Exchange rate effect and lower prices would decrease oil revenues, even with a larger production

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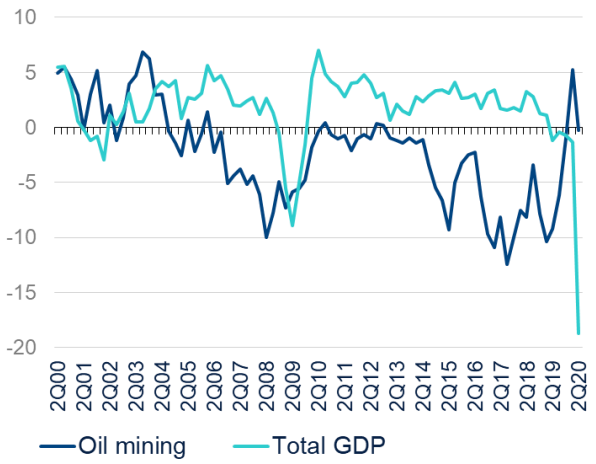
Mexico as a price-taker in the international crude oil market

Oil mining is a sector of great interest for the analysis of the Mexican economy. Petróleos Mexicanos (Pemex), as a productive state company, constitutes the greatest contribution to the value added of this mining subsector. Pemex also operates as a transporter, refiner, and marketer of oil and natural gas, although, for the purposes of this analysis, we will focus on oil production and, to a much lesser extent, its marketing.

Among the oil-producing countries, Mexico ranks thirteenth in terms of production, with an average of 1.7 million barrels per day (Mbd) in 2019, representing 2.1% of the world production of crude oil and natural gas condensate.

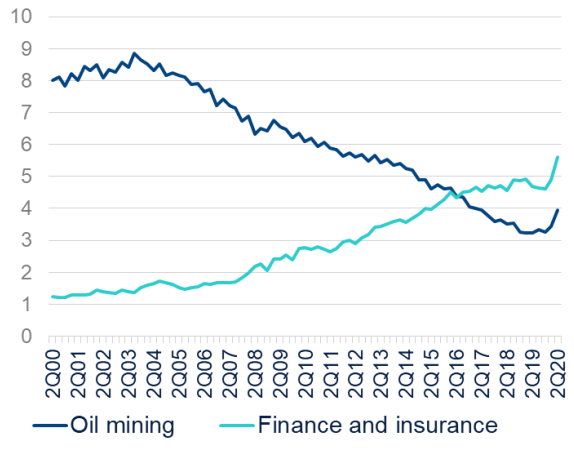
This relatively small share in the world market constitutes an obstacle for strategic behavior in terms of the setting of international oil prices and defines Mexico as a price-taker in said market.[1] However, income from oil marketing is a fundamental variable in Pemex's results, having a direct impact on national public finances.

Graph 1. **OIL MINING GDP AND TOTAL GDP**
(YOY % CHANGE)



Fuente: BBVA Research with data from Inegi.

Graph 2. **SECTORAL GDP**
(% SHARE)



Source: BBVA Research with data from Inegi.

