Post-COVID-19 and globalization of oil and natural gas trade: Challenges, opportunities, lessons, regulations, and strategies

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Summary
The Coronavirus (COVID-19) outbreak hit the global economy like a tsunami. Every aspect of human society, including the energy industry and market, is affected by this pandemic. The pandemic has affected prices, demand, supply, investment, and several other aspects of the energy sector, including the oil and gas industry. This article is aimed to analyze the impacts of COVID-19 on the oil and gas industry and give a perspective of the post-COVID-19 oil and gas market. Results of this article show that COVID-19 impacts the oil and gas industry. The short-term impact is nearly 25% decrease in petroleum consumption, slowly recovering to its former amount and even growing more. The long-term impacts are the 30% to 40% decrease in the CAPEX and R&D investments over the oil and gas market, which is a regional scale in the United States, caused oil exploitation projects to decrease from more than 800 in 2019 to 265 in 2021. And it is predicted to reduce the competitiveness of oil and gas vs other energy carriers such as ever price-decreasing renewable energies. Thus, the oil and gas industry has to change rapidly before losing a substantial energy market share. Finally, this article discusses acknowledging oil and gas trade as a part of World trade organization (WTO/ECT) regulations. And considering it a general energy commodity. An act that reduces the freedom of action of oil-exporting governments and great oil cartels and protects their interests in a globalizing competitive energy market.

KEYWORDS
energy charter treaty, energy systems, natural gas market, oil economy, petroleum industry, petroleum products, world trade organization

1 INTRODUCTION

Since the start of the 21st century, many theoreticians and philosophers mentioned a global crisis is outbreaks and involved the whole world.1 The Coronavirus (COVID-19) pandemic has changed the face of the world. Its impacts hit the economy like a great tsunami and damaged every economic sector. The International Monetary Fund (IMF) predicts that economic growth will be around −4.1% by mid-2021. However, the EU and USA damaged deeper than the world average. For example, Italy and Spain faced a −12.8% decrease in their economic volume (GDP). Although the infected population has grown rapidly in the United States, the economic growth rate decreased by −8% by 2020. An introduction to healthcare problems is needed to understand the crisis.
and its impacts better. Thus in the next paragraphs, we discuss the storyline of COVID-19 over the world. As of Feb 2021, the number of people infected with the COVID-19, which has been officially confirmed, has exceeded 105 million. Of this number, more than 2.3 million people have lost their lives. So far, more than 222 countries have been infected with the virus.1

By the end of April 2020, most new cases were reported from Europe. Approved cases in the United States, meanwhile, were rising rapidly. In the United States, the sharp increase in the number of new cases in May 2020 has made it one of the countries with the highest incidence of COVID 19. California, New Jersey, and New York had the highest number of new deaths during May 2020. But all these numbers are statistics published by governments and differ from what simulation models show significantly. As of Feb 2021, about 2 billion people had been infected with the virus, according to the Rystad Energy Institute simulation model, but the number of officially reported cases to date has been about 105 million (these different statistics are due to the protocols of confirmed cases). Official statistics show only ~5% of the actual cases (according to the rest model). The virus outbreak is still in its infancy, and it is unclear how long this epidemic and its negative economic effects will continue. The effects of this crisis on the upstream part of oil and gas and oil and petrochemical products will be examined in the following.

As mentioned in the facts above, COVID-19 has been swiping the world. And by late 2020, reached to more than 75 million confirmed cases, and more than 1.7 million deaths in 220 countries all over the world had been reported to the World Health Organization.2 In comparison to the early 2020 COVID-19 outbreak and the 1918 Spanish flu pandemic, a study done by Faust2 suggests that the COVID-19 pandemic might get more severe than the most deadly pandemic twentieth century. Many indexes such as quarantine, social distancing, and lockdown have been implemented to face the COVID-19 pandemic.3 COVID-19 pandemic has harmed many industries, including agriculture, manufacturing, finance, education, healthcare, sports, tourism, and food.4 However, several new ways of controlling infectious diseases are being proposed in 2020, and researchers in this field are working to develop newer methods to minimize the economic and social impacts of the COVID-19. For example, early detection of SARS-COV-2 without human intervention drone technology is one of the most recently mentioned technologies.5 Several new advancements in modeling and understanding COVID-19 transmission have been achieved during 2020 to 2021, helping control the infection.6,7 Although many advancements and developments happened in controlling the disease, it still severely impacts the industry and economy. One of the most important parts of the industry, which damaged significantly from the illness was the energy industry. And the energy industry was not immune to those harms.8 According to data from the International Energy Agency (IEA),9 the shock to energy demand-side in 2020 was the largest in the last seven decades. World's energy demand in 2020 decreased by 6% compared to 2019, a decline more than seven times greater than the 2009 financial crisis.

In comparison to the average amount from 2015 to 2019, the total average power production from 16 European countries in April 2020 declined by 9% (25 GW), where conventional energy generation decreased by 28% (24 GW), nuclear energy decreased by 14% (11 GW), while renewables increased by 15% (15 GW).10 Although overall energy demand declines are simple and clear, the repercussions are very complicated in different energy types and consumption patterns. The energy industry is on the way to understand the complicated impacts and identify emerging opportunities.

Some existing literature and studies overviewed the changes and challenges with various focuses. A study by Brosemer11 provided a perspective review of the energy and power crises related to the intersections of inequity, indigeneity, and health. Another study by Zhong12 reviewed the implications and challenges of COVID-19 for the electricity sector. They stated that increased uncertainty of electricity demand posed greater pressure on system operators. Fell et al13 studied the considerations, challenges, and responses for the energy social research during and after pandemics. Mastropietro et al14 reviewed global emergency measures on energy consumer protection during the pandemic. More studies are focusing on problems in specific countries or regions, such as the analysis of the short-term impacts on the USA electricity sector,14 the review of government interventions in South Africa,15 the review of solar energy development in Malaysia,16 the impact analysis for electricity sector performance in India,17 the overview analysis of impacts on electricity grid dynamics in Europe,10 the overview of impacts on electricity and oil demand in China,18 and the impacts of containment measures on European electricity consumption.19 The studies mentioned above are dedicated to the knowledge of the impacts of the COVID-19 outbreak from different perspectives. In the urgent and emergent ambient under COVID-19 outbreak, more dedication is vital, and it is beneficial for the whole energy industry and society by providing more views. This study investigates the global impacts and challenges of COVID-19 outbreak on oil and gas upstream and downstream industry and its market status and highlights energy-related lessons and
emerging opportunities. Data used in this article are based on currently available data from the relevant agencies, and due to fast development, it cannot be precise and is not enough to be used in developing quantitative models. The value of this article aims to be presenting an overall view of the oil and gas industry in the post-COVID-19 world and add some new points on strategic energy management of challenges while there is not enough data available for quantitative models. This article aims to contribute to the new lessons and emerging opportunities by capturing main trends rather than details with precise data. And in the final discussion, challenges and opportunities caused by the COVID-19 pandemic are analyzed, and recommendations are made for Organization of the Petroleum Exporting Countries (OPEC) member countries. Some policy and strategy recommendations are also mentioned in the following sections to handle this shift in the global oil and gas industry.

