

Analysis of oil extractivism in Mexico and industry perspectives**Análisis del extractivismo petrolero en México y perspectivas de la industria**

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Abstract

The extractivism is an economic growth model based on the exploitation of primary natural resources, little transformed, including oil, to be sold on the world market. Several countries, including Mexico, were inserted into an extractivist model, to obtain the highest possible income, through which their industrialization and development were financed; on the other hand, these resources have also been used to pay for growing public spending. The objective of this research work is to determine the impact of oil extractivism on the economic growth of Mexico. For which an econometric model was developed, by ordinary least squares, analyzing the period of time 1990-2020. The results obtained show negative effects associated with a high dependence on public finances toward oil extractivism, in addition, derived from the lack of transformation and improvements of the Mexican extractivism model, negative impacts are generated in the economy that, if not addressed, can trigger a domino effect with greater losses for the oil sector, which could lead to increasing the country risk, an aggravating the economic and social situation of the country in the medium term.

Oil exploitation, Economic impact, Econometric model

Resumen

El extractivismo es un modelo de crecimiento económico fundamentado en la explotación, de recursos naturales primarios, poco transformados, entre ellos el petróleo, para ser vendidos en el mercado mundial. Varios países entre ellos México se insertaron en un modelo extractivista, para obtener los mayores ingresos posibles, mediante los cuales se financiaron su industrialización y desarrollo; por otro lado, también se han utilizado estos recursos para solventar el creciente gasto público. El objetivo del presente trabajo de investigación es determinar el impacto del extractivismo petrolero en el crecimiento económico de México. Para lo cual se desarrolló un modelo econométrico, por mínimos cuadrados ordinarios, analizando el periodo de tiempo de 1990-2020. Los resultados obtenidos muestran efectos negativos asociados a una alta dependencia de las finanzas públicas hacia el extractivismo petrolero, además derivado de la falta de transformación y mejoras del modelo extractivista mexicano, se generan impactos negativos en la economía que de no atenderse pueden desencadenar un efecto dominó con mayores pérdidas para el sector petrolero, que podra derivar en aumentar el riesgo país, y en agravar las situación económica y social del país en el mediano plazo.

Explotación petrolera, Impacto económico, Modelo econométrico

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Introduction

The Mexican economy has had, over time, different components relevant to its development and growth; such is the case of high technology industries, oil production, mineral exports and manufacturing, among others. Specifically, energy resources were for many years the driving force behind Mexico's economic growth. It is important to note that for Mexico, oil and gas reserves are one of its most prized possessions, since oil production alone represents about one third of government revenues. Furthermore, according to Sanchez (2011), oil had positive effects in terms of industrial growth.

The importance of oil in Mexico can be understood by analyzing its historical trajectory, since with the discovery of large reserves, Mexico based both its economic policy and its foreign relations on its oil potential, taking for granted that it was an abundant and "infinite" resource, it traded it at a very low price for a long time, and from this profit it managed to finance the industrialization of the country, and also tried to diversify the economy (Sánchez, 2011).

Sánchez (2011) argues that Mexico's decision to expropriate and nationalize the oil industry in 1938 not only represented an early action by a developing country to assert the control and exploitation of its natural resources for its economic development, but also constituted tangible evidence that, when there is a national consensus, it is possible to establish limitations to the economic power and political influence of external economic agents that have the national economy as a framework for their operations.

Thus, throughout the oil development, the Mexican economy became highly dependent on oil exports, but this in turn managed to slow down its long-term growth, bringing, of course, great macroeconomic repercussions to the country. In the first instance, one would think that the large volumes of oil exported by Mexico are always economic advantages for the country, but the truth is that we find a harmful linkage, because as Tosoni (2011) mentions, despite the fact that crude oil prices have increased, Mexico has not managed to have a better economic performance for its oil industry.

This author also states that at the end of the 1990s high oil prices were detrimental, due to a lower demand for non-oil export products from the United States, and just as then, it seems that history is repeating itself, since Mexico continues to be subject to extractivism.

Since the nationalization of the oil industry, Mexico has used oil as an engine of industrial development and economic growth. The existence of oil in abundant quantities, although it had a positive effect in terms of industrial growth, also had a negative effect as the economy became heavily dependent on oil export revenues and, in addition, because it was believed that oil revenues would always be growing, governments resorted to indebtedness and also avoided making adjustments in the economy. The economy did not diversify to the desired level and companies did not make the technological adjustments that would allow them to become more competitive in the international market. The effect of the lack of adjustment was, firstly, the economic crisis that affected the country in 1980, and secondly, the growing external indebtedness, which has limited the possibilities of growth and development of the economy. Oil prices are highly volatile, and the fall in oil prices caused Mexico to face difficulties in paying its foreign debt in the early 1980s, and high indebtedness became an obstacle to economic growth (Sanchez, 2011).

The high dependence on hydrocarbons for an economy always represents a risk and a factor of concern in the short term, which tends to become even more acute in the medium and long term (Cantamutto, 2022), for Mexico this represented an enormous weight as time went by, since the high volatility of prices has generated instability of oil revenues causing strong crises in the Mexican economy (Sanchez, 2017). Although the economy is an important point to analyze, it should not be forgotten that resources such as oil are not renewable and that its extraction will also bring environmental and social consequences (Ofstehage, Wolford and Borrás, 2022), although this article focuses mainly on the economic effects and intends to go deeper into the environmental and social aspects in a later article.

The extractivist model by its own characteristics encourages companies to extract natural resources without ethical limits (Alarcón, 2022), because by prioritizing above all the rate of profit, they ignore the terrible consequences that this model brings not only for the environment and the social aspect, but for the same economic model in the medium and long term (Azama & Ponce, 2014).

The research objectives are to determine the impact of oil extractivism on economic growth in Mexico, using an econometric model to estimate the impact of various indicators associated with oil on economic growth and to discuss the consequences for the Mexican economy and for the economic model with a high dependence on oil extractivism.

Methodology

An analysis of hydrocarbon statistics in Mexico was carried out considering a period from 1990-2020. An ordinary least squares econometric model was estimated. The dependent variable is GDP and the independent or explanatory variables are gross capital formation, crude oil production, the value of oil exports and the Gini coefficient with a lag. In other words, GDP is a function of or depends on the behavior of the explanatory variables.

The specified model is as follows:

$$Y_i = \beta_0 + \beta_1 X_i + u_i \quad (1)$$

Where:

GDP: Gross Domestic Product in millions of dollars at 2010 prices.

Y_{Crude}: Crude oil production in thousands of barrels per day with a lag.

X_{s_oil}: Value of oil exports in millions of dollars at 2010 prices.

Gini coefficient: Gini coefficient (index) with a lag.

GFC: Gross capital formation in millions of dollars at 2010 prices.

Statistics from official sources were used: World Bank, Ministry of Energy, Bank of Mexico, as main tool the databases and the econometric software Gretl®.

Results

Overview of the hydrocarbon sector in Mexico

Oil is a very important resource for Mexico's economy and represents a national security issue. Despite the high volatility of oil prices, with abrupt drops in the price of crude oil worldwide in recent years, the contribution of oil revenues to public finances is more than 15 percent. On the other hand, given that oil is a non-renewable natural resource, the long-term viability of oil extractivism and the lack of greater diversification of Mexico's energy matrix are under discussion.

According to data from the Energy Secretariat, crude oil production participated with 59.83 percent of total primary energy during 2019. In addition, Mexico had in 2018 an exploration and extraction area of 19,034,031 hectares, of which 86.5 percent are dedicated to exploration and 12.2 percent dedicated to hydrocarbon extraction (Reynoso, 2018). Pemex has 97.7 percent of the contracts and allocations of national crude oil production; while the remaining is held by private initiative (Secretaría de energía, 2020). During the period from 1990 to 2020, crude oil production decreased at an average annual rate of 1.3 percent, however, it continues to be the largest producer. Analyzing the production of 30 years, it is observed that since 2005 crude oil has negative production growth rates, reaching around 9 percent between 2009 and 2018, so the high dependence on oil revenues for public finances represents a high economic risk for the country (Fig. 1).