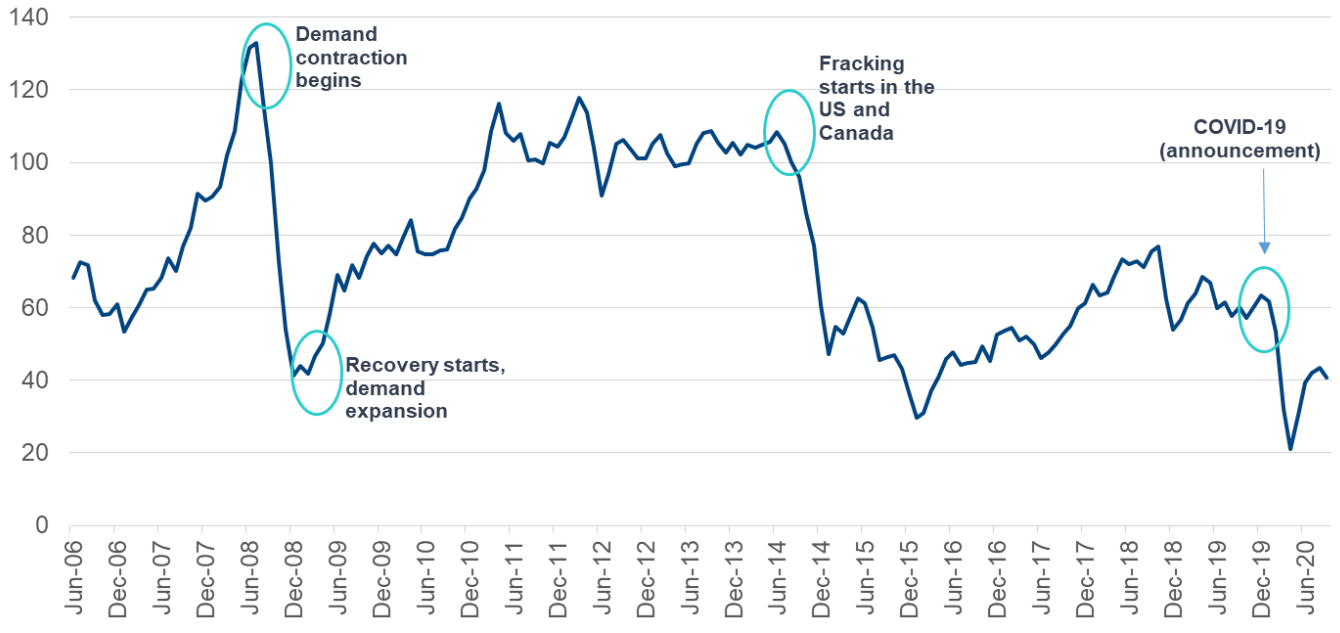
[1] When Mexico has tried to play a different strategy and not accept the market price, it has been counterproductive as it was in the cases of 1982 and 1986.

As of the second quarter of 2020 (2Q20), real GDP of the oil mining subsector constitutes 4.0% of total economic activity, in contrast to an 8.0% figure in 1Q00. This drop in the sector's participation has been due both to a composition effect, with sectors that have increased their importance in the mix of productive activities in the face of the changing economic and energetic reality of the 21st century, as well as to an intrinsic effect because of the dynamics of the national production.

Bearing in mind the price-taking role of Mexico in the international crude oil market, some critical points in the evolution of the price of oil in recent years should be pointed out:

- From 2004 to 2008, there was a rise in prices, which ended with the contraction of demand towards the end of 2008 and the subsequent fall in the price of oil.
- When fracking began in the US and Canada, the price experienced another drop, accompanying the rise in production costs in those countries and, therefore, reducing the local margin. Saudi Arabia and other oil producing and exporting countries decided not to adjust their production and to accommodate the drop in prices, expanding the supply and further accentuating the drop in prices.
- With the announcement of COVID-19, another contraction in global demand began and the price experienced the largest drop in recent decades towards the end of the first quarter of 2020 (1Q20). The data for 2Q20, although implying a recovery, does not exhibit a return to pre-pandemic levels.

Graph 3. **INTERNATIONAL PRICE OF OIL (MONTHLY)**
(USD/BBL, CRUDE OIL AVERAGE)

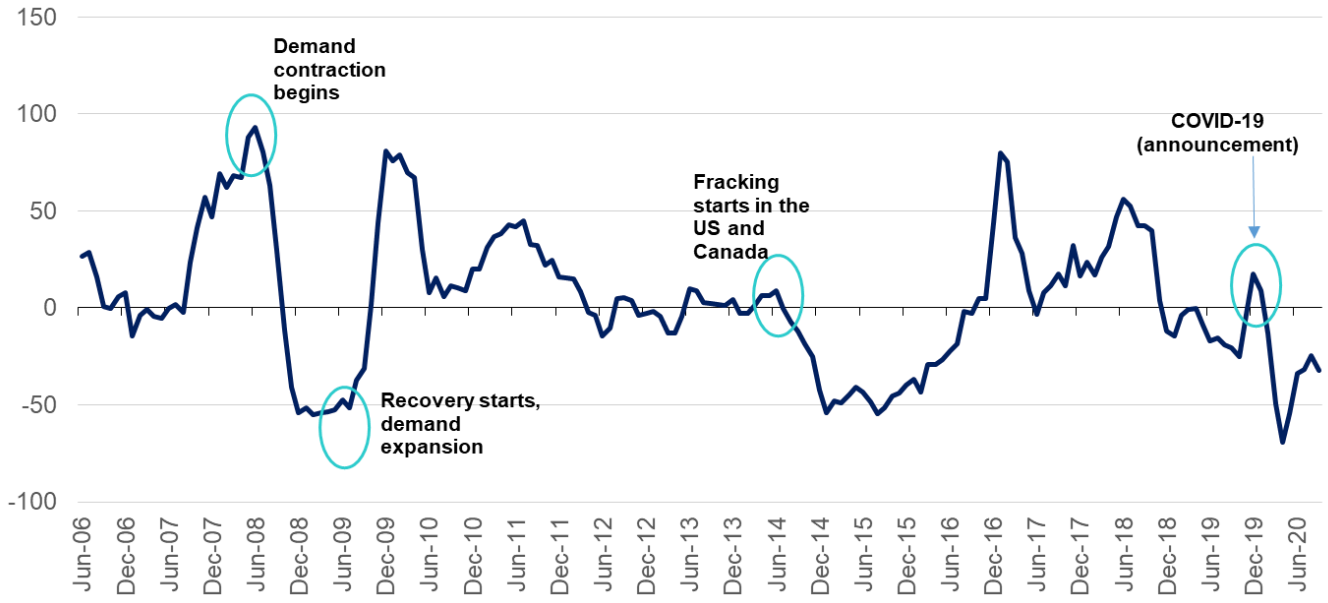


Source: BBVA Research with data from the World Bank.

In terms of variations, it can be observed that the fall in 1Q20 was 53.4%, even greater than the 51.1% experienced in the second quarter of 2009 (2Q09), explained by the global financial crisis. Likewise, despite a rise in the price from June, annual variations are still in negative territory.

The partial recovery in demand explained by a worldwide partial reopening of activities, could mean that this trend will endure, under the assumption that no additional contractions in oil demand arise due to additional closings or reductions of activity due to outbreaks that have taken place in multiple regions.

Graph 4. **INTERNATIONAL PRICE OF OIL (MONTHLY)**
(YOY % CHANGE, CRUDE OIL AVERAGE)



Source: BBVA Research with data from the World Bank.