2 | POST-COVID-19 OIL INDUSTRY

Demand for crude oil has fallen sharply due to the COVID-19 virus and the resulting economic downturn. Consequently, various crude oil indices have again reached their lowest level by mid-2020 (2016 prices). The reports of various institutions concerning crude oil demand are examined and discussed in this section.19,20

2.1 | International energy agency

In its latest oil market report in April 2020, the IEA reported that the average annual oil demand in 2020 decreased by about 9.2 mbb/d than 2019. The agency also stated a 29 mbb/d drop in April 2020 demand due to an approximate shutdown in countries affected by the COVID-19 compared to April 2019. Oil demand was last seen at this level in 1995. The organization also mentioned that oil demand in the second quarter of 2020 was 23 mbb/d less than the same period in 2019. According to the IEA, oil demand improved in the second half of 2020. However, oil demand in December 2020 was still 2.7 mbb/d lower than in December 2019.18

Regarding oil supply, the organization considered that in May 2020, crude oil supply decreased by 12 mbb/d after the OPEC Plus agreement to reduce 9.7 mbb/d from its production volume. The organization also reported that oil production in other countries. And on top of that, the United States and Canada are reduced. According to the organization, the total decline in oil production of non-OPEC countries in the fourth quarter of 2020 has reached 5.2 mbb/d.19 The average production of non-OPEC countries in 2020 was about 2.3 mbb/d lower than the average production in 2019.

2.2 | US energy information administration

The US Energy Information Administration (EIA) reported total crude oil consumption in the first quarter of 2020 to be 94.1 mbb/d, down 5.8 mbb/d from the same period in 2019. The agency also mentioned that the average oil demand in 2020 was about 8.1 mbb/d lower than 2019 demand, which was 100.7 mbb/d. The EIA believes that oil demand at the end of 2021 will increase by about 7 mbb/d compared to 2020.20

The organization also reported that the average volume of oil stored in 2020 compared to 2019 increased by about 2.6 mbb/d. The volume of stored oil will increase by 6.6 mbb/d in the first half of 2020 and by 5.11 mbb/d in the second quarter of 2020 due to widespread transportation restrictions and a sharp decline in economic activity.21

Brent crude averaged $18 a barrel in April 2020, down $13 from March 2020. The agency stated that the average price of Brent oil in 2020 would be around $34 per barrel. The average price of Brent oil in 2019 was about $64 per barrel. The organization forecasts Brent crude oil price in the second quarter at $23 per barrel and in the second half of 2020 at about $32 per barrel. Brent crude averaged about $48 a barrel in 2021, according to the organization.22 But due to the coalition of the OPEC+ and other major oil-exporting countries, the oil price has been recovered to the 2019 levels by the end of 2020. But several publications stated that the oil market is volatile in a time of crisis, and major shares of oil-exporting income in the GDP of countries can be destabilizing.

2.3 | Wood Mackenzie Institute

The Wood Mackenzie Institute stated crude oil demand in 2020, taking into account two scenarios. Under the first scenario, 1A, which assumes that the virus will re-emerge and the economy will grow slowly and long-term, oil demand will decline by 11.4 mbb/d in 2020. For oil under the second scenario, 3A, which is supposed to control the COVID-19 virus and slow the economy's recovery, will decrease by about 5.4 mbb/d in 2020. Wood Mackenzie forecasts crude oil demand in 2020 before the COVID-19 virus outbreak 100.8 mbb/d (Figure 1).23
2.4 | Rystad-Energy Institute

The Energy Rystad Institute reported oil demand growth in April at -27 mbl/d amount in its latest report. It also mentioned demand growth of minus 11.4% in 2020. The chart below shows various organizations’ latest reports regarding oil demand growth (see Figure 2).24

2.5 | Oil resources and price

Crude oil reserves have risen sharply since Russia’s deal with OPEC broke, and oil demand plummeted following the outbreak of the COVID-19 virus. For example, according to Reuters, China stored about 1.98 mbl/d of crude oil in the first quarter of 2020. Meanwhile, China’s crude oil reserves for the same period in 2019 were about 1.07 mbl/d.

Since early April, the United States had stored an average of more than 15 million barrels of oil per week. Thus, in the first 3 weeks of April, US crude oil reserves are around 2.2 mbl/d. In the United States, the persistence of the COVID-19 virus and declining oil demand, as well as limited oil storage capacity, pushed the price of West Texas Intermediate (WTI) futures into negative territory near the time of physical delivery. The WTI Index is located in Cushing, Oklahoma.19,20

The storage capacity of the Cushing facility is about 70 million barrels. As of 20 April, about 50 million barrels of the facility had been completed, and the remaining capacity was leased to institutions or individuals. So on this day, there was no capacity for people who had not acted before. Thus, the people who had the oil purchase vouchers had no place to store oil, and on the other hand, the cancelation penalty was very high; and In general, the momentary negative dynamics of prices in the futures market can be changed by three factors: 1- Increasing oil demand 2- Creating new storage tanks 3- Stopping oil production by the producer.25

But a negative future oil price on a trading day does not mean a negative oil price as a commodity. In the physical market, the price of oil is such that the oil producer enters into a long-term contract with the refinery, and the price of oil is determined every month, and the financial settlement is made every month. This formula is the weighted average of futures prices in the previous month. Since futures prices are positive on most days, oil prices will also be positive.26 If the average oil price is lower than the producer’s oil extraction price, the producer will decide to stop production. Therefore, the average price and not the oil price on a trading day will be the producers’ criterion to decide.

Oil reserves in other parts of the world are also running low. According to the company’s latest data, Kepler Energy Data is available from a capacity of 5.3 billion barrels of onshore storage, about 600 to 700 million barrels. With onshore reservoirs filling, companies and countries have turned to tankers to store oil. About 180 million oil barrels are currently stored in floating reserves, about one-third of which comes from Iranian...
and Venezuelan oil. If oil demand does not increase and producers do not reduce their oil production, the price of other indicators, including Brent, could fall negatively as oil reserves fill up and there is no tanker to store oil.27

Since the main reason for the decline in oil demand has been the decline in fuel demand in the transportation sector, with the gradual lifting of traffic restrictions, oil demand will gradually increase, and oil prices will gradually return to previous levels. But after controlling the COVID-19, two points can affect the return of oil demand and prices to pre-outbreak levels19:

1. Lifestyle and business change: If COVID-19 is not controlled soon, conferences and business meetings will be held in webinars and virtual, and most jobs will be done in absentia. Even after the COVID-19, the world may get used to this style of doing things. In this case, oil demand may never return to the previous level due to reduced traffic.

2. Oil war between Saudi Arabia and Russia: Saudi Arabia and Russia compete for more market share, especially in East Asia, although not currently the main cause of falling prices, in the post-COVID era if the two countries continue to fight due to declining demand in East Asian countries, oil is likely to return to previous prices.

### 2.6 Investment in the upstream oil sector

Given the sharp drop in oil prices and the reduction in capital costs for most major oil companies, a drop in investment in the upstream oil sector is inevitable. Assuming an average price of $34 per barrel for crude oil in 2020 and $44 per barrel for 2021, the Energy Restructuring Institute predicts that upstream investment will decline by about 20% in 2020, equivalent to $100 billion, compared to 2019.17 Figure 3 shows the decrease in investment in each of the oil production sources; shale oil and sand oil will experience a further decrease in the upstream investment area.

