



A Practitioner Perspective on When OPEC Spare Capacity Has Mattered for Oil Prices

Presentation by Hilary Till, Solich Scholar, J.P. Morgan Center for Commodities, University of Colorado Denver Business School, for the EIA 2022 Workshop on Financial and Physical Energy Market Linkages

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A Practitioner Perspective on When OPEC Spare Capacity Has Mattered for Oil Prices*

- I. **When Has OPEC Spare Capacity Predominated as a Driver in the Price of Oil?**
- II. **Why has Swing Capacity Historically Been Important?**
- III. **Can U.S. Shale be a Swing Producer?**
- IV. **When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?**

* The views expressed herein are solely those of the presenter and do not necessarily reflect those of other organizations with which the presenter is affiliated, including the J.P. Morgan Center for Commodities (JPMCC) at the University of Colorado Denver Business School. The information contained in this presentation has been assembled from sources believed to be reliable but is not guaranteed by the presenter. It is based on Till (2022), and the presenter benefited from detailed discussions with Jan-Hein Jesse, Founder, Josco Energy Finance & Strategy Consultancy (The Netherlands). Jesse is also an Editorial Advisory Board member of the JPMCC's *Global Commodities Applied Research Digest (GCARD)*.

Note: this presentation is for educational purposes only.

I. When Has OPEC Spare Capacity Predominated as a Driver in the Price of Oil?

A. Oil Prices “Feed Off Multiple Influences”

But Are There Times When OPEC Spare Capacity is the Most Important Factor for Driving Oil Prices?



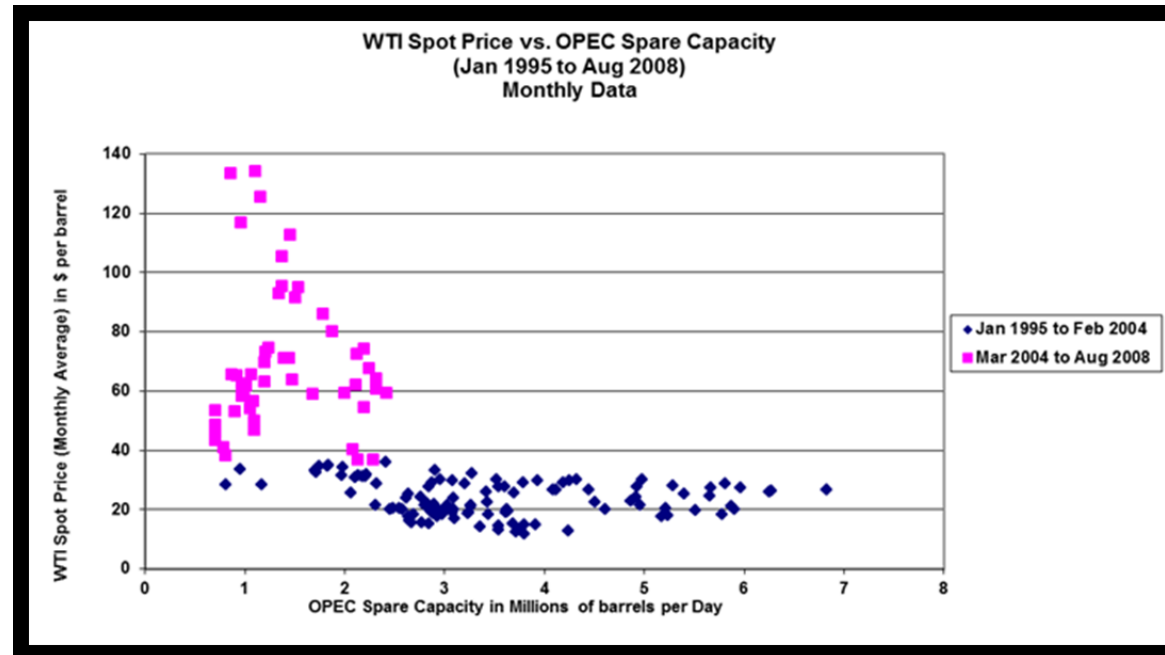
Note: Jesse (2022b) and Morse *et al.* (2022) include SPR usage as an additional factor.

Source of Diagram: Büyükşahin (2011).

I. When Has OPEC Spare Capacity Predominated as a Driver in the Price of Oil?

B. The Collapse of Oil Spare Capacity in 2008

When OPEC Excess Capacity Levels Have Reached Pinch-Point Levels, the Price of Crude Oil Responded by Exploding



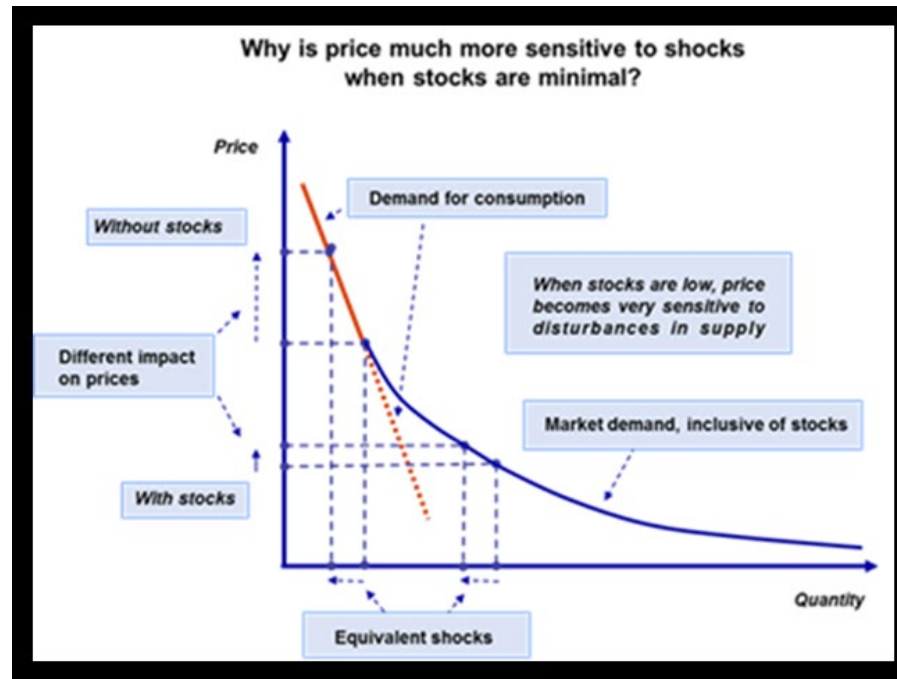
Notes: Presenting data in this fashion is based on Büyükşahin *et al.* (2008), which has a similar, but not identical, graph. Their graph, instead, shows “Non-Saudi crude oil spare production capacity” on the x-axis.

Source of Graph: Till (2015).

I. When Has OPEC Spare Capacity Predominated as a Driver in the Price of Oil?

C. The Typical Economics-of-Storage Diagram

Through 2008, the Relationship Between the Price of Oil versus OPEC Spare Capacity was Conceptually Similar to the Economics-of-Storage Relationship, which is Widely Applicable Across Commodity Markets



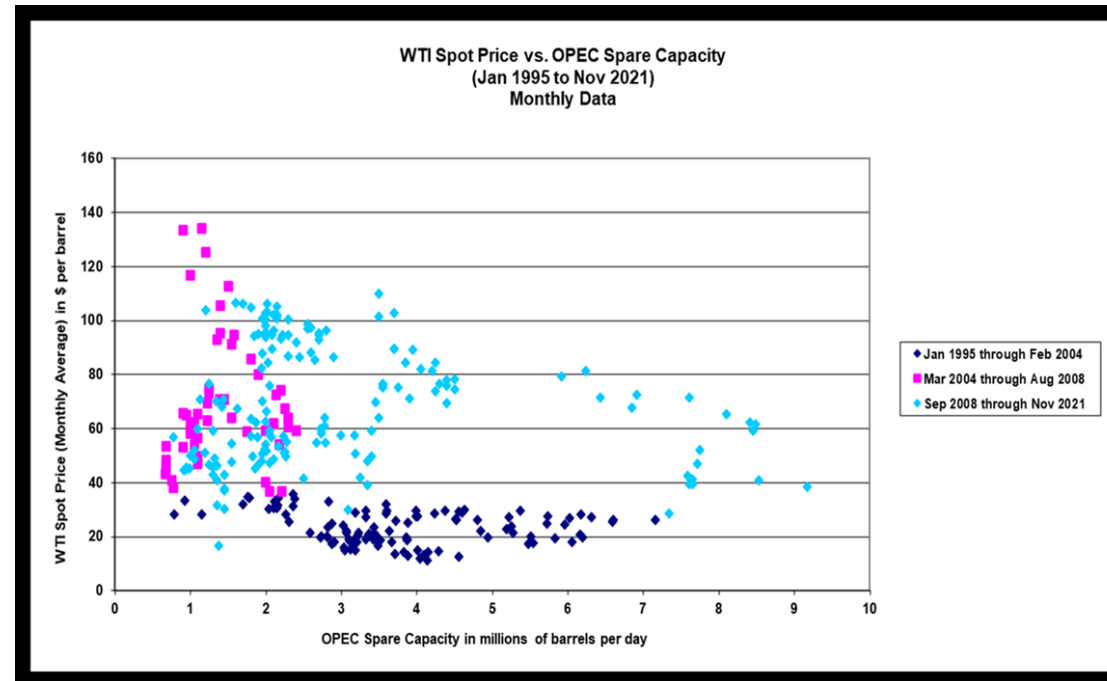
Note: The diagram illustrates the role of stocks in buffering shocks.

Source of Graph: Wright (2011).

I. When Has OPEC Spare Capacity Predominated as a Driver in the Price of Oil?

D. Structural Break After 2008

Not Immediately Clear What the Relationship is between Oil Prices and OPEC Spare Capacity

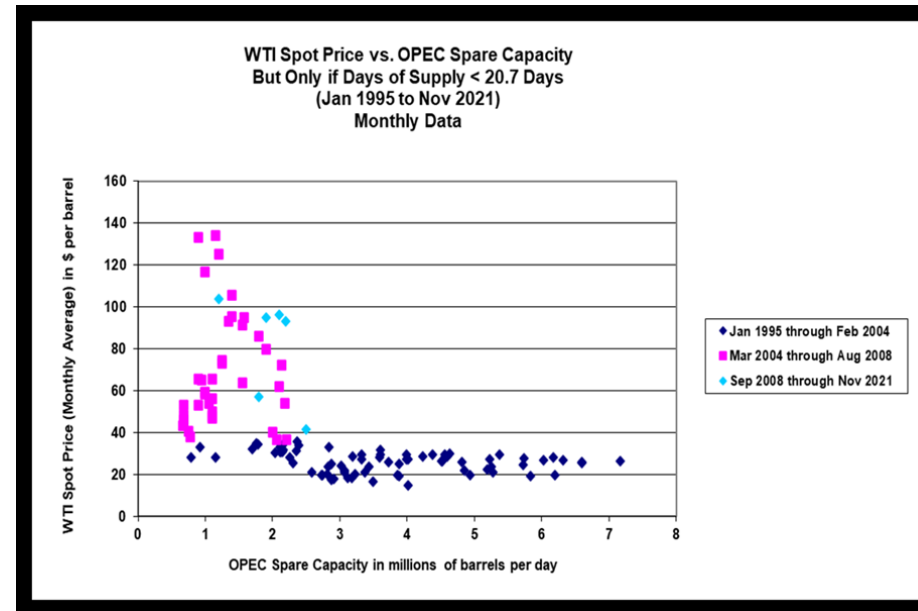


Source of Graph: Till (2022).

I. When Has OPEC Spare Capacity Predominated as a Driver in the Price of Oil?

E. The Conditions under which a Generalized Economics-of-Price-Volatility Relationship Has (Historically) Applied to Crude Oil

OPEC Spare Capacity Has Mattered When Oil Inventories are Low



EIA (2022a): Monthly OPEC Total Spare Crude Oil Production Capacity for October 2022 was assessed at 1.83 million barrels per day.

Source of Graph: Till (2022).

I. When Has OPEC Spare Capacity Predominated as a Driver in the Price of Oil?

F. Economics of Price Volatility for Crude Oil

Harrington (2005) noted that the true buffer against crude-oil price shocks should be represented as not just above-ground stocks, but also spare-production capacity.

In the absence of being able to draw on inventories or exploit surplus capacity, price is the only lever (in the short term) that can balance supply-and-demand in such a scenario, leading to demand destruction.

When inventories have been sufficiently low, decreasing OPEC spare capacity has (historically) led to prices responding as shown in the economics-of-price-volatility diagram*.

* Based on Bloomberg and EIA data from 1995 to 2021.

II. Why has Swing Capacity Historically Been Important?

A. “The Quest for Price Stability”

McNally (2020): “Oil production and consumption exhibit very high short-term insensitivity or ‘inelasticity’ to price changes.”

As noted in Pierru *et al.* (2018), “Hamilton (2009) proposed a short-run global demand elasticity of -6% , but noted that it might be higher or lower.”

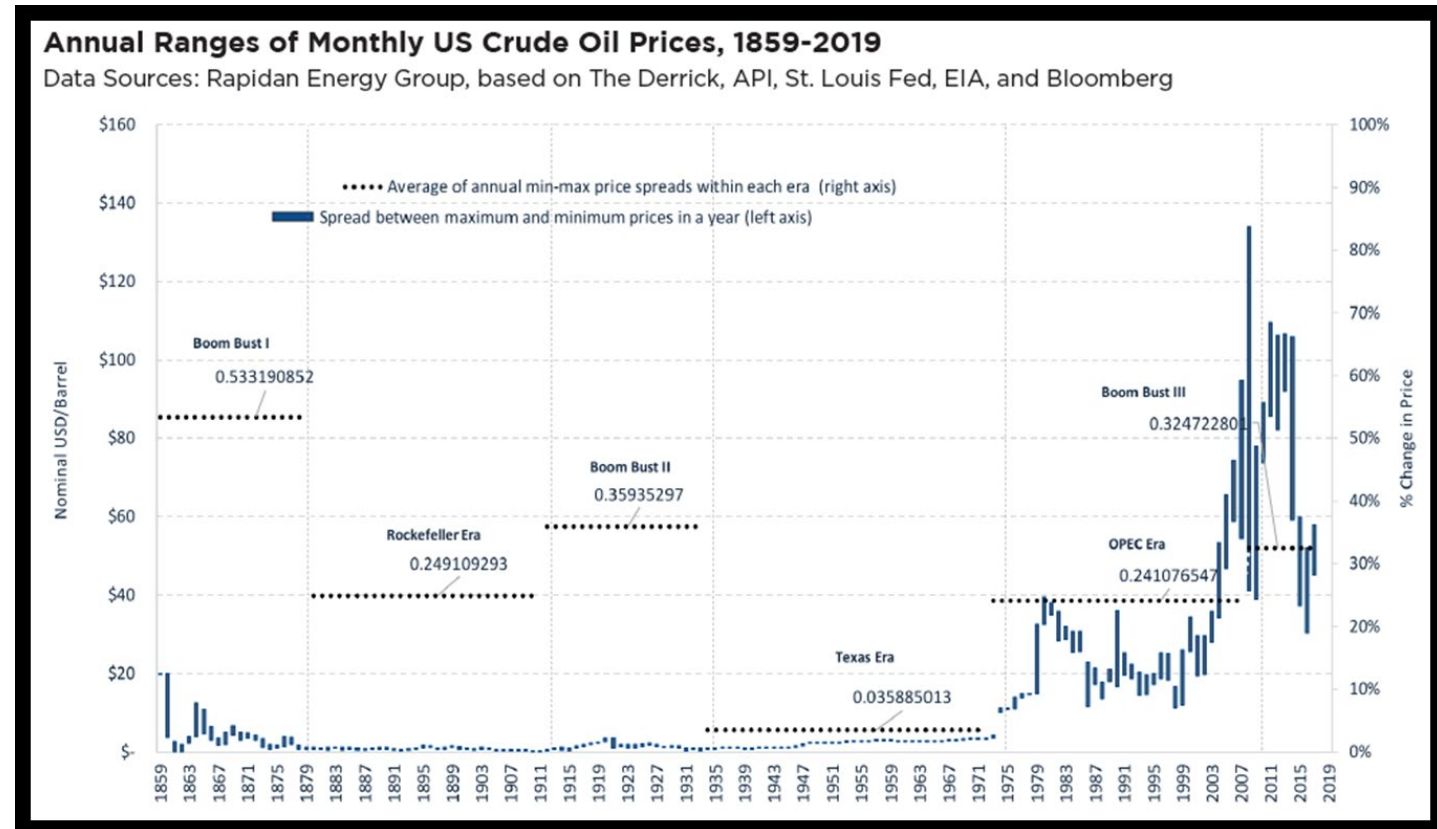


If that short-run global demand elasticity holds, “[t]his implies that an event that removed 6% of global oil supply would cause oil prices to double in order to eliminate the resulting demand surplus and rebalance the market. Oil supply is also inelastic or unresponsive to short-term price changes,” explained McNally (2020).

II. Why has Swing Capacity Historically Been Important?

A. “The Quest for Price Stability” [Continued]

“History has shown that the only true prescription for limiting oil’s volatile price cycle is through a ‘swing producer’ who is able and willing to adjust production quickly, and if necessary, for a long period of time to prevent supply-demand imbalances that would otherwise trigger harmful price instability.”



Source of Graph: McNally (2020).

II. Why has Swing Capacity Historically Been Important?

B. “The ... Value of OPEC’s Spare Capacity to the Global Economy”

OPEC (2010): “The Organization will continue making investments to expand its production capacity to not only meet perceived demand for its crude, but also maintain an adequate level of spare capacity.”

The IMF (2005) has referred to the “maintenance of adequate spare capacity as a public good” because of the role that spare capacity can play in reducing the volatility of oil prices.



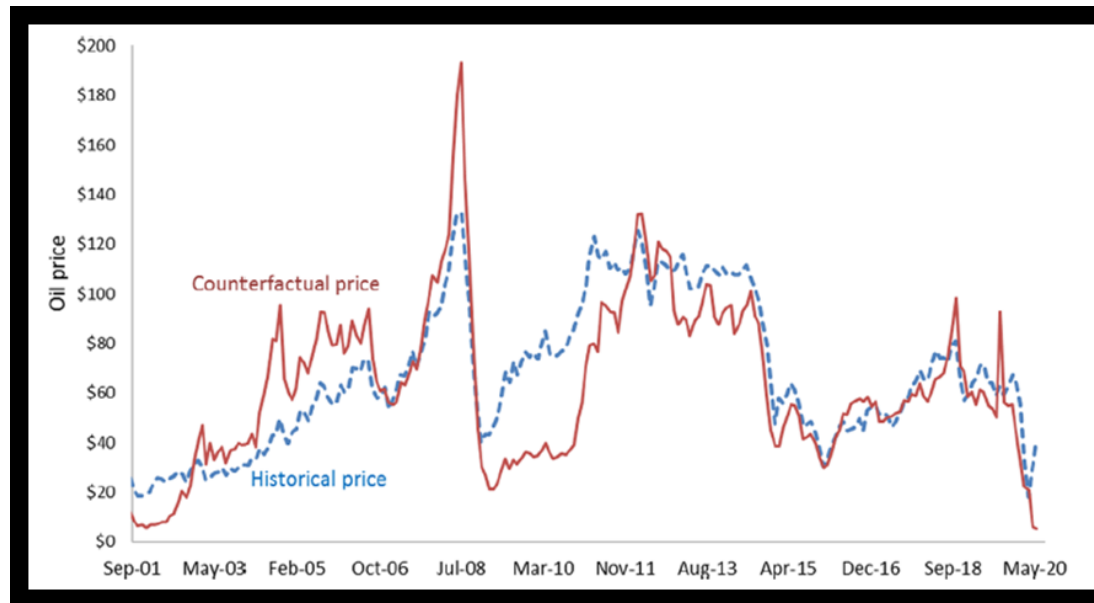
Source of Graphic:
Lecture hall at the University of Colorado Denver Business School's J.P. Morgan Center for Commodities.

II. Why has Swing Capacity Historically Been Important?

B. “The ... Value of OPEC’s Spare Capacity to the Global Economy” [Continued]

Pierru *et al.* (2020): “[G]iven an estimate of the elasticity of global demand for oil, a counterfactual history of price is obtained by calculating the price adjustments that would have been required for the market” to equilibrate supply and demand in the face of shocks – had OPEC not employed its spare capacity.

OPEC’s Spare Capacity May Have Reduced Oil Price Volatility



Source of Graph: Almutairi *et al.* (2021).

II. Why has Swing Capacity Historically Been Important?

B. “The ... Value of OPEC’s Spare Capacity to the Global Economy” [Continued]

Almutairi *et al.* (2021): “The value of OPEC’s buffer is determined by its ability to reduce the losses in the world’s GDP resulting from supply shortfall ...”

Based on comparisons to the counterfactual scenario of OPEC not having used its spare capacity to offset shocks, OPEC’s spare capacity is estimated to have generated \$193.1 billion in annual economic benefits for the global economy.

Counterfactual Monthly Volatility (Assuming OPEC’s Spare Capacity is Not Used to Offset Shocks)

Period	Commodity boom September 2001–October 2014	OPEC’s market-share campaign November 2014–December 2016	OPEC+ January 2017–February 2020
Historical volatility	8.6%	12.5%	7.2%
Counterfactual volatility	14.6%	12.1%	16.4%

Source of Graph: Almutairi *et al.* (2021).

III. Can U.S. Shale be a Swing Producer?

A. Shale is “Ill-Suited to ... Swing Producer Role”

McNally (2020): “In theory, shale’s shorter production cycle - quarters as opposed to the years required for conventional production - lowers supply inelasticity and makes it more responsive to prices.

But shale oil has proven ill-suited to the swing production role.

While it has shorter cycles than conventional oil production, shale output still does not adjust fast enough to prevent large imbalances.

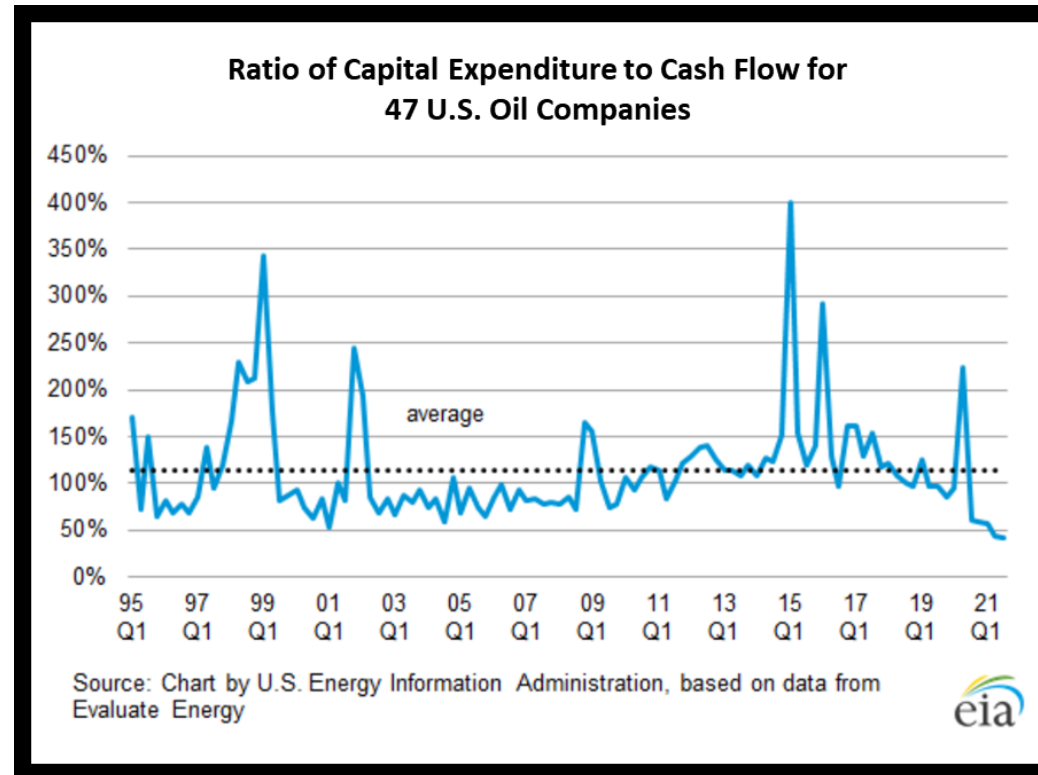
Even if shale companies were able to adjust swiftly enough, U.S. antitrust laws prohibit them from collaborating to do so.”



III. Can U.S. Shale be a Swing Producer?

B. Oil as the New Tobacco: The Pressure Not to Invest

Toplensky (2020): Like cigarette makers before them, oil producers [have] face[d] a state-sponsored drive to drastically cut demand for their products ...”



Source of Graph: EIA (2021).

III. Can U.S. Shale be a Swing Producer?

B. Oil as the New Tobacco: The Pressure Not to Invest [Continued]

Jesse (2020): “Western European banks are mostly looking to discontinue financing new oil projects over the longer term.”

Murti in Bordoff (2021): Traditional investors, governments, and ESG investors are all encouraging oil companies not to invest.

Sen in Bordoff (2021): In 2020, “88 banks and financial institutions that used to ... fund or finance fossil fuels stopped doing so.”

Therefore, we are back to asking the same question as in 2007:

“[W]here does the onus of maintaining sufficient spare capacity lie?”, citing OPEC (2007).

III. Can U.S. Shale be a Swing Producer?

C. Capital Discipline is Now Essential

1. The Resources Exist

Jesse (2020): The “new oil & gas revolution led by U.S. E&P companies ... unlocked 100+ billion barrels of U.S. shale oil resources.”

Murti in Bordoff (2021): “There is still quite a bit of non-OPEC supply that could come on in coming years, but [we are] ... in a world where Western oil companies (the U.S. shale producers, the majors) are coming off a decade of really poor profitability ...

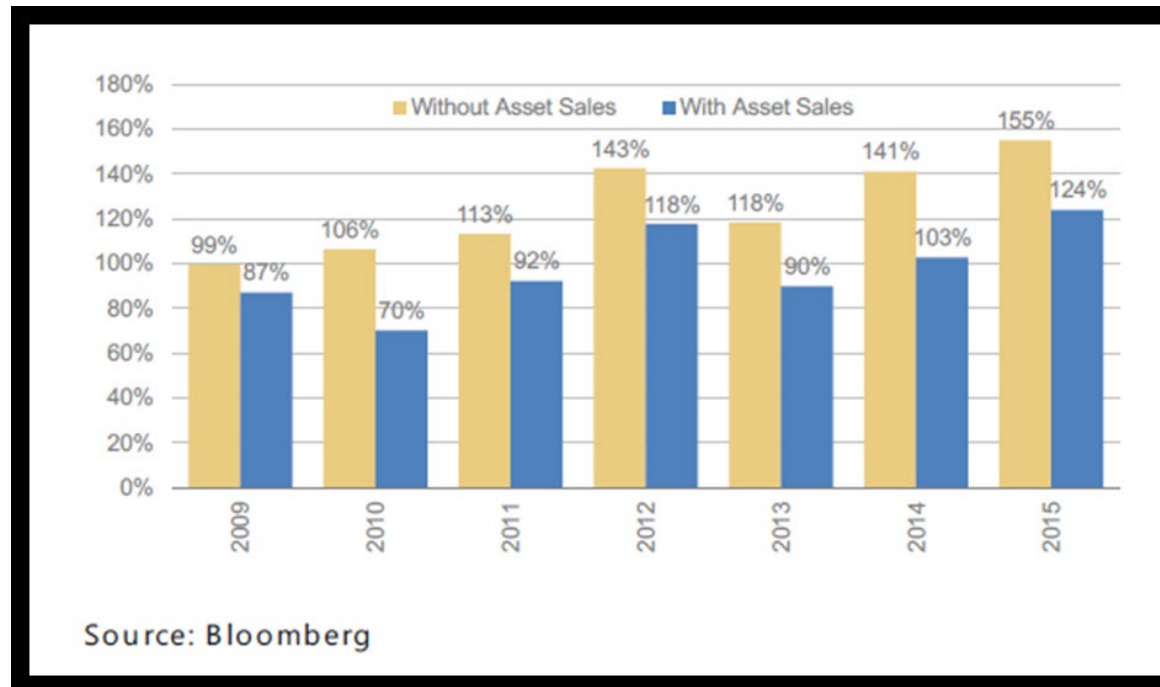
There is still an abundant shale resource to be developed, especially in the Permian Basin. ... This is not about [the world] running out of oil ... [given the] short-cycle resources, ... medium-cycle projects ... [and] long-cycle projects [that are all possible with investment.]”

III. Can U.S. Shale be a Swing Producer?

C. Capital Discipline is Now Essential

2. Past Cycle

Historical E&P Outpend (Capex as % of Cash Flow)



Source of Chart: Morgan Stanley Research (2016).

III. Can U.S. Shale be a Swing Producer?

C. Capital Discipline is Now Essential

3. Current Cycle



McCormick (2021): “After years of burning through investor cash in pursuit of ever-greater growth, America’s shale patch is suddenly making money.”

“[F]ree cash flow, a key shale investor metric determined by the difference between cash from operations and capex, is coursing through a sector that once exemplified value-destruction ...

[The] new [business] model involves not injecting cash back into drilling new wells but rather funneling cash back to investors in the form of healthy dividends.”

IV. When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?*

Arguably, OPEC Spare Capacity has not Predominated When There have been Sufficient Commercial Inventories

Sieminski (2018): “Spare capacity is only one piece of a much larger picture in terms of neutralizing the negative impact of oil shocks. By maintaining costly inventories, individual consumers, producers, government agencies, and multilateral organizations [can] also shoulder part of the burden of dealing with oil price shocks.”

- A. Short-Term: the Effectiveness of SPR Sales**
- B. Beyond the Short-Term: the Markets May Need U.S. Shale to Preserve the Spare Capacity Cushion**
- C. Still Need to Address the Global Shortage in Refining Capacity, Though**
- D. Long-Term: Consideration of Energy Efficiency Efforts**

* In the interest of time, this section is covered in the presentation's Appendix.

Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

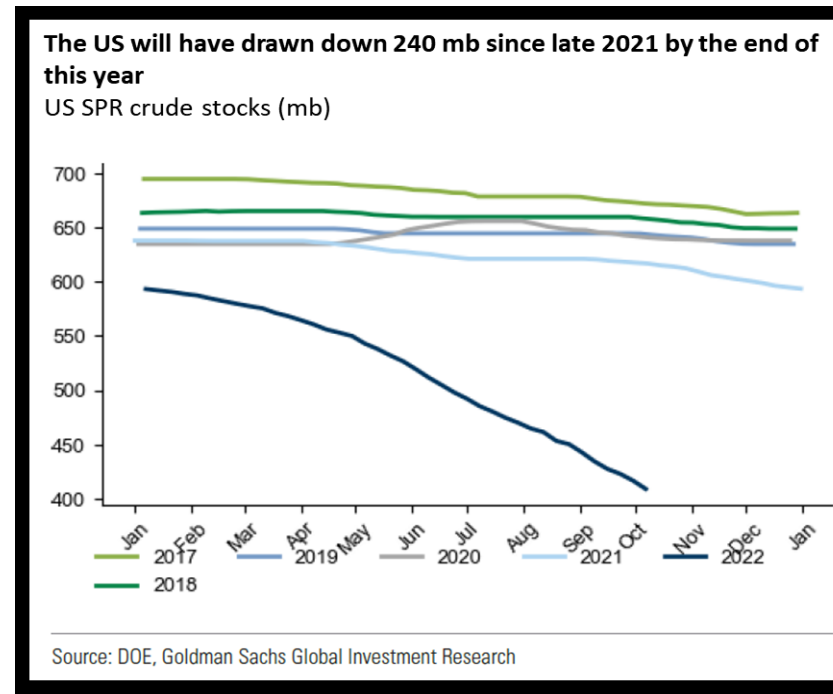
A. Short-Term: the Effectiveness of SPR Sales

Morse *et al.* (2022): “Coordinated SPR sales, especially U.S. SPR sales, have been pivotal for easing markets and prices ... [These] sales ... have added supply to the *commercial* part of the oil markets, which is most meaningful for oil price formation.” [Italics added.]

“The U.S. and its allies have become more flexible about using their huge SPRs as tools to manage oil market conditions.”

EIA (2022b): U.S. Days of Supply of Crude Oil as of November 4, 2022 are at 28 Days.

Source of Graph: Bruce *et al.* (2022).



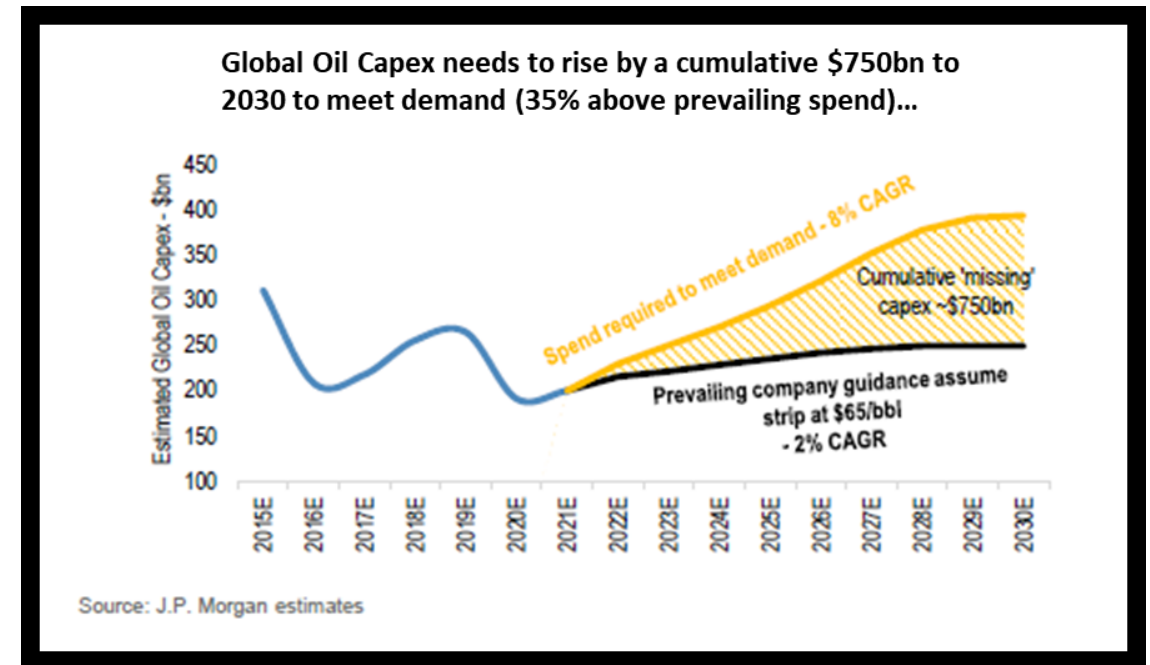
Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

B. Beyond the Short-Term: the Markets May Need U.S. Shale to Preserve the Spare Capacity Cushion

1. Lack of Capex Spending

HFI Research (2021): “Lack of capex spending and insufficient supply growth outside of OPEC and U.S. will lead ... to a structural supply deficit,” citing Goldman Sachs Commodity Research.

Egan (2021): “The central problem ... is that while OPEC nations have plenty of oil in the ground, they don’t have the capital and logistics to deliver it quickly[;] there is a \$750 billion gap in terms of global oil capital spending,” noted J.P. Morgan’s Head of Oil and Gas Research.



Source of Graph: J.P. Morgan Global Research (2021).

Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

B. Beyond the Short-Term: the Markets May Need U.S. Shale to Preserve the Spare Capacity Cushion

1. Lack of Capex Spending [Continued]

Jesse (2022b) explains that further supply growth is needed to “compensate for 4 percent annual declines in existing fields and [to support] ... [increased] global demand in the coming years.

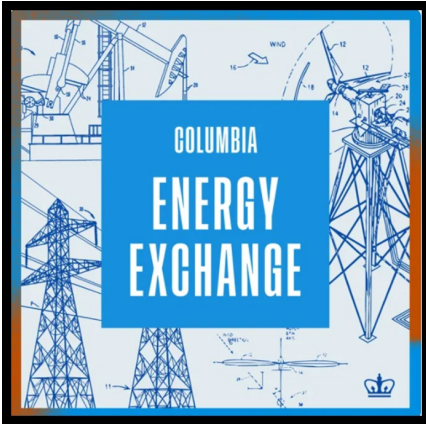
Without funding and investments, and without human resources and industry capabilities, markets ... [would be expected] to stay extremely tight,” absent a global recession.



Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

B. Beyond the Short-Term: the Markets May Need U.S. Shale to Preserve the Spare Capacity Cushion

2. Twin Goals: A “Non-Messy Energy Transition” & Avoidance of Energy Poverty



... As discussed by Arjun Murti, Senior Advisor, Warburg Pinkus, and Amrita Sen, Chief Oil Analyst, Energy Aspects, in Bordoff (2021).

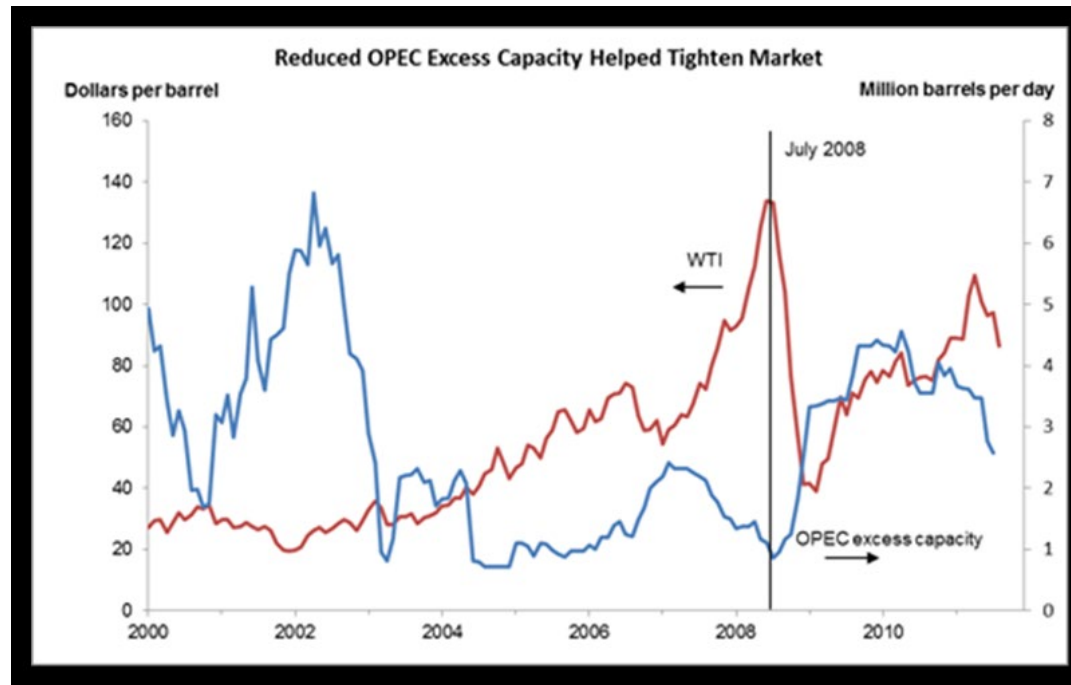
Sen in Bordoff (2021): “Structurally, [there is a] ... real investment hole that is already present, [which] ... will only get worse over the coming years.

... If there isn’t enough energy, you are talking about energy poverty that is going to massively inhibit economic growth.”

Murti in Bordoff (2021): “What motivates investors to come back?”

Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

- B. Beyond the Short-Term: the Markets May Need U.S. Shale to Preserve the Spare Capacity Cushion
- 2. Twin Goals: A “Non-Messy Energy Transition” & Avoidance of Energy Poverty
 - a. Understand the Dynamics of What Causes Oil Price Spikes

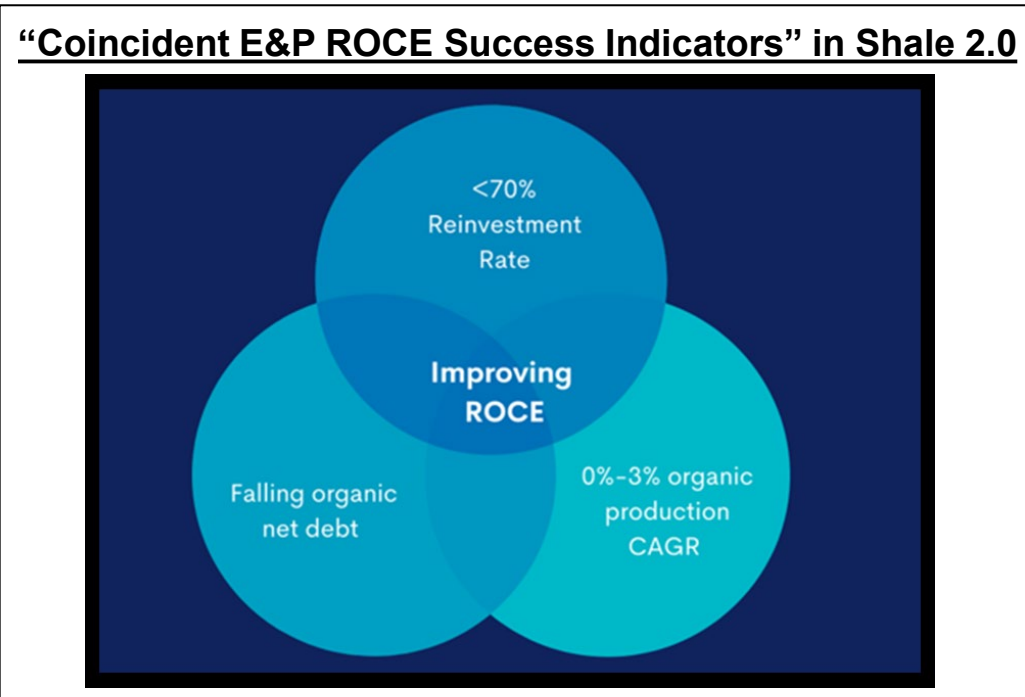


Notes: Oil prices are monthly average. The red line is WTI prices while the blue line is OPEC excess capacity.

Source of Graph: Plante and Yücel (2011).

Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

- B. Beyond the Short-Term: the Markets May Need U.S. Shale to Preserve the Spare Capacity Cushion
- 2. Twin Goals: A “Non-Messy Energy Transition” & Avoidance of Energy Poverty
 - b. Solve for Cost-of-Capital Return



Murti (2021a): “[It] is critical that” capex increases in order to avoid “an oil price super cycle due to insufficient non-OPEC supply growth.”

Note: ROCE stands for Return on Capital Employed.

Source of Diagram:
Murti (2021b).

Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

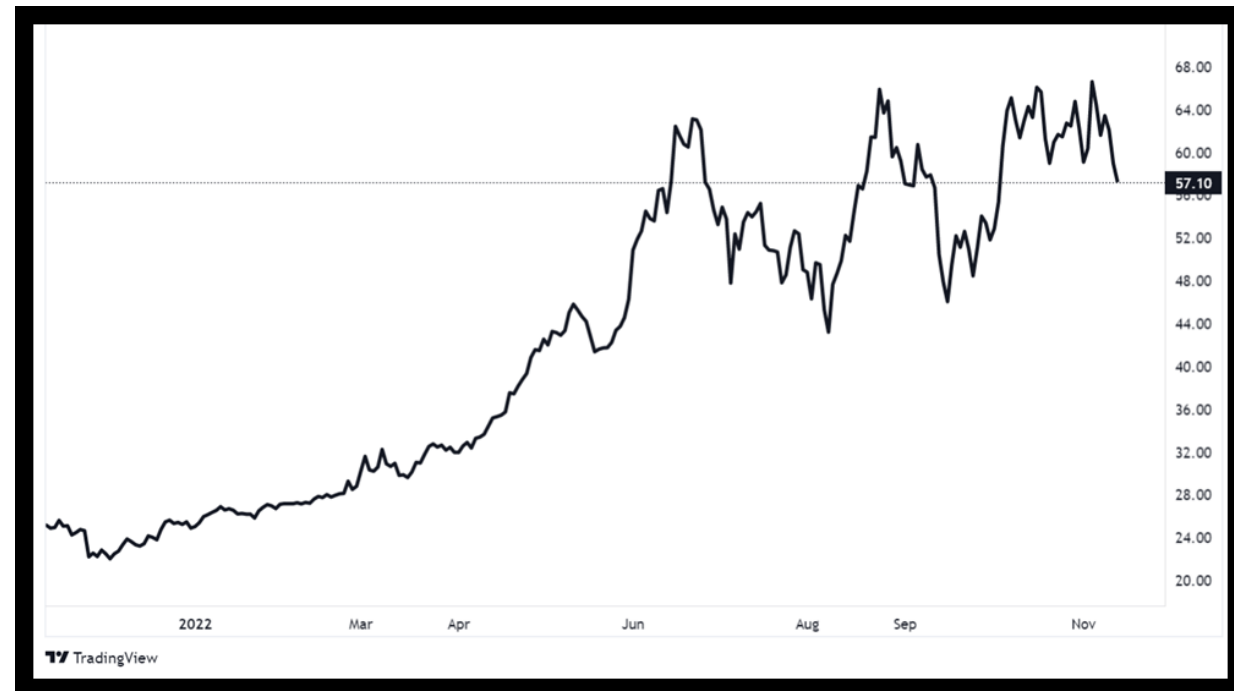
C. Still Need to Address the Global Shortage in Refining Capacity, Though

Bruce *et al.* (2022): There is “a lack of refined products and global (and especially domestic) processing capacity.”

“While the Northeast Heating Oil reserve remains an option, it amounts to all of 1 million barrels, roughly 6 hours of total U.S. distillate demand.”

* As discussed in CME Group (2017), this spread is “a gross representation of the direction of the distillate component of refinery margins against WTI crude oil.”
CME Group (2022) provides the exact calculation of this spread.

NY Harbor ULSD (Ultra-Low-Sulfur Diesel) Crack Spread*
in \$ per Barrel



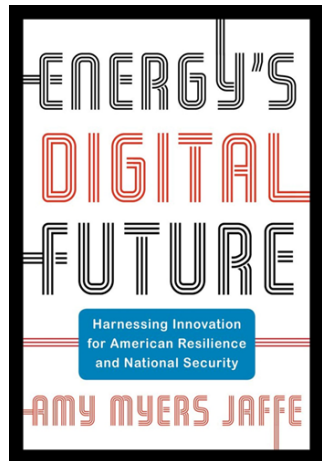
Source of Graph: TradingView (2022).

Appendix: When Would OPEC Spare Capacity Not Predominate as a Driver in the Price of Oil?

D. Long-Term: Consideration of Energy Efficiency Efforts

Jesse (2022a): “OPEC effective spare capacity is ... only readily available in Saudi Arabia, UAE and Kuwait.”

In order not to be dependent on such a small number of oil producers, this presentation has focused on supply-side solutions, namely U.S. shale and refining capacity.



But there are also lessons from the 1970s in considering energy efficiencies.

In “Energy’s Digital Future,” Jaffe (2021) discusses the current effect of (and the future promise of) “digital energy technologies,” defined as “the convergence of automation, artificial intelligence, big data, and the Internet of Things,” in potentially making a material impact on reducing oil demand.

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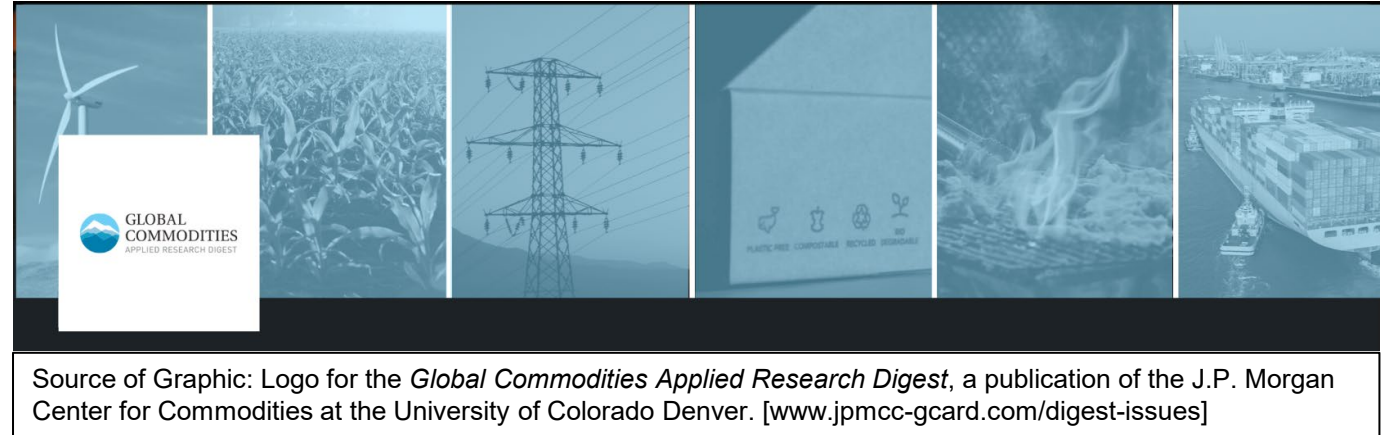
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