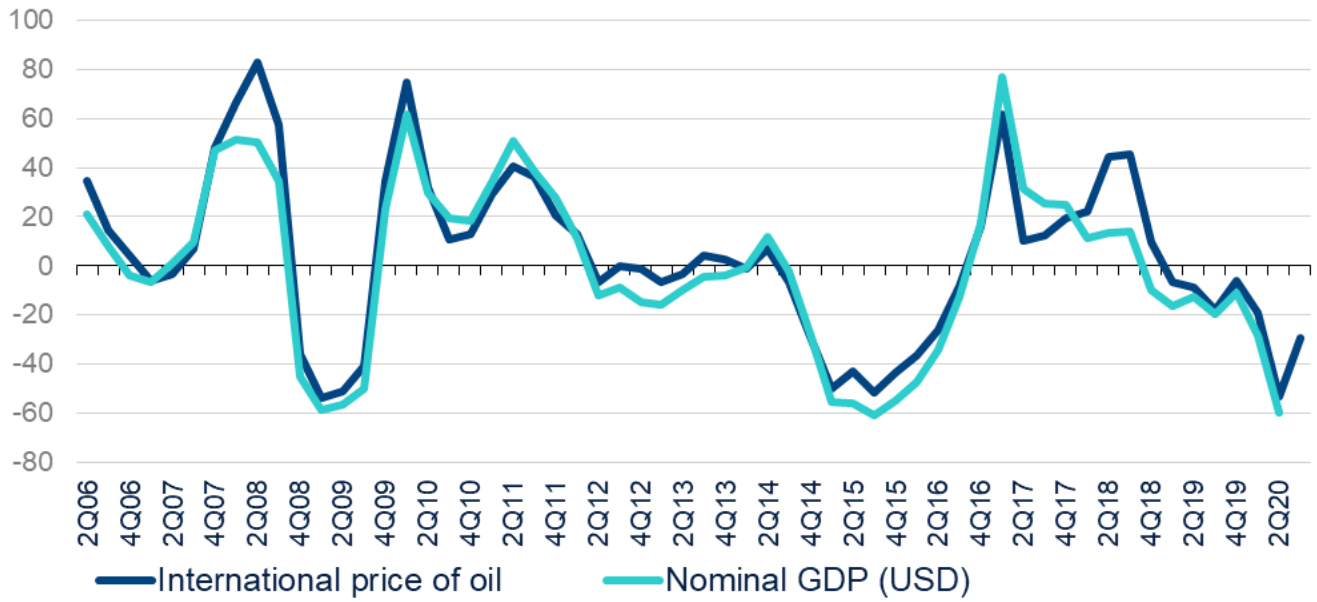
A phenomenon that must be pointed out in order to understand the dynamics of oil mining in Mexico is the high correlation between international prices and variations in the GDP of the oil subsector denominated in dollars.

Partially, it has been seen that the price of crude oil is dictated by the international market and does not constitute a decision variable at the national level. The other component of value, volume or quantity, is given by the crude oil production platform.

It can be inferred that international prices largely determine the dynamics of the nominal GDP of the oil subsector (with a correlation coefficient of 0.95% with the price series, and one of 0.03% with the oil platform (production) series).[2]

[2] The correlations of nominal GDP in USD were calculated for the 2006-2020 period. If calculated for the 1994-2020 period, the coefficients would be 0.82 for the international price of oil and 0.05 for the oil platform.

Graph 5. **INTERNATIONAL PRICE OF OIL AND OIL MINING GDP**
(YOY % CHANGE, CRUDE OIL AVERAGE)



Source: BBVA Research with data from the World Bank, Banxico and Inegi.

Since oil price is denominated in United States dollars (USD), its change can be decomposed into a component attributable to inflation (measured in terms of the GDP deflator) and an exchange rate component. The separation of these effects can constitute a basis for the forecast of the nominal oil GDP in USD and, therefore, of the oil revenues of the public sector in Mexico.

Additionally, if we consider that nominal GDP in USD is the product of oil production volume (measured in terms of the oil platform, production in million barrels per day average), the exchange rate (USD per peso) and the relative price of Mexican oil (measured in terms of the GDP deflator), it is possible to approximate the percentage change in nominal GDP in USD by means of a total differential.

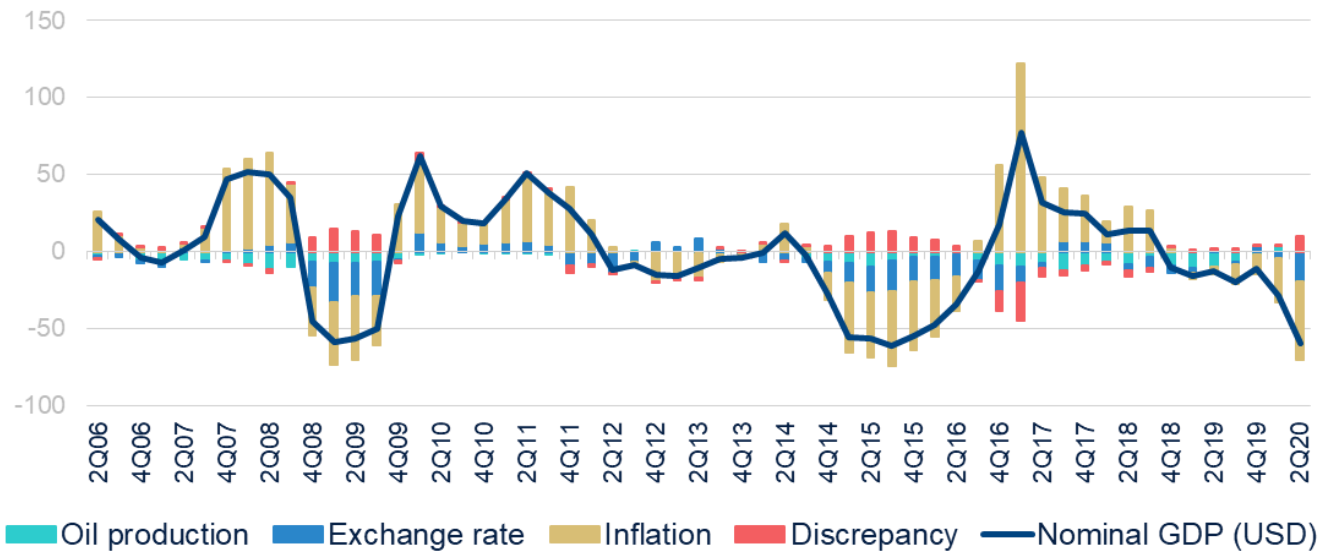
Therefore, the sums of the percentage variations of the components would locally approximate this variation and, consequently, that of the federal government's oil revenues.

That is, for period $t = 0$, let $GDP_0^{nominal\ USD} = \varphi_0 \cdot \upsilon_0 \cdot \omega_0 + \delta_0$, nominal GDP in USD, where φ is the oil production platform, υ is the exchange rate expressed in USD per Mexican peso and ω is the GDP deflator for the corresponding period. The calculation of the percentage change is approximated by $\Delta\%GDP^{nominal\ USD} \approx \Delta\%\varphi + \Delta\%\upsilon + \Delta\%\omega$ [3], by means of a total differential.[4] The term δ_0 corresponds to an accounting discrepancy, due to

[3] Nominal GDP in USD corresponds to the value of total production in US dollars, regardless of the segment of demand to which said production is destined; for example, what is consumed in the domestic market.
[4] The purpose of the total differential is the evaluation of changes by means of the local linearization of the function and the computation of variations in the tangent space to it as an approximation of the variations in it.

either nominal rigidities, variable reporting date or the use of the oil production platform to approximate real GDP in the subsector.

Graph 6. **OIL MINING GDP**
(YOY % CHANGE)



Source: BBVA Research with data from Banxico and Inegi.

In periods of significant discrete variations in the components or fluctuations with significantly greater dispersion, the discrepancy is greater, reflecting the inability of a linear approximation to accurately describe the behavior of the function outside a given neighborhood.

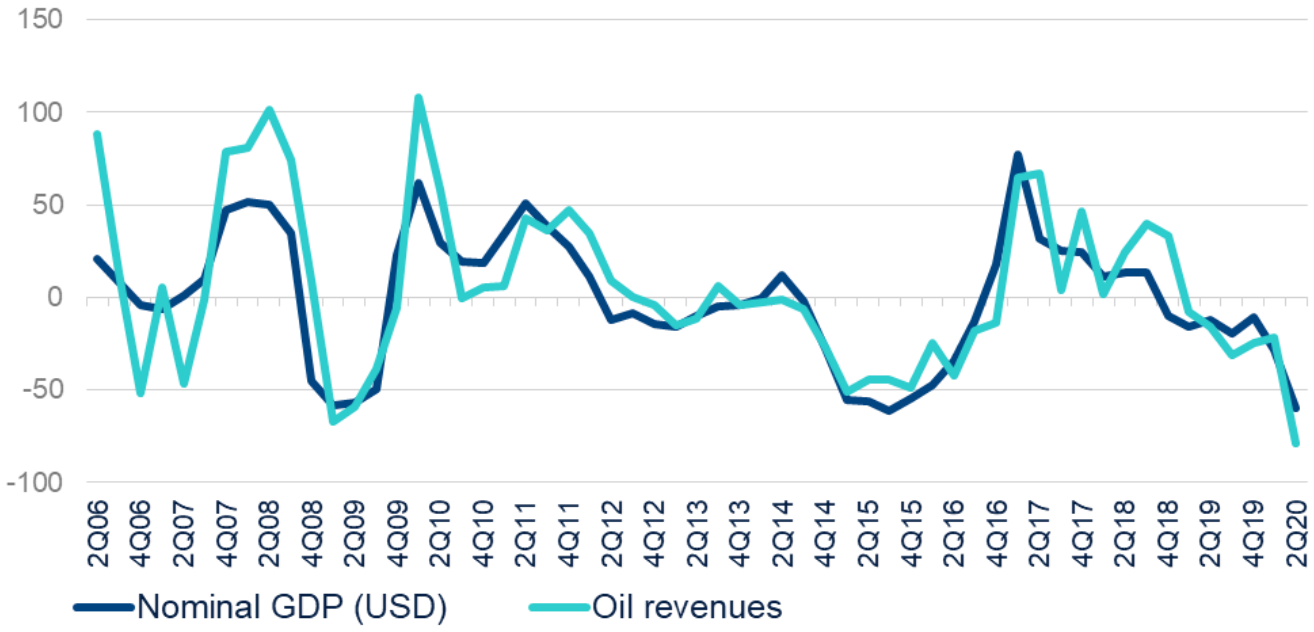
In 1Q20, for example, growth was observed in the oil platform and, therefore, in the real GDP of oil mining, although in nominal terms there was a contraction, both due to the fall in the price of oil and to the loss in terms of trade following a depreciation of the Mexican peso against the dollar.

The analysis would conclude that, in the face of a rebound in oil prices with recovering demand coupled with a possible appreciation of the peso against the dollar, the federal government's oil revenues would experience growth, even if the oil platform remained constant or decreased, as it has been most of the quarters in recent years.[5]

Finally, graph 7 shows the dynamics of the oil revenues of the federal government and the GDP of oil mining, reinforcing that, given a description of the behavior of the terms of trade, the dynamics of oil prices and a forecast about the oil production, the approximation of the variations in the GDP of oil mining would also shed light on the growth path of another variable of fundamental interest for public finances.

[5] It should be noted that federal government revenues are being considered, regardless of Pemex's own oil revenues, which, together with these, make up the oil revenues of the public sector.

Graph 7. **OIL MINING GDP AND OIL REVENUES OF THE FEDERAL GOVERNMENT**
(YOY % CHANGE)



Source: BBVA Research with data from Banxico, Inegi and SHCP.

Using the previous methodology, with data on the oil production platform, prices and exchange rates observed in 3Q20, the estimated variation in nominal GDP in USD would be -45.4% for the period, equivalent to a production value of 14,830.2 million dollars.

Moreover, given a forecast evolution of the oil platform at an interannual rate of 7.6% for 4Q20[6], with an annual variation in the USD per MXN exchange rate of -8.8%[7] and a -28.7% in the international price of oil[8], the prediction of interannual growth of nominal GDP in USD in 4Q20 would be -29.9%, equivalent to a quarterly level of 18,436.5 million dollars.

Based on these estimates, the nominal GDP in USD for 2020 would be equivalent to 16,158.2 million dollars, a contraction of 41.1%. An evolution in the same direction and of a similar magnitude would be expected in the oil revenues of the federal government.

[6] According to an interpolation of production and reaching 1,908 million barrels per day in December 2020, according to the statements of Octavio Romero Oropeza in an appearance before the Energy Commission on Congress (bulletin No. 6026, Cámara de Diputados).
[7] According to the current macroeconomic forecast scenario.
[8] According to the October forecasts of the World Bank, with 41 $/bbl as the average price of 2020 and 44 USD/bbl as the average price of 2021.

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