According to the Wood Mackenzie Institute, reducing investment costs in the upstream oil and gas industry will directly impact production over the next few years.11 The big projects that were about to make the final investment decision, FID, by 2020, would add about 1.8 million barrels per day to oil production and 20 billion cubic feet per day to gas production by the mid-2020s. But now, delays in projects and their cancelation mean that 90% of this increase in production is unlikely to happen at all.22

According to the IEA’s latest forecast, global investment in energy by 2020 will be reduced by about 20%, or $ 400 billion, as the risk of COVID-19 disease slows the transition to clean and sustainable energy systems. The agency predicts that government and industrial energy revenues will fall by more than $ 1 trillion this year due to falling demand, falling prices, and non-payment by the public.27

The oil sector will experience the sharpest capital cuts, according to the IEA. According to the report, global investment in the oil and gas sector will decline by almost a third in 2020. US shale oil will be hit hardest by a 50% drop in investment. The reduction in upstream investment in 2020 is projected to reduce crude oil supply by about 2.1 mbl/d by 2025 and natural gas supply by 60 billion cubic meters by 2025.28

### 3 POST-COVID-19 NATURAL GAS INDUSTRY

Demand for natural gas also fell sharply due to widespread quarantine in various parts of the world,
especially China, India, and Europe. This decline in demand has pushed the price of natural gas and LNG points in Asia and Europe to their lowest level in years.

The Platts JKM Index for LNG’s current price has fallen below $2.3 per million BTU, and this downward trend will continue. The price of LNG in long-term contracts that depend on oil prices has also dropped to $2.4 per million BTU, and now, due to the lack of market reaction to the agreement to reduce the production of OPEC plus and the continuation of the downward trend in oil prices, Omidy There is also no LNG to increase the price.

These prices are much lower than the head-to-head price of LNG for manufacturers, and manufacturers will likely avoid further losses by reducing LNG production.

Although the decline in LNG production may seem inevitable, Platts analysts believe that LNG demand will increase in 2020, unlike many other industries. “We expect the LNG market to grow by about 19 billion cubic meters, or 4%, by 2021, similar to 2019, the market experienced 11% growth, equivalent to 5.47 billion cubic meters” (Figure 4).

Given the high cost of transportation from the United States to Asia and the high price of shale gas, the likelihood of a decline in US shale gas production this year is very high. According to the US EIA, the average US gas production will increase from 92.2 billion cubic feet per day in 2019 to 91.7 billion cubic feet per day in 2020. According to the organization, the monthly gas production of the United States will increase from 94.4 billion cubic feet in March 2020 to 5.87 billion cubic feet in December 2020. The main reasons for the decline in gas production are the decline in Appalachian field activity and mobile gas production in it will be Permian Square. But this reduction in gas production does not necessarily mean a reduction in LNG exports. Platts analyst group believes that the United States will increase its LNG exports by launching new infrastructure. And this increase in exports is almost certain because the US produced about 49 billion cubic meters of LNG in 2019, while US LNG production will be more than half of that amount by the end of April 2020.

In Europe, the gas price at the German Title Transfer Facility (TTF)* hub has reached its lowest level in recent weeks, at €8 per MWh. According to Hans Koenig of the Aurora Consulting Institute, Germany’s wholesale electricity index price has also fallen to 5.33 euros per megawatt-hour in recent weeks. Reduce gas imports through the pipeline could reduce gas production in producing countries such as Russia and Norway. Germany could shrink by 20% by 2020 (wholesale electricity prices are projected to fall by about 4.7%).

In China, although the country’s gas demand forecast has fallen by 11 billion cubic meters to 323 billion cubic meters, it still shows a growth of 7% compared to 2019. The Energy Restoration Institute predicts that most of this increase in demand will come from Russia through the recently launched Siberian Power Pipeline.

4 | UPSTREAM AND DOWNSTREAM OIL AND GAS INDUSTRIES

4.1 | Oil and gas refineries

The worldwide spread of the COVID-19 and the restrictive measures taken by countries worldwide to combat it have also upset the supply and demand balance of the downstream and petrochemical sectors. In the refinery

![FIGURE 4](image-url) Time course of the decline in the price of various LNG indicators in 2020 [Colour figure can be viewed at wileyonlinelibrary.com]
sector, most petroleum products, especially products related to the transportation sector, such as gasoline, jet fuel, and ship fuel, fell. For example, the price of gasoline delivered to US ports reached its lowest level on 31 March 2020, at 14.5 cents per liter. According to Definitive Icon data, in early April 2020, jet fuel production’s profit margin compared to the Dubai Oil Index price was negative. It dropped by three and a half dollars per barrel. Since 2009, when the institute initiated data entry, this is the first time that the profit margin for jet fuel production has been negative. Singapore’s jet fuel profit margin was $10 a barrel on 10 March 2020.15,25

Among the different fuel types, jet fuel prices and demand have suffered the most downward pressure. According to energy rest analyst Magnus Neeson, jet fuel demand may not be fully recovered even by 2021, as travelers will continue to worry about long-distance travel, and various businesses have become accustomed to meeting via video conferencing. While agricultural and shipping exemptions from extensive quarantine have boosted demand for fuel oil and diesel, jet fuel demand remains weak, given that about 23 000 commercial aircraft are grounded.27 The price of jet fuel in Singapore with the symbol JET-SIN fell by about 61% in March and February, and the profit margin of jet fuel production is still very low. The situation is similar to gasoline. The sharp decline in demand and surplus supply has pushed prices to their lowest level in decades. The US EIA forecasts in its latest short-term energy outlook report that the average price of gasoline in the United States in the summer, which is the peak of fuel demand, is about $1.5 per gallon (equivalent to 9.35 cents per liter). Meanwhile, the average gasoline price in the summer of 2019 was about 28.7 cents per liter.28

This drop in prices and demand in the petroleum products sector has led most refineries worldwide to reduce the volume of oil imports and exports of their products. For example, China refinery giant Sinopec cut its exports of petroleum products in the second quarter of 2020 compared to the same period in 2019. One of the company’s units, the Guangzhou Petrochemical Complex, cut its jet fuel exports by 70% in April from the normal level of 100 000 tons per month. PetroChina also reduced exports of the Liaoyang Petrochemical Complex and the West Pacific Petrochemical Company by 50% and 22%. In the second half of March, China’s gasoline exports fell by about 200 000 tons compared to the first half of March, which probably indicates the beginning of a downward trend in exports with the expansion of the corona pandemic.19 In India, the Indian Oil Company has reduced oil imports by 50% to its nine refineries. Chennai Oil Company of India has also reduced oil volume entering the Manali refinery by 30% to 35%. Other refineries and petrochemical plants in India, including Bina Refinery, Mangalore Petrochemical and Refinery Complex, and MIA Refinery, have reduced their oil inputs by 20% to 50%. Oil inflows to many refineries in other countries, including Pakistan, Thailand, South Korea, Australia, and Taiwan, have also dropped significantly. Given the persistence of traffic restrictions, both at the road and air level, and the lack of a clear vision for corona pandemic control, it is unlikely that fuel products’ price and demand will improve to pre-Corona levels.27

### 4.2 Petrochemical industry

Like other sectors, the petrochemical sector has faced supply and demand constraints due to the COVID-19 outbreak. Reducing refineries worldwide will lead to less feed (LPG, naphtha, etc.) for the petrochemical industry, and petrochemical producers are thinking about adjusting their production volume. Will enter the automotive and construction industry. Synthetic tires, propylene, acrylonitrile-butadiene-styrene (ABS), and polystyrene will see a sharp drop in demand. With the global economy facing its worst recession since 1930, buying a new car will be the last thing on. People think that the automotive industry is one of the major customers of petrochemicals, with more than a third of raw materials for a car being petrochemical products.3,29

Of course, as soon as traffic restrictions are lifted, demand in the automotive sector is expected to rise sharply as people worldwide will turn to private cars for some time for fear of the COVID-19. Synthetic tires, especially styrene-butadiene (SBR) tires, will suffer the most from the downturn in the automotive industry, accounting for about 70% of SBR production. According to ICIAC data, 10% of propylene demand is also related to the automotive industry, and the loss of this demand can have a significant impact on the petrochemical industry.

![Figure 5: Global end-use petrochemical market](wileyonlinelibrary.com)
major impact on propylene production. Of course, a large part of the demand for propylene, as shown in Figure 5, is related to the packaging sector, in which the growth of demand in this sector during the quarantine period can, to some extent, support the demand for propylene. Demand for polycarbonate and ABS in the automotive sector is almost identical. ICIAC analyst John Richardson believes that in 2020, polycarbonate and ABS production will see negative growth compared to 2019.\textsuperscript{30}

Among petrochemical products, ethylene’s demand is in good condition due to its applications in basic foods, health and medical materials, and packaging. The prices of petrochemical products have also decreased due to the fall in oil prices. In the United States, polymer prices have reached their lowest level in 17 years.\textsuperscript{17} In Europe, ethylene and propylene prices fell to €200 and €175 per tonne in April 2020, respectively. China is projected to import about 61% of net polyethylene and about 41% of net polypropylene in 2020. Manufacturers worldwide have invested heavily in steam crackers and export facilities to meet China’s seemingly insatiable demand for the two materials. If the Chinese demand growth for these two products is disappointing this year, the two products will face a large supply surplus in the market, reducing their price.\textsuperscript{1}

Demand for chemical products has plummeted in all final markets, global supply chains have been disrupted, the prices of petrochemicals in petrochemical companies worldwide have plummeted, and producers’ competitive order has changed overnight. It has become deep. The following is the most important impact of the outbreak of COVID-19 on the petrochemical industry\textsuperscript{15}:

- Sudden oversupply, supply disruptions and demand shocks

Declining demand has put the petrochemical industry in a state of oversupply, which was on the verge of collapse before the COVID-19. The automotive, transportation, and consumer goods sectors were among the final markets to suffer the most from the outbreak, with demand for their products falling by about 30%. On the other hand, demand for pharmaceuticals, food additives, and disinfectants has increased, and chemical companies operating in these sectors report that demand for these products has increased dramatically. Figures 6 and 7 show the COVID 19 outbreak's impact on chemical production worldwide, by region and type of chemical, respectively.\textsuperscript{15}

As shown in Figure 6, due to the outbreak of COVID-19, the production of various chemical and petrochemical products in March 2020 decreased by 3.1% in the world. Although production of chemical and petrochemical products increased from January to March 2020, production in the rest of the world declined significantly during the same period. During this period, the largest decrease in chemical product production was related to the Asia-Pacific region, which decreased by 5.1%. In this region, China is in the first place with a decrease of 8.3% in chemical products production.\textsuperscript{18}
As you can see in Figure 7, although in January 2020 compared to December 2019, some groups of chemical and petrochemical products increased, the production of chemical products in February compared to January and March compared to February, it decreased in all groups. Compared to February, the highest decrease among different petrochemical products in March was related to the group of paints, whose production decreased by 12.9%.19

• New global order following the fall in oil prices

May 2020, crude oil prices fell the most since the 1991 Gulf War began. The fall caused a dramatic change in chemical feed prices and a competitive world order. The United States lost its cost advantage for shale gas production, and the Middle East was severely affected. Figure 8 shows the changes in oil prices from 2000 to April 20, 2020.2

The impact on Asia is 2-fold, given that China is the world’s largest importer of crude oil, as lower inputs are offset by lower commodity prices and virtually no profit. Europe is also benefiting from lower feed prices while increasing the production of specialized chemical products will significantly increase their profits, but the important point is that the feed used in specialized chemical products is not crude oil.12

• Increasing the speed of reverse globalization and supply chains

In response to widespread disruptions in the global supply chain, petrochemical companies have begun to produce vital chemicals and pharmaceuticals (eg, active ingredients in pharmaceuticals, disinfectant gels, and masks) closer to the final consumer markets. Trade antagonisms and trends in the structural sectors affect supply chains, and now the reverse globalization trend is accelerating.

• Incremental fluctuations and new winners and losers emerging from volatile stock markets

Since the beginning of 2020, petrochemical and chemical companies have seen a significant decline in the value of their stocks, and their future depends on
their performance in the face of the COVID-19 virus (and the effect of crude oil prices) and their financial strength. Some companies with a strong leadership and management system could overcome the crisis and even grow their market share. Companies in financial trouble and whose portfolios no longer have the past benefits may find themselves in a critical situation and unable to survive in their current form and size.19

- Unpredictable boom for interaction and integration and otherwise spread of recession

In a major change compared to recent years, the market for interaction and integration for petrochemical and chemical companies is now getting closer and closer to its stopping point. However, this crisis may lead to a boom in the market, but otherwise, it will lead to a widespread recession in this market because, before the pandemic of COVID-19, some companies’ value had reached a maximum demand outlook good.21

- The unique catalyst for innovation and design of new business models

It is usually a catalytic crisis for innovation, launch, and design of new industry structures and cost levels. For the petrochemical and chemical industries, this is a unique opportunity to get closer to the end consumer markets and change digital and innovative business models based on customer demand. By interacting with their customers, petrochemical companies can get rid of the trap of commodification and price calculation based on value instead of weight.13,14

- The need to achieve responsible supply chains for future generations

Despite the current challenging period, the petrochemical industry must put its long-term goals at the heart of its response to the outbreak of COVID-19, not only economically but also in environmental and social terms. The petrochemical industry can use its historical experience to improve our living standards and strengthen its innovation and flexibility to engage supply chains (from participating in safe and cheap access to water and food to energy and transportation without carbon). These opportunities are also sufficient and include developing technologies related to 3D printing, polymer recycling, green hydrogen as an energy source, and bio-energy products. Now is the opportunity to increase green investment and implement the United Nations Sustainable Development Goals through government stimulus packages.15

5 | DISCUSSION

5.1 | Global economy and COVID-19

The global economy has been affected by the pandemic. On the global scale, capital flows, and population trend changes, and in the regional scales, unemployment, and rising gaps can be seen.16 United Nations conference estimated that the foreign investment (FDI) would decline by 30% to 40% in 2020 to 2022. Also, the tourism industry will experience long-term damages from travel restrictions and lifestyle changes.17 These forecasts were verified by a 60% decline in the flights even when the vaccination is started in many countries.