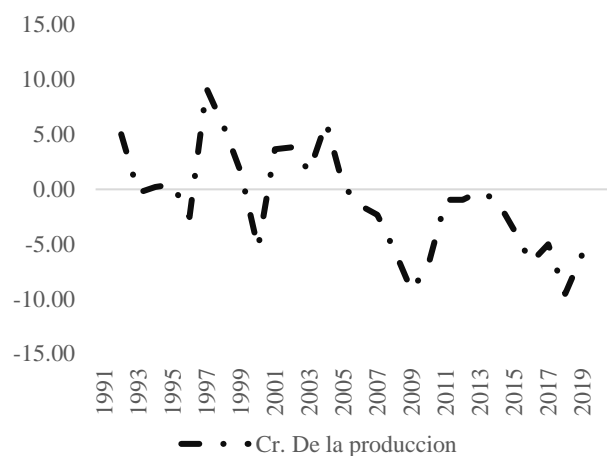


Figure 1 Crude oil production growth rate
 Source: Own elaboration with data from the Ministry of Energy (2021)

It is also important to point out that crude oil is the hydrocarbon with the highest share in the international market; its share in the value of oil exports since 2000 has been at least 80 percent of oil currencies; however, in 1997 and 1998 it contributed 46.6 percent and 22.5 percent, respectively, atypical data if we consider its share during the period under analysis. Overall, crude oil exports contribute an average of US\$30,334 million annually (Fig. 2).

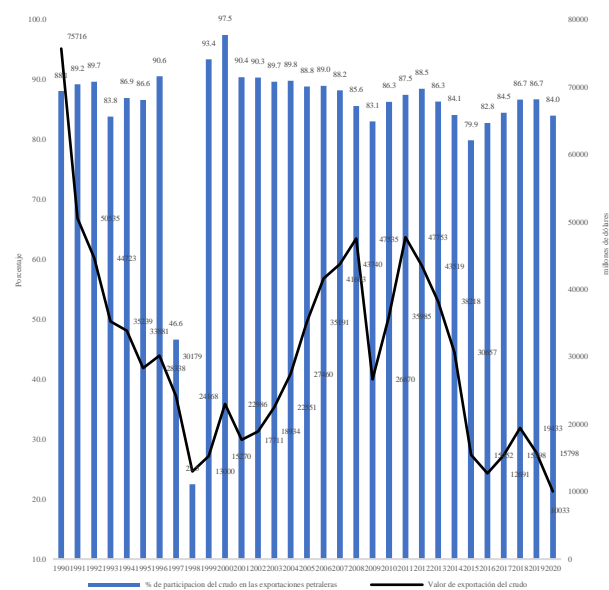


Figure 2 Value of crude oil exports
 Note: Value of exports expressed in millions of dollars at 2010 prices
 Source: Own elaboration with data from the Statistical Information System of the Ministry of Energy and Banco de México (2021)

An antipodean characteristic of economic growth is that on the one hand it generates economic wellbeing, however, on the environmental side it generates pollution and resource depredation (Auz, 2022), even more so in the case of oil production, since it is an activity that generates soil and water pollution, as well as Greenhouse Gas Emissions (GHG), including carbon dioxide, the main cause of global warming. In general, most of the activities related to higher economic growth also imply higher CO₂ emissions.

According to data from the World Bank (2021), in 2018 Mexico ranked eleventh in pollution with 679, 880 kt of CO₂. Carbon dioxide emissions had an average annual growth rate of 2 percent during the period 1990-2020. However, the annual growth with respect to the previous year is higher than 2 percent in half of the observations, and contrasting with GDP growth, a similar behavior is observed with an average rate of 2.05 percent (Fig. 3).

It should be noted that the energy sector, understood as the energy transformation and commercialization sector, is responsible for one third of greenhouse gas emissions. In fact, Mexico and Brazil are the only Latin American countries in the ranking of the 15 countries that emit the most carbon dioxide (CO₂) in the world, according to data from the Global Carbon Atlas, a collaboration between the international network of scientists Future Earth and the UