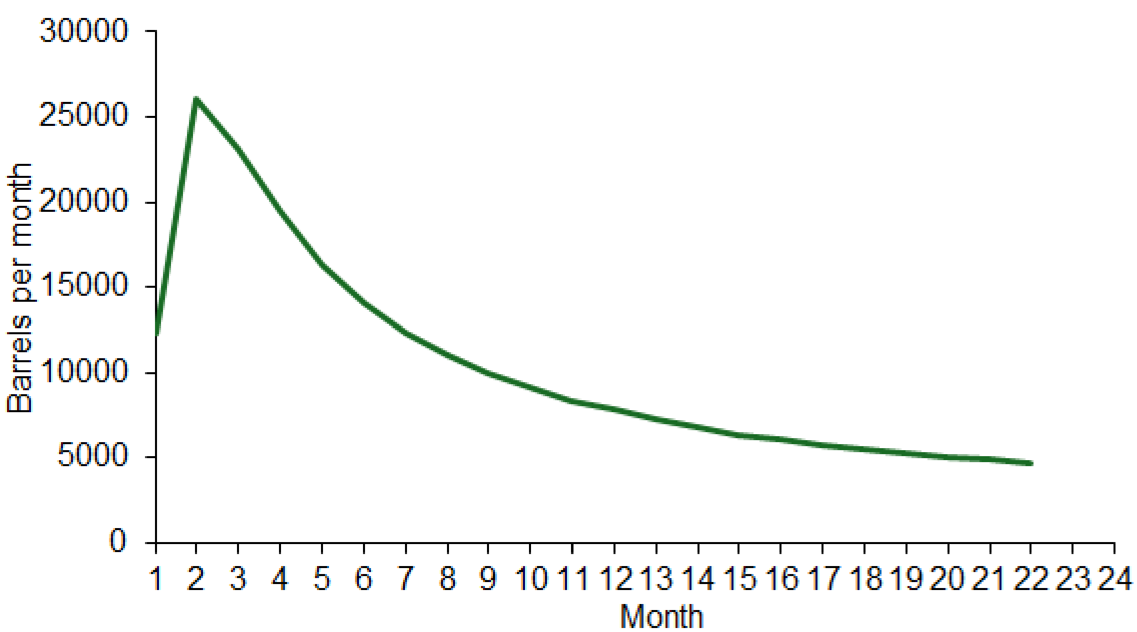
The time is takes to complete a DUC in response to unexpectedly higher oil prices is much shorter than the time to develop a new well. Thus, oil producers are able to respond to higher oil prices by executing their DUCs much more quickly, if they think that higher oil prices will persist long enough. Even completing DUCs, however, takes time (see Figure 8). Industry statistics show that the median duration between the arrival of a completion crew at the DUC site and the completion of the well is 1.4 months. Only 10 percent of DUC completions occur within three weeks, but there are indications that this percentage is inflated by measurement error. Collins and Medlock (2017) estimate that it takes at least three weeks from

Figure 8: Months from completion crew arrival at DUC to well coming online



NOTES: Kayrros and Federal Reserve Bank of Dallas. Based on 21,299 wells from all U.S. oil basins completed in 2023 and 2024.

Figure 9: Production per new well in the Permian



NOTES: All wells placed online in 2024, the last year for which complete data are currently available, including horizontal wells. Source: WellDatabase.

the time the completion of a DUC starts to the well coming online. Even the most optimistic industry estimates are at least one week or, more commonly, at least two weeks. About 0.9 percent of the DUCs are listed by Kayrros as being completed within less than one week and 3.8 percent in less than two weeks, which likely reflects incomplete data provided by the owner and lack of satellite coverage. Dropping these observations reduces the percentage of wells completed within three weeks to only 6.2 percent. Considering the additional time it takes to arrange for a completion crew, these data cast doubt on the view that DUCs could explain a one-month price elasticity of shale oil production much larger than zero.

This result also applies to older wells that are being refractured to stimulate production and extend their economic life. Industry statistics show that there are a limited number of older wells that are refractured each year. For example, Rystad Energy reported public data showing about 200 refractured wells out of a total of 8,900 stimulations from January 2023 to September 2023, representing only 2% of completions.[8] Re- fracs involve re-stimulating the well, making this procedure subject to similar delays as when completing a DUC.

The right column in Table 4 shows that the heterogeneity across U.S. oil basins in the completion times for DUCs is modest. Compared to the expected completion time for DUCs in the Permian that in the DJ basin is 0.1 months longer and that in the Williston basin 0.3 months longer. Completion times in the Eagle Ford and Anadarko basins are 0.3 months shorter than in the Permian. There is no material difference between publicly and privately owned DUCs or depending on whether the well is vertical or horizontal, which supports our earlier conjecture that differences in the time it takes for new wells owned by public companies to come online are driven by the time it takes to drill these wells.

[8]See https://jpt.spe.org/shale-refracs-next-big-thing-or-a-piece-of-the-big-puzzle

4.3. The response of oil production from new wells in March 2026

The data on well completions in Figure 6 have important implications for the responsiveness of shale oil production to oil price signals. Producers are forward looking and will respond to unexpectedly higher oil prices by drilling a new well if they expect the price increase to persist over the relevant horizon. That horizon extends beyond the time required to complete a new well (A) to the time horizon during which the well will be in operation (A+B). A typical production profile for a new shale oil well is shown in Figure 9. Production peaks in the second month upon completion and declines to 20% of the peak output within less than two years.

This means that a temporary spike in the price of oil is not likely to induce much of a production response. A surge in the price of oil that with high probability lasts only three months, for example, would be met by inaction. Implicit in the definition of a short-run price elasticity of oil supply therefore is the assumption that the increase in the price of oil is expected to be permanent.

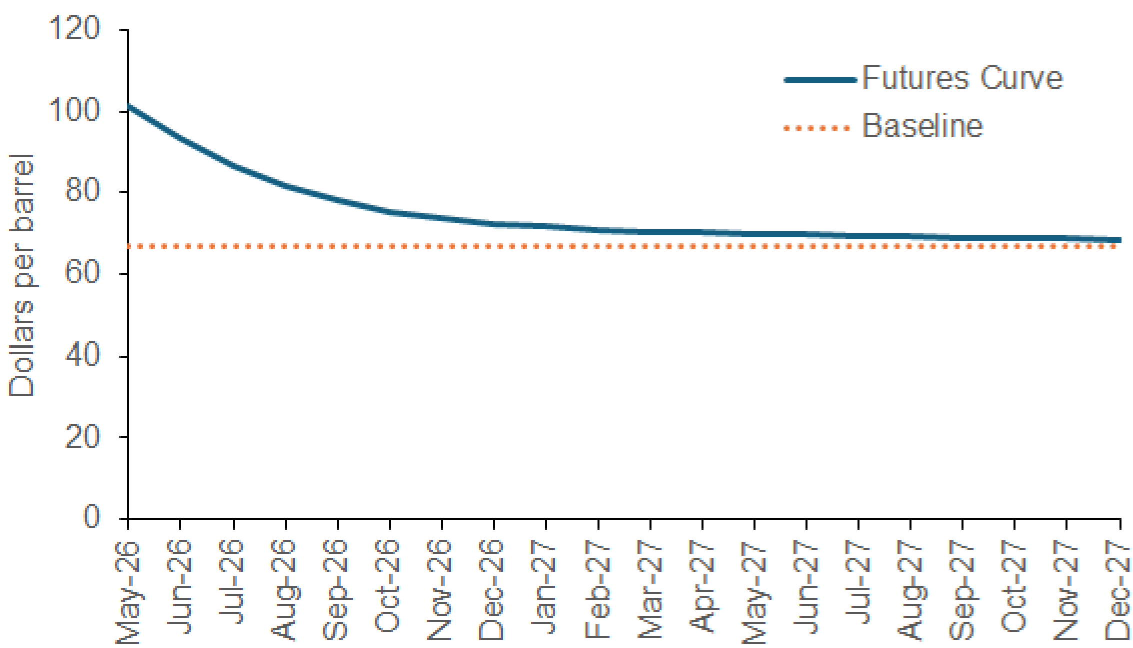
Of course, even if a producer believes that the price of oil will remain elevated, there is no reason for that outcome to be realized. One way of hedging this risk is to lock in the current oil futures price by selling forward. The relevant futures price for this transaction is the price at horizon A+B, which typically will be more than 8 months. If we think of the futures price as the conditional expectation of the spot price, we can think of the conventional definition of the own-price elasticity of oil supply as being based on a thought experiment involving a persistent oil price increase that simultaneously shifts up both the spot price and the oil futures price at the relevant horizon.[9]

If the oil futures curve is declining steeply with the futures price at the relevant horizons

[9] Baumeister and Kilian (2018) provide evidence that oil futures prices differ from the conditional expectations by a potentially large and time-varying risk premium, calling into question this assumption.

not much higher than before the oil price surge, as was the case after the 2026 Iran War broke out, producers will likely refrain from hedging and hence will not drill new wells. Thus, the sluggish response of shale oil producers implicit in our elasticity estimate in Table 2 is not surprising. As of the end of March 2026, shale oil producers would have looked at oil futures prices for delivery in 2027 when deciding whether to drill and complete a new well. Figure 10 illustrates that at that horizon WTI futures prices were close to the $67 per barrel price prevailing right before the war broke out, providing little incentive for major production increases. Our finding of a near zero elasticity is fully consistent with this evidence.

Figure 10: WTI Futures Curve, March 31, 2026



NOTES: Bloomberg.

Our point, however, goes beyond this observation. Even if oil futures prices at the relevant horizon had risen as much as the spot price, our earlier evidence about the time it takes to drill and complete a new well implies that the response of shale oil producers would have been close to zero in the initial month. Thus, the finding of a near zero monthly supply elasticity from new wells does not depend on the oil futures curve.

4.4. The response of oil production from DUCs in March 2026

While our evidence explains why oil production from new wells has been unresponsive to the oil price surge caused by the 2026 Iran War, this leaves the question of how to reconcile our elasticity estimate with the notion that shale oil production responds primarily by creating or completing DUCs. Underlying this argument is the view that shale oil producers respond to an expected increase in the spot price of oil, as proxied by $\left(\ln S_t^{oil} - \ln F_{t|t+h}\right) < 0,$ for example, by storing oil below the ground rather than extracting it. Conversely, when producers expect the spot price to decline, as proxied by $\left(\ln S_t^{oil} - \ln F_{t|t+h}\right) > 0,$ producers are incentivized to increase production today by reducing storage. It might seem that this mechanism could rationalize a stronger response of current oil production given that DUCs may be completed more quickly than new wells.

Our evidence in Figure 8 about the time it takes to complete DUCs strongly argues against this view. For example, the only way for shale oil producers to store oil below the ground is by not completing wells. It seems conceivable that producers may choose not to complete DUCs in response to an expected fall in the price of oil, but our evidence about the time it takes to complete a DUC in Figure 8 suggests that that this decision will not have a material effect on production in the current month. Given the time it takes to arrange for a completion crew and to complete a DUC in response to a price signal, there are few, if any, excess DUCs from which additional production would have been forthcoming in the current month, even if their completion had not been delayed. As a result, in the aggregate, postponing the completion of excess DUCs would not be expected to make a material difference for production in the current month.

Conversely, the only way for producers to increase production would be to bring online excess DUCs in their inventory. This adjustment for most DUCs is expected to take more than one month. Only about 10% of DUCs in the U.S. have a recorded completion time of under three weeks, excluding the time it takes to arrange for a completion crew. Even the most optimistic industry sources put the completion time for a DUC at one week at least, once a crew has been found. More common estimates are two weeks or higher. This means that even under the most optimistic assumptions these DUCs could produce perhaps 6,000 barrels each in the initial month.[10] There simply are not enough such DUCs available for completion to generate a price elasticity of oil supply of 0.62. This would have taken the completion of more than 12,000 DUCs in record time in March 2026. There were 2,357 DUCs nationwide in February 2026, according to Kayrros, so this is plainly impossible.

Even given an elasticity of 0.12, as discussed in Section 3.1, it would have taken the completion of about 2400 DUCs within two weeks. Completing essentially all DUCs available in this timeframe seems rather implausible, given that historically only 236 of these DUCs would have been completed quickly enough to matter for March production and, realistically, that number will be closer to 146, given apparent measurement error in the completion times of some of these wells in the Kayrros data.[11] Many of these DUCs will simply not be available for this

[10] This assumes that these DUCs are completed within one to three weeks or, on average, within two weeks, with one week added to arrange for a completion crew after deciding to increase production on March 1. This leaves one week for production to increase in March. Drawing on information provided by the EIA, we further assume that the initial production level of 12,000 barrels in Figure 9 is based on wells started mid-month, and that half of this amount can be produced in one week.

[11] 0.9 percent of DUCs are listed by Kayrros as being completed within less than one week and 3.8 percent within less than two weeks, which likely reflects incomplete data provided by the owner and lack of satellite coverage. Dropping these observations would reduce the percentage of wells potentially available for fast completion to 6.2 percent.

purpose because they are part of the working inventory of DUCs. This makes a nontrivial positive impact response to the $h-$month spot-futures spread a priori implausible regardless of the choice of h.

This finding is especially important since Aastveit et al. (2026) do not have direct evidence on the response of DUCs to the spot-futures spread. They merely assume that changes in DUCs can explain their positive estimate of η_F. Our evidence is at odds with that interpretation. In fact, Figure 7 indicates that the number of DUCs slightly increased from 2,357 in February 2026 to 2,381 in March, rather than falling sharply, as predicted by Aastveit et al.

In short, the extraneous data we provide about the time it takes to bring a new well online or a DUC online in response to a price signal appear to rule out large monthly shale oil supply elasticity estimates and corroborates our elasticity estimate near zero based on the natural experiment of the Iran War.

5. Implications for Oil Market VAR Models

One reason researchers are so interested in the value of the short-run price elasticity of oil supply is that this parameter is essential for the identification of structural shocks in VAR models of the global oil markets. Aastveit et al. (2026) observe that their much higher shale oil elasticity estimate also implies a much higher global price elasticity of oil supply (see Table 3). They argue that this higher global elasticity invalidates some existing oil market VAR studies while corroborating others. This argument does not follow from their evidence, however. It is important first to understand the implications of their findings, taking their estimates as given, before explaining what difference our analysis in this paper makes.

First, it may seem that the high shale oil elasticity estimates in Bjørnland et al. (2021) and Aastveit et al. (2026) would invalidate earlier oil market VAR studies such as Kilian (2009) that imposed a zero global oil supply elasticity or Kilian and Murphy (2012, 2014) that bounded this elasticity by 0.0258 based on extraneous evidence. This is not the case because these studies were estimated on data excluding the shale oil period. There is universal agreement among all studies in the literature that the short-run supply elasticity of conventional oil, which was the only oil available until the shale oil revolution, is effectively zero. Thus, there is no reason to question the substantive findings of these early oil market VAR studies.

Second, it may also seem that these high elasticity estimates would support more recent oil market VAR models based on much higher oil supply elasticities, as favored by Caldara et al. (2018) or Baumeister and Hamilton (2019). This again would be a misinterpretation because these elasticity estimates only apply to the shale oil era. They do not apply to data from the pre-shale oil era, which accounts for the bulk of the estimation period in these oil market VAR studies, which are typically estimated on data back to 1974.

Third, what these high elasticity estimates, if taken at face value, actually mean is that there has been a change in the oil supply elasticity sometime around or after 2011 that invalidates the assumption of a constant oil supply elasticity in all linear oil market VAR models. Conventional models may still be viewed as a first-order approximation, of course. The linear approximation will be close as long as much of the estimation period excludes the shale oil period, as in recent variants of the Kilian-Murphy model in the literature estimated on data extending to mid-2018 (see, e.g., Herrera and Rangaraju (2020), Zhou (2020), Kilian and Zhou (2020, 2022)). It is likely to worsen, as more recent data from the shale oil era are included.

The good news from the point of view of empirical researchers is that the evidence in our paper puts this concern to rest. There is no evidence that the short-run price elasticity of oil supply is larger now than in the past. Indeed, this elasticity has been remarkably stable over time.

There is no reason to be concerned with the stability of the price elasticity of oil supply after 2011 or with the credibility of oil market models imposing tight bounds on this elasticity. There is reason to be skeptical of oil market models allowing for much higher oil supply elasticities, however.

6. Conclusion

The question of how close the short-run price elasticity of oil supply is to zero plays an important role not only in assessing the ability of the U.S. oil industry to offset the shortfall in global oil production following the outbreak of the 2026 Iran War. It is also of central importance for the identification of oil demand and oil supply shocks in structural VAR models of the global oil market. We discussed the construction and interpretation of the price elasticity of oil supply. While economic theory suggests that this elasticity should be close to zero, a number of recent studies have argued for much larger elasticity values. This view has been seemingly supported by empirical evidence in Bjørnland et al. (2021) and Aastveit et al. (2026) that the price elasticity of supply of U.S. shale oil producers is 0.6 or even as high as 0.9, in sharp contrast to earlier work by Newell and Prest (2019) that estimated this elasticity to be zero.

We showed that these much higher elasticity estimates are at odds with the observed response of U.S. shale oil production to the oil price surge caused by the 2026 Iran War. This event may be viewed as a natural experiment that sheds light on the external validity of regression-based estimates. Our evidence contradicts the view that the monthly and quarterly price elasticity of shale oil producers (and by extension the global oil supply elasticity) is large. There appears to be little or no response in shale oil production, consistent with the regression estimates in Newell and Prest (2019) and with economic theory in Anderson et al. (2018).

This conclusion is further corroborated by the fact that high elasticity values are at odds with survey evidence of the views of oil company executives. Moreover, we documented that a significant shale oil supply response within one month is implausible, given the time required for oil production from new wells and oil production from DUCs to come online. This finding has important implications for the construction and credibility of structural VAR models of the global oil market.

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