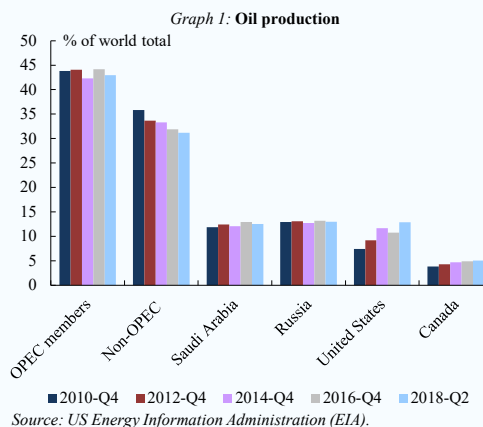


Box 1.1: How resilient is the economy to oil price shocks?

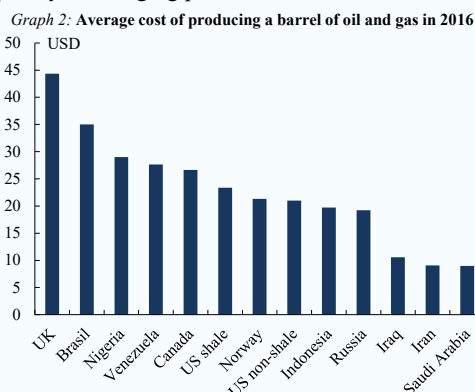
Oil prices have increased substantially since the publication of the spring forecast in May 2018. The impact of price fluctuations, which may be substantial over a relatively short period of time, matter for the euro area outlook as oil prices affect the economy through several channels.⁽¹⁾ This box overviews the developments on the oil market over the last decade, focussing on the emergence and effects of shale oil production. The response of conventional oil producers to the new source of competition, as well as the outlook for oil prices also are discussed. Finally, an analysis of the impact of an oil price shock (which broadly matches the magnitude of the increase in oil prices since the spring forecast) on euro area GDP growth and inflation is presented. Understanding oil price movements and their effects on macroeconomic variables in the recent past has important lessons for forecasters as it should allow them to better assess the impact of future shocks.

The rise of unconventional oil and OPEC's response

A prolonged period of high oil prices between 2010 and mid-2014 led to a surge in oil production and some redistribution of oil market share among producers, most notably towards unconventional oil⁽²⁾ producers in the US and Canada. The US, the world's largest oil consumer, almost doubled crude oil production from 5.6 million bbl/day in 2010 to 10.5 million bbl/day in 2018, while in the same period, production in Canada rose from 2.9 million bbl/day to 4.1 million bbl/day. Altogether, the two countries have increased their combined market share of global oil production from 11% in 2010 to 18% in 2018, and the US now rivals Saudi Arabia and Russia as the world's top global oil producer (see Graph 1). The increase in shale oil (and gas) production since 2010 has had a lasting effect on the US energy mix and resulted in growing US oil exports (which until 2015 had been prohibited for national security reasons).



The rise of unconventional oil in North America influenced OPEC's decisions on whether to target price stabilisation or market share. In 2014, OPEC producers agreed to defend their market share by increasing output, which combined with easing of geopolitical supply disruptions, led to a period of lower oil prices, despite robust global demand. However, advances in technology led to significant reductions in shale oil and gas production costs to an average of USD 25/bbl in 2016. This significantly boosted the competitiveness of the sector (see Graph 2). As a consequence, high-cost production of conventional oil in some non-OPEC countries (e.g. UK, Brazil, Nigeria) declined. Production of shale oil also proved more flexible than that of conventional oil due to its lower initial investment that allowed producers to react more quickly to changing prices.



By the end of 2016, OPEC's strategy of targeting market share had proved effective but costly to the budgets of many of its members, as the efforts to

⁽¹⁾ For a detailed analysis of the impact of oil price changes on euro area see European Commission (2015). 'European Economic Forecast – Winter 2015'. *European Economy*, 1/2015, Section 1.1.
⁽²⁾ Unconventional oil consists of a wider variety of liquid sources including oil shales, oil sands, extra heavy oil, gas to liquids and other liquids.

(Continued on the next page)

Box (continued)

reduce their fiscal break-even prices⁽³⁾ were not as effective and remained mostly above USD 70/bbl. This led to a return to a price stabilisation strategy and OPEC producers together with eleven non-OPEC oil producers led by Russia, agreed to cut output (OPEC+ agreement). The deal, together with a broad-based upswing in the global economy, helped oil sustain prices above USD 50/bbl.