On the other hand, global lockdowns positively impacted the IT industry, and many internet-based frameworks were bloomed during the pandemic.19,20 Lockdowns also caused several shocks in the domestic and international stock markets. And the market risk aversion is increased due to the pandemic restrictions at a rate that has not been seen since the global financial crisis.21,22

Statista indicated that in March 2020, all international stock indexes fell in value due to the pandemic outbreak, although decreasing indexes, later experienced record-high single gains. Dow Jones Industrial index on 24 March 2020 was a good example of that, and similar occupations happened in the Japanese benchmark and other major ones.23,24

Meanwhile, global restrictions caused layoffs in the human capital market. In the United States, the unemployment rate Skyhieghted after the restrictions due to the high-human capital market volatility.15,17 A significant unemployment increase was detected in increases in the number of initial unemployment insurance claims per week in the USA by mid-march 2020 (from 282 thousand to 7 million). An American research center has stated that the US unemployment rate was as high as the great recession.18

Briefly to say COVID-19 outbreak is a special case for the global economy for many aspects.22,25 The most vital one is the side that for several years the world economy has not faced external supply side shocks. Instead, it is usually used to face negative demand-side shocks that impacted financial conditions. But the SARS-COV-2's outbreak began with a supply side shock on world markets as PR China was made to decrease its exports by a staggering 17% in early 2020. However, the outbreak of the COVID-19 began to involve other countries as well. With administratively imposed social distancing measures in many countries, demand weakened, and many companies have been temporarily shut down.26 In this sense, COVID-19 started with a negative supply shock evoking a negative demand response.
5.2 COVID-19 impacts on the oil finance and price

Many oil-exporting developing countries are non-diversified, sector-dependent economies, with oil contributing most of their exports and government revenues. The current fall in oil prices limits these countries’ ability to respond to the multidimensional domestic pressures produced by COVID-19 when more money is needed to finance service delivery, mitigate health risks, and ease macroeconomic pressure. In March of this year, the IEA estimated that key oil-producing countries, including Iraq, Nigeria, and Angola, would likely see a drop in their net income for 2020 of 50% to 85% compared with 2019. This would amount to the lowest income received from these countries’ sectors in over two decades, and the IEA has cautioned that revenues could fall further depending on future market conditions. Accentuating the challenges, there has been a decline in investor appetite for fossil-fuel projects, and with the onset of COVID-19, companies have been shelving new projects and permanently shutting-down high-cost operations in response to the oil price collapse.19 Smaller or new producer countries are expected to be hardest hit by the drop in discoveries and investments.20

The current oil price shock scale will vary depending on their export concentration and their estimated oil reserves, and production cost. For example, Saudi Arabia and Iraq can produce oil relatively cheaply, not needing a price of more than approximately USD 30 per barrel to break even. At the same time, countries like the Bolivarian Republic of Venezuela (“Venezuela”) and Nigeria depend on a price of over USD 50 per barrel (see Figure 9).

Low-cost oil-producers are anticipated to continue producing for a substantial amount of time, even in a low-carbon scenario. For countries with higher cost reserves, discontinuing production might be necessary. The current crisis presents new incentives and brings urgency to countries’ efforts to halt or reverse costly fuel subsidies to free up fiscal space and stem pollution and diversify toward less carbon-intensive industries. Yet tighter public finances are also expected to limit the funds available for public services and infrastructure projects, and changing gears will require carefully calibrated contextual approaches. At the onset of the COVID-19 crisis, foreign exchange reserves were considered high by historical standards, but these are expected to be insufficient to meet the multifaceted demands that developing countries now face.

The longer-term systemic issues that characterize many oil-dependent developing countries—including their tendency to direct money away from priority sectors such as health favoring rent-generating institutions—will also impact their resilience capacities. Historically, many resource-rich countries have exercised limited fiscal prudence and heavily invested in the extractive sectors to exclude others. Diversification efforts are often also stymied or complicated by factors such as poor private sector growth conditions, weak competitive capabilities, and entrenched political interest in fossil-fuel production activities.

As has been the case in many fragile developing countries since independence in the 1950s and 1960s, resource-rich fragile economies’ stability is often based on political power-sharing arrangements among elites’ political factions, underwritten by rent creation and distribution mechanisms. In other words, where countries are rich in resources, resource rents tend to provide distributive regimes’ backbone. As a result, the sharp contraction of financial inflows from the oil sector that many countries are now experiencing can exacerbate existing fragilities by sparking political instability and social unrest. Although patterns of rent distribution can take different forms—such as fuel subsidies targeting the middle-class in Nigeria and Angola, direct government contracting in South Sudan, and social distribution programs for the poorest in Venezuela—the common trend is that the political elites of oil-exporting countries recurrently distribute rents in strategic ways, to those who are seen as crucial to consolidating their position in power. A fall in distributive power resulting from the structural decline in the oil demand and exaggerated by COVID-19 could make it harder for decision-makers in these countries to keep competitive constituencies happy, generating increased domestic upheavals risks instability. Whether the reduction of rent distribution capabilities

![Figure 9](https://wileyonlinelibrary.com/)

**FIGURE 9** The breakeven oil price, USD per barrel, for a selected number of countries (Average 2015-2020) [Colour figure can be viewed at wileyonlinelibrary.com]
directly impacts the larger populations in these countries depends on how inclusive such distributive schemes were before the crisis. Should oil rents dry-up, social unrest and conflict could follow due to the breakdown in political power-sharing arrangements.39

Many oil-exporting developing countries are experiencing intensified capital outflows due to heightened economic uncertainty and perceived risks of political upheavals. Known as a “flight to safety, investors are scrambling to move their assets to benefit from advanced economies” security and stability. Banks in offshore financial hubs have noted a significant rise in activity so far in 2020,31 and there has been a growth in demand for golden visa schemes, which allows wealthy individuals to trade investments for residency.32 Oil exporting countries have historically proven particularly vulnerable to capital flight, accounting for 55% of Africa's total outflows between 1970 and 2015.34 Although the money that finds its way across borders illegally is trickier to measure, existing literature warns of increased risks of illicit outflows under current conditions, where large amounts of money are being moved, and oversight and audit functions are overstretched.37 With the extractives sector particularly susceptible to corruption—the OECD Foreign Bribery Report shows that one out of five foreign bribery cases comes from the extractive sector, by far the highest of any industry38—illicit outflows are expected to increase among oil-exporting countries during the current crisis.

Many oil-exporting countries had high debt levels at the onset of the COVID-19 pandemic, having responded to the lower commodity prices from 2014 with increased borrowing. From 2013 until the end of 2018, oil exporters' median debt-to-GDP grew from 31% to 54%, significantly faster than their resource-poor counterparts. Angola and the Republic of Congo saw their debt levels more than doubled during the 5 years, while the debt level of Equatorial Guinea grew five times larger.17 Cameroon, Chad, and the Republic of Congo, and Ecuador approached the IMF before the crisis for program financing and lines of credit, and Angola, Equatorial Guinea, and Gabon had already entered into IMF's Extended Fund Facility, demonstrating that the difficulties these countries faced in self-financing even in times of higher oil prices.18

The risks of heightened debt faced by these countries are closely tied to their debt portfolio's changing composition, away from traditional concessional financing sources, from multilateral and bilateral partners, toward non-Paris Club governments and private creditors.33 In the case of commodity exporters in sub-Saharan Africa, debt held by non-Paris Club countries, including the People's Republic of China, accounted for 90% of total bilateral debt at the end of 2016.38 Yet, the largest share of long-term public debt in low-income countries (LICs) is held by private creditors (bondholders, banks, and commodity traders), amounting to 41% in 2018.35 In some oil-exporting countries, the situation is more extreme, like in Chad, where 49% of total debt is to private lenders.

What distinguishes loans from private creditors and non-Paris Club governments from traditional concessional lenders is that financing from these sources typically comes at shorter maturities and higher interest rates, translating into costlier external debt servicing. Since 2010, the cost of servicing Africa's total public external debt has increased by about 4%,32 an increase driven by the higher cost of private-sector loans. Private creditors account for 55% of the continent's external interest payments, or USD 6 billion, in 2016, compared to 28% bilateral and 17% to multilateral financiers.37

Another feature of many of the new loans extended by non-Paris Club governments and private sector actors is that they are resource-backed loans, where the repayment is made in the form of natural resources, frequently crude oil to traditional loans, which are repaid in cash. These loan agreements often entail repayment in kind, based on volumes of natural resources and where the quantities are valued at an agreed benchmark price. Collateralized loan agreements with commodity traders and bilateral lenders in both Chad and Angola followed this model. Alternatively, repayment terms might be set in value terms or equivalent where the resource acts as the source of the income revenue stream or serves as collateral.40

The IMF reports that collateralized loans have been on the rise in LICs in recent years, amounting to approximately 20% of commercial debt issuance in 2016 to 2017.31 Although beneficial for countries instead of more conventional financing sources (such as Eurobonds and unsecured bilateral credits), collateralized lending agreements come with particular risks. For one, the markets for such loans are often uncompetitive, and the few actors who offer such loans typically do so through private rather than public channels. Commodity trading firms have become increasingly active in this space in recent years, with one trader reporting a 600% increase in collateral loan activity between 2013 and 2019.42 Risks appear to be significantly elevated when these types of loans are extended by commodity trading firms, given that they often come with shorter maturity and higher costs.43

Another of the risks associated with resource-backed loans is that they are often more difficult to restructure. A number of these loans are held by creditors who are not part of the typical forums for debt reschedulings, such as the Paris Club of the Institute of International Finance. The presence of resource-backed loans might also complicate creditors' coordination and, therefore,
the debt resolution processes, as these loans are often treated as more senior to other, unsecured debt. 32 To the extent that resource-backed borrowing is seen as negatively impacting a country’s ability to service future loans, countries that have heavily subscribed to these types of loans might also find that their future access to concessional sources of financing is jeopardized. 32

Collateralized loan agreements are characterized by their greater opacity, including lending terms and fees often undisclosed. Resource-backed loans are often excluded from countries’ official debt statistics or databases, and only more recently have these types of loans been brought on the agenda by initiatives like the Extractive Industries Transparency Initiative (EITI). One explanation for the lower degree of oversight and accountability surrounding collateralized lending agreements is that both governments and state-owned enterprises, including national oil companies, maybe empowered to borrow, with or without an explicit state guarantee or Parliamentary approval. A recent report by the Natural Resource Governance Institute (NRGI) found that of all the resource-backed loans identified in sub-Saharan Africa and Latin America, in as many as 40% of the cases, the borrower was an state-owned enterprise. 45

In some cases, lenders contribute to the greater opacity surrounding collateralized loan agreements. Non-Paris Club and private creditors are typically not subject to the same levels of scrutiny or safeguards that govern other lenders. For instance, there is no specific regulation governing commodity traders’ lending practices, who are the holders of many resource-backed loans extended to the countries in question over recent years. For the most part, the financial institutions who regularly help traders finance these private loan arrangements only extend their risk analysis to their counterparty, the trading company, with a limited view on the ultimate borrowers in the oil-producing country and the country’s fragility landscape. 22, 27

The opaqueness of these complex loan agreements means that, among other things, the sustainability of the country’s public debt or overall fiscal position becomes harder for national governments (and their partners) to grasp. In the Republic of Congo, the country’s official debt-to-GDP ratio had to be adjusted upward by over 50% overnight in 2017 after the IMF learned of debt owed to commodity traders Glencore and Trafigura, which had previously been unknown. 39 Therefore, the risk is high that countries might continue to borrow using these types of collateralized instruments until they arrive in a position where they have difficulties servicing them, that is, over-borrowing. The latter scenario played out in the case of the Republic of Congo in 2017. The country only revealed the extent of its resource-backed loans (70% of total public external debt) once it was forced to seek assistance from the IMF. At this stage, the country’s debt servicing burden, which was estimated to reach an average of USD 1.5 billion (about 12.5% of GDP) between 2019 and 2022, had become unmanageable. A large part of Congo’s debt servicing was on debt owed to commodity trading firms. 31

That oil-backed loans are hard to oversee and are typically off-budget—even if they end up being the state’s responsibility when crisis strikes—significantly adds to the danger that these funds might be misappropriated or diverted. On several occasions, including in the Republic of Congo and Angola, corrupt intermediaries have been linked to securing these deals. There are instances where the loans cannot be accounted for, as was the case during a UN investigation in South Sudan. The investigation detailed how South Sudan’s Government had received resource-backed loans totaling just under USD 400 million from commodity traders in 2017 and 2018, some of which were later linked to arms purchases. 46 The greater discretion that these loans offer to the people in positions of authority is part of their appeal for borrowing countries. Research also shows that resource-backed loans are particularly popular among poorly governed states. 33 Despite the risks involved, oil-exporting developing countries can be expected to try to borrow their way out of the current crisis.

In the context of a progressive structure decline in the oil demand, oil-prices might never recover to their pre-crisis levels, and many oil-exporting developing countries will need to brace for long-lasting trade and fiscal deficits, which could produce a long-term decline in GDP. 47

Diversification away from fossil-fuel income and carbon-intensive industries is a sine qua non for long-term recovery. Yet, in the short-term, oil-exporting developing countries, like other countries, are likely to turn to borrow to manage the current multidimensional crisis and shrinking fiscal space. The list of over 90 countries that have so far requested emergency financing from the IMF includes oil-exporting countries like Nigeria, Iran, and Ghana. 17 In April, the IMF stated that it was responding to this unprecedented number of calls for emergency financing with USD 100 billion in emergency loans to LICs, in addition to making available USD 1 trillion in lending capacity. The IMF also expanded its Catastrophe Containment and Relief Trust (CCRT), a donor-funded debt relief program for LICs. The World Bank similarly announced that it would deploy up to USD 160 billion in the financing, including over USD 50 billion of IDA resources on grants and highly concessional terms. 25 Still, concessional financing is likely to be insufficient, and financing from official and private-sector creditors will be needed to fill the financing gap.
In line with recent trends and the absence of viable alternatives, oil-exporters are expected to turn to private creditors and non-Paris Club governments to address their financing gaps. Yet, access to international capital markets is severely curtailed, reducing the scope for rolling over maturing liabilities. Most financiers are also expected to favor safer assets and therefore not be willing or capable to take on the high risks that these oil-exporting developing countries present.\textsuperscript{48} The credit rating agency S&P Global downgraded some high-profile sovereign ratings in March 2020, including Nigeria, Mexico, Angola, Ecuador, and Oman, following the fall in oil prices, impacting the type of financing they can access and on what terms. The credit rating agencies downgraded Nigeria’s credit rating to what they refer to as “junk” territory, while the same agencies consider Angola and Ecuador to be in the “default danger zone.”\textsuperscript{49-54}

Given the likely increased demand for financing, commodity trading firms may seek to position themselves favorably vis-à-vis producer countries, possibly extending financing in return for access to fossil fuels, potentially locking these countries into an unsustainable industrial future. Producer countries and their national oil companies can be expected to be harder pressed to find buyers in the current market environment.\textsuperscript{55} On the other hand, commodity trading firms have well-developed risk management capabilities and storage facilities (although these are expected to reach saturation point shortly), giving them significant leverage vis-à-vis producers. Under these conditions of tightening fiscal liquidity, the risks are high that oil-producing developing countries contract non-commercial loans from private creditors on suboptimal terms and under conditions that leave scope for corruption and illicit financial flows.\textsuperscript{56}

Given that oil prices may never fully recover and oil reserves could become stranded, many oil-producing countries face an increasingly uncertain future. A timely and coherent response is needed: one that creates fiscal space; reduces the risks of unsustainable debt, corruption, and illicit financial flows; and builds resilience through the cleaner and more diversified industrial policy. Whether through ODA, blended finance, or private sector investments, this is the moment to catalyze a transition to a cleaner and more sustainable future.

5.3 Future of oil and gas in the post-COVID-19 era

A similar shock portfolio can be detected in the energy industry. The current condition is different from any shock the world has experienced so far.\textsuperscript{57} First, because shale gas had transformed the energy markets (both oil and gas), and second, global oil demand in 2020 is predicted to contract for the first time since the 2009 global recession. With the rapid rise in renewable energy use, the COVID-19 outbreak undermined the oil and gas industry’s already weakened position. Since the transportation sector depends on 60% of energy from oil demand,\textsuperscript{57} Transition constraints are quickly interpreted into reduced oil demand. Daily global oil consumption reduced from 100 mbbl in early 2020 to less than 75 mbbl in mid-2020. Behind the COVID-19 pandemic influence over oil markets, there is also an inimitable discussion among the OPEC+ on stabilizing oil prices. As a result, WTI futures (expiring May) in mid-2020 turned negative.\textsuperscript{56} The natural gas market long before the COVID-19 pandemic was in a difficult condition due to a mild winter that had already reduced demand. IEA is foresighted that global natural gas demand in 2021 will also fall by 3.6%.\textsuperscript{58}

Not only has the COVID-19 outbreak shifted the consumption of energy carriers, but it also affected their supply, as revealed by volatilities in the oil and gas industry. From late 2019 to mid-2020, the number of oil and gas exploration and exploitation projects in the US decreased from 805 to 265. Most of the world’s major oil and gas role-players have revisited their capital expenditures due to the COVID-19 in 2020.\textsuperscript{59} According to all of these mentioned facts, it is clear that the oil and gas industry is changing rapidly.\textsuperscript{60}

That includes MENA region companies, European and North American firms. The greatest revision of CAPEX (Capital Expenditure) is to Aramco (from 35 B$ to 25 B$) and Chevron (from 25 B$ to 20 B$). British petroleum and Equinor are also predicted to reduce 2020 CAPEX, respectively, from 15 B$ to 12 B$ and from 10.6 B$ to 8.6 B$).\textsuperscript{59} In the mid-2020, the IEA predicted that international CAPEX in petroleum and gas is predicted to drop by almost 30% in 2020 to 2021. The combined petroleum and natural gas market is predicted to decrease CAPEX by 244 B$ in 2020 (compared to 2019), which shows the greatest change of any energy sector (including coal, which is predicted to reduce its CAPEX by 74 B$). The impacts of the corona virus’s outbreak on petroleum and natural gas supply were also detectable in supply chain disruptions.\textsuperscript{56} Restrictions impacted the world’s supply chains. According to the agency’s report, 22 out of the 28 global mega-production, storage, and offloading vessels under construction in the first quarter of 2020 were built at shipyards in China, Korea Singapore. Moreover, a major manufacturing center for specialized oil and gas industry engineering equipment is the Lombardy region of Italy, which was among the first restricted areas of Europe.\textsuperscript{60,61}
A detailed analysis of the petroleum and gas industry between early 2020 and mid-2020 also shows how pandemic prices were affected. During this time, Brent (61.6-19.07 $/bbl), West Texas Intermediate (WTI, 55.51-14.10 $/bbl) and the reference OPEC basket (63.26-21.66 $/bbl)\textsuperscript{62} prices were volatile. However, natural gas prices did not drop significantly. As the EIA stated, the Henry Hub spot price in the respective timeline shifted from 1.95 $/m.Btu to 1.65 $/m. Btu.\textsuperscript{63} Thus, it is vital to consider whether the pandemic outbreak impacted petroleum and natural gas prices. The impacts of a past disease outbreak on the energy sector were not a common field of research for many reasons. First, such pandemics as the Spanish flu (1918) happened when oil and gas were not widespread in the energy portfolio. Second, the scale of newer disease outbreaks such as SARS (Severe Acute Respiratory Syndrome) (2002) and MERS (Middle East Respiratory Syndrome) (2012) was limited to Asian and Persian Gulf countries, and they have not been spread throughout the world to become a pandemic. The considerable difference was A/H1N1, which can be considered as a pandemic in 2009. However, the swine flu's mortality and contagion rates were lower than SARS and MERS, which introduces SAR-COV-2 unique in terms of recent global infectious diseases.\textsuperscript{64} It is expected that the American and Japanese experience different degrees of COVID-19 impacts on their oil and gas markets. Specifically, since America is both an energy exporter and importer and has many infected and mortality cases, it is more likely to have more significant pandemic effects than Japan. It is also anticipated that the COVID-19 outbreak resulted in different effects among crude oil and natural gas markets since crude oil is connected to energy demand in the transportation sector. In contrast, natural gas serves many other applications less affected by restrictions.\textsuperscript{65,66}

6 | FUTURE IMPLICATIONS AND RECOMMENDATIONS

Considering the facts discussed in the discussion section, it can be mentioned that COVID-19 impacted the oil market in both short-term and long-term aspects.\textsuperscript{67} Although the oil and gas industry's supply shock is slowly recovering (short-term), but in a closer look at the hydrocarbon industry, a significant change in their R&D and CAPEX can be seen.\textsuperscript{68} This decrease in the R&D and CAPEX is what we have called the long-term impact of the COVID-19 on the oil and gas industry and may cause certain damages to this industry. However, it was predictable to happen to the oil and gas industry due to its unique characteristics, such as highly policy and diplomacy-dependent, making it a volatile market. Therefore, oil and gas market brought this upon itself by its internal characteristics.\textsuperscript{69}

In this section, the author recommends that the petroleum and gas trade be appended completely to the world trade organization's rules and regulations. The negotiations for joining oil trade to the Energy Charter Treaty (ECT)/WTO are undergoing since the 1990s, but due to the WTO's restricted regulations/WTO and the unique characteristics of petroleum and gas as a commodity, minimum further going has been achieved decades. Although oil and gas as an independent trade have more freedom of action for the major role-players in this industry, it also unguarded the current pandemic conditions. But ECT/WTO regulations are both restrictive and protective and can save the market share of the oil and gas industry during the global energy transition and give it more time to be changed during this period, instead of a rapid decline to a phenomenon that is called “the fall of the oil age.” There are four sections in the ECT/WTO regulations which can significantly support the oil and gas industry from losing CAPEX and R&D investments, which are being mentioned below:

- Foreign investment in the WTO/ECT treaty

In the ECT system, there is a separation in terms of investment. This is the distinction between the pre-investment stage and the post-investment stage. The pre-investment stage is the stage in which capital inflows and investment are raised, but the post-investment stage is the stage in which the risk is raised, and the investor becomes vulnerable to the national policies of the host country. In general, the pre-investment phase is distinguished by soft low or voluntary and friendly rules with a series of commitments to encourage investment and stabilize and provide a set of favorable, fair, and transparent conditions to investors in other ECT countries.\textsuperscript{70} Besides, there are weak commitments in applying national behavior principles and a well-to-do government and having fair and equal treatment of investors. In traditional oil and gas trade treaties, the opposite is done, and it is necessary to observe the principle of national behavior toward the establishment of the implementation and the elimination of investors’ investments.\textsuperscript{71} However, the ECT pays particular attention to the results of the supplementary agreement on commitments in the over-investment phase. The post-investment stage of the ECT energy charter is similar to the traditional oil and gas trade treaties system, that is, in this stage, hard law obligations are imposed so that these obligations based on international arbitration become enforceable and binding. At this stage, investors are treated following the
principle of national conduct and full-fledged government. Besides, sources and nationalizations are constrained by the traditional terms and requirements that capitalist governments have emphasized. According to these conditions, confiscations must be made for public and non-discriminatory purposes, and confiscations must be carried out in a proportionate and correct process, with immediate, sufficient, and effective reparations. However, these conditions and commitments align with European governments’ growing trend to accept such commitments in the Multilateral Agreements and Bilateral Investment Pacts (BITS). Thus, the investment contracts cannot be easily canceled during every severe situation such as COVID-19.72

- Competition law and energy sector

The regional treaties, such as traditional oil and gas trade treaties, have acknowledged the growing link between competition and international trade law and investment flows. In traditional oil and gas trade treaties, this issue has been dealt with in a partial and advisory manner.71 It recognizes members’ rights to prohibit anti-competitive practices, but only if the parties to the agreement occasionally consult on the impact of the measures and how to cooperate on executive policy and competition rules. Finally, the point to be made about competition and trade policy is that the parties' objectives to the traditional oil and gas trade treaties and the Energy Charter are different.72 In traditional oil and gas trade treaties, competition and trade regulations also reflect US concerns about other countries' competition policies (and the simultaneous benefit it has from maintaining its competitive policies, policies that it has pursued vigorously, even if the effects cross-border) and reflect the concern of Canadians and Mexicans about US competitive policy, which has led to bilateral friction in the past. But in the ECT, the initial concern was not about the overuse of competition policy, but rather about the lack of competition policy, especially concerning the energy sector in Central and Western Europe, where it is dominated by unilateral monopolies, Surrounded by powerful and large bilateral governments. Thus, these regulations for defending the interests of the different market players and restrictions over creating monopolies can support the share of the oil and gas resources in energy.74

- Environment and energy sector

The traditional oil and gas trade treaties do not have any chapters that directly address the energy sector environment. In contrast, the ECT Energy Charter Treaty stipulates certain conditions in the energy sector’s environmental aspects, which also have the characteristics of soft low regulations such as traditional oil and gas trade treaties. However, the content, modernity, and scope of the environmental regulations in the energy sector in the ECT/WTO represent some improvement over the traditional oil and gas trade treaties environmental regulations.74 Thus, clear regulations of each energy carrier’s environmental impacts can clarify carbon footprint issues and state the true amount of carbon emissions from each energy source away from advertising and untruths. This will help the oil and gas to become competitive with other energy sources and get the chance to implement R&D projects on green hydrocarbon fuels to carve their way into the future.75

- Tariff and taxation regulations

Other provisions in the Energy Charter treaty relate to the energy sector, some of which pursue specific interests, while others pursue more general interests. In the case of the first category, for example, we can mention the rules of transit of energy goods, one of the concerns of Europe. Other general interest issues include taxation (Article 21) and trade-related investment measures (Article 5). This feature of ECT/WTO regulates the governmental control over the petroleum and gas trade and limits them in setting tariffs and taxes, which decreases the competitiveness of the oil and gas industry vs other energy sources.76

7 | CONCLUSION

The outbreak of COVID-19 disease and the restrictive measures taken to deal with it led to all markets, especially the energy market, facing severe shocks on the consumer side. According to most institutions, the average oil demand in 2020 decreased significantly and most sectors in the energy industry damaged by the pandemic. The oil and gas industry is especially damaged more than any other energy sector during the pandemic’s early days. And several prices, demand, and technical shocks hit the hydrocarbon market in several regions (ie, Negative oil price in April 2020). Reviewing energy reports and other professional oil and gas market essays, this article analyzed the oil and gas market during the COVID-19 crisis. However, it can be studied quantitatively, and many methods can be implemented to study these markets, but lack of data for several parameters of the oil and gas market is the most important limitation of this kind of studies, which prevents researchers from comprehensive research in this field. Therefore, this article tried to use a literature review to fill that limitation and illuminate this
section of Covid's story in the light of the energy industry. Our results show that the oil industry is rapidly losing investments, and many mega projects in this industry are closing due to lack of funding. Thus, it can be concluded that the oil industry needs a new strategy to stabilize its funding backups and attractiveness to the FDI. In the end, the ECT/WTO regulations are suggested as the strategy to save the oil and gas industry’s competitiveness during the energy transition. As mentioned before, this article could not propose a quantitative model supporting its proposed strategies and statements due to the lack of available data and the oil and gas industry’s complexity. Thus, it is suggested that this gap be filled in future studies, and a quantitative model be developed to investigate the impacts of the COVID-19 and other similar global crises on the oil and gas industry. It is also suggested that more strategies for minimizing the COVID-19 long-term impacts on the oil and gas industry be proposed in future research.

DATA AVAILABILITY STATEMENT
Data will be available by an official request from the corresponding author.

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ENDNOTE
* A Special LNG market.

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