Reasons for the recent surge in oil prices

Since mid-2017, oil prices have been increasing due to a combination of factors, including a robust growth of global demand, compliance with the OPEC+ agreement, growing tensions in the Middle East, unplanned supply outages in Angola, a sustained plunge of supply from Venezuela, and the US withdrawal from the Iran nuclear deal, which raised concerns about the future Iranian oil supplies future supply from Iran. Most recently, Brent prices rose above USD 80/bbl, as OPEC producers agreed not to increase output soon and as severe weather conditions were threatening to disrupt production in the Gulf of Mexico. At the same time, the US is not yet in a position to turn on the oil tap when the global economy needs it. Only Saudi Arabia, the United Arab Emirates, Kuwait (OPEC), and Russia currently hold enough spare production capacity to offset shortfalls from major lasting supply disruptions.

Question marks about the sustainability of the US shale boom have also helped sustain higher prices. Increasing costs due to labour and material shortages have started to weigh on the economic viability of the sector. A tightening US labour market means that trucking and labour shortages in the Permian Basin are increasingly raising producer cost pressures. In addition, growing costs for the immense amounts of sand and water needed for fracking is also weighing on the profitability of the sector. Infrastructure constraints in the Permian Basin are also making it difficult to get barrels out of the US, as output has overwhelmed pipelines that connect the Texas desert to markets along the Gulf Coast and abroad. As a result, US local prices are declining due to accumulating land-locked shale oil, increasing the spread between the WTI (the main price benchmark for US oil) and Brent. It is likely that additional oil supplies from the US could reach international markets only from the

⁽³⁾ The price of crude oil needed to meet the spending plans and balance the government budget of an oil-exporting country, in which oil revenues constitute a part of government revenues.

second half of 2019 when new pipelines catch up with surging production in the area.⁽⁴⁾

Rising oil prices have also affected gas prices, which globally have picked up over the last six months. In Europe, however, the link between oil prices and gas prices has weakened due to the significant shift away from oil-indexation and towards hub prices: the share of oil-indexation in gas price formation has decreased from 78% in 2005 to 28% in 2017.⁽⁵⁾

Who benefits and who loses from higher oil prices?

A sustained recovery in oil prices above USD 70/bbl would most benefit conventional oil-exporting countries, where higher oil prices are associated with higher exports and improving current accounts and fiscal positions. Elevated oil prices would also support the medium-term expansion of US shale producers and necessary upstream investments. In particular, US shale producers need prices above USD 65/bbl for further output expansion to be profitable.⁽⁶⁾

By contrast, the impact of higher oil prices on the rest of the world (oil importers) is expected to be negative. In general, higher oil prices affect oil-importing economies through higher inflation, which reduces household real disposable incomes and consumption, as well as through higher production costs in energy-intensive sectors of the economy, potentially putting pressure on corporate profit margins and affecting investment. Energy taxes (or subsidies) may put a wedge between the import price and the domestic price and thereby reduce the domestic price swings. The impact of higher prices also varies considerably depending on the energy efficiency of an economy. In some vulnerable oil importing emerging markets, recent currency depreciations against the US dollar amplify the impact and further widen their current account deficits. This is particularly the case in India and South Africa and to some extent Indonesia and the Philippines, where higher oil prices accentuate the risks related to the funding of their current accounts and put further pressure on their currencies. In others, governments face difficult policy choices, such as whether to subsidise the higher fuel price at the expense of

⁽⁴⁾ Source: Oil 2018 - Analysis and Forecasts to 2023, International Energy Agency.

⁽⁵⁾ Source: Wholesale Gas Price Survey 2017, International Gas Union.

⁽⁶⁾ Source: World Energy Investment 2018, International Energy Agency.

(Continued on the next page)

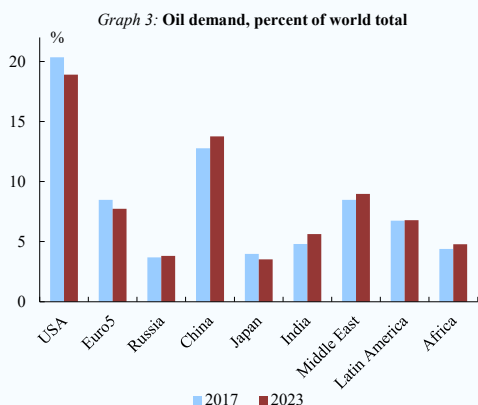
Box (continued)

aggravated fiscal positions (as they have in Brazil and Malaysia) or let elevated oil prices take a hit on domestic demand.

The outlook for oil prices

Over the forecast horizon, upward price pressures are expected to be tempered by growing oil production in Canada and the US and moderating demand as global growth is slowing. However, additional supply from the US is likely to reach international markets only in the second half of 2019 due to pipeline capacity constraints and will therefore not be a mitigating factor until then. Moderating global oil demand growth, in line with slowing global economic growth, is also expected to weigh on prices. Substantial uncertainties and possible price fluctuations around this scenario relate to the scale of the reduction in Iranian crude exports, the willingness and ability of Saudi Arabia to bridge this gap, the volatility of Libyan and Venezuelan production, as well as the evolution of demand for oil as trade tensions intensify and growth in emerging markets softens. Beyond 2020, additional upward price pressures could arise if investment into replacing reserves of conventional oil production does not pick up over the forecast horizon.

In the long-term, most of the net growth in oil demand should come from emerging and developing markets outside the OECD, but the overall growth rate of oil demand will slow. Growing populations and rising income levels in emerging and developing countries will be the main driving factor behind oil demand in the future, as advanced economies reduce their dependence on fossil fuel energy in line with environmental policies, the rapid deployment and falling costs of renewable energy, and increased energy efficiency (see Graph 3).

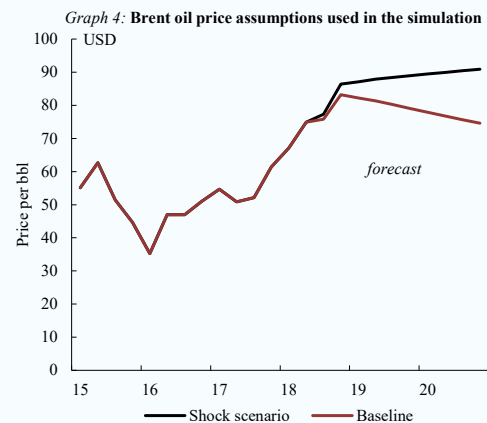


Source: IEA - Oil 2018 - Analysis and Forecasts to 2023.

Impact of oil price increases on the euro area

As a net oil importer, the macroeconomic impact of higher oil prices on the euro area is negative. The costs of industries that use oil and petroleum products as inputs will rise, which in turn may affect product margins or be transferred to final consumers through higher prices, leading to upward pressure on inflation. In parallel, the increase in fuel prices is weighing on the real disposable income of households.

The magnitude of the direct effects of increasing oil prices may be quantitatively estimated by structural macroeconomic models or more flexible vector autoregressive ones. Simulations of a 20% cumulative increase (7) in Brent oil prices (8) over the forecast horizon (9) suggest a relatively limited dampening of growth and a relatively limited boost to inflation.



First, a 20% cumulative increase in oil prices is estimated to shave off around 0.1 pps. of euro area GDP growth in 2019, while the negative impact would rise to about 0.2 pps. in 2020 (see Graph 5).

(7) A 20% cumulative increase lifts the assumed oil prices so that the difference between the assumption in the forecast and the oil prices used in the simulation reach 20% by the end of the forecast horizon (see Graph 4).
 (8) A 20% increase in Brent oil prices until 2020 corresponds approximately to the increase in the assumed oil prices between the spring and autumn forecasts.
 (9) For the simulation, a large scale Bayesian vector autoregressive (BVAR) model is used, developed for conditional forecasting on euro area developments. For a detailed description of the model, see Bańbura, M., D. Giannone and M. Lenza (2014). 'Conditional forecasts and scenario analysis with vector autoregressions for large cross-sections', ECB Working Paper Series 1733.

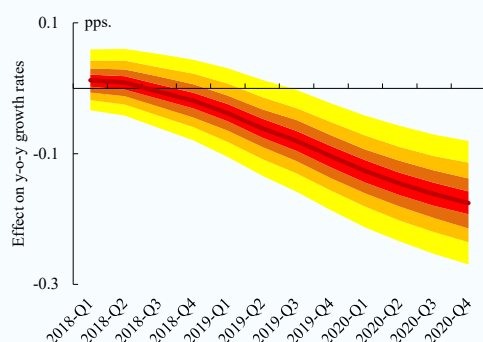
(Continued on the next page)

Box (continued)

The dampening effects on GDP mainly take place through private consumption.⁽¹⁰⁾

Second, the estimates suggest that rising production costs, together with the direct effect of higher oil prices on consumer prices would translate into only a marginal rise in euro area HICP inflation rates of about 0.1 pps. in 2019 and 0.2 pps. in 2020 (see Graph 6).

Graph 5: Impact of a cumulative 20% increase in oil prices on euro area GDP growth



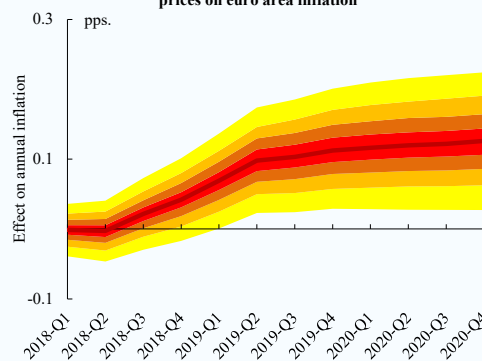
Source: Own calculations.

The results of the above simulation exercise match the impact of the oil price shock estimated with the Global Multi-country model.⁽¹¹⁾ Across different specifications of the structural macroeconomic model, the impact on inflation for both 2019 and 2020 ranges between 0.1 and 0.2 pps. For GDP, the profile of the negative impact is different, with 2019 being affected more than 2020, but the magnitude is broadly the same across the different models and specifications.

In conclusion, over the past several years, the emergence of shale oil production in North America led to shifts in OPEC's output strategy and that has been a key factor behind oil price fluctuations. The most recent surge in oil prices reflects strong demand and tightening supplies, the latter also driven by geo-political factors in the Middle East. In the short-term, oil prices are expected to peak and then gradually decline on the back of moderating global demand and additional

US supplies coming on stream in late 2019. Beyond 2020, additional upward price pressures could arise if investment into oil production fail to pick up in the coming years. In the long-term, the rise of efficiency improvements and clean power sources in the global energy mix, as well as population and income growth will be the main factors determining oil demand.

Graph 6: Impact of a cumulative 20% increase in oil prices on euro area inflation



Source: Own calculations.

The impact of the oil price shock on euro area GDP growth, according to simulation results, is relatively limited but not negligible. The size of the simulated impact on inflation, which is rather on the low side,⁽¹²⁾ may be partially explained by the gradually increasing nature of the assumed oil price shock.⁽¹³⁾ Also, despite not being captured in these frameworks, the lower⁽¹⁴⁾ and increasingly nonlinear⁽¹⁵⁾ sensitivity of euro area GDP growth and inflation to oil price volatility compared to earlier decades may play a role in explaining its smaller-than-expected effect on these variables.

⁽¹⁰⁾ The model does not capture second round effects that might take place through exports to emerging market economies or other advanced economies, which are as well affected by the oil price increase.

⁽¹¹⁾ The Global Multi-country model (GM) is an estimated multi-country DSGE model developed by the European Commission. For further details, see Albonico, A., L. Calès, R. Cardani, O. Croitorov, F. Ferroni, M. Giovannini, S. Hohberger, B. Pataracchia, F. Pericoli, R. Raciborski, M. Ratto, W. Roeger and L. Vogel (2017). 'The Global Multi-Country Model (GM): an estimated DSGE model for the euro area countries'. *JRC Working Papers in Economics and Finance 10*.

⁽¹²⁾ For 2019, the simulation implied 0.1 pps. increase in the pace of annual inflation is somewhat lower than the 0.2 pps. upward revision in the forecast compared to spring. Though, the oil price assumptions increased more (by 26% in USD terms from the SF18) for 2019 than assumed in the simulation.

⁽¹³⁾ A sudden, frontloaded oil price shock where oil prices increased by 20% at the beginning of the shock and remain broadly at that level over the next two years, would affect more 2019 than 2020.

⁽¹⁴⁾ The structural factors include a long-term reduction in the energy and oil intensity of global production as well as in the OECD countries (see e.g. Key World Energy Statistics 2017). This reflects advances in technology, conservation efforts, energy and fuel efficiency.

⁽¹⁵⁾ Hahn, E. and Mestre, R. (2011). 'The role of oil prices in the euro area economy since the 1970s'. *ECB Working Paper Series 1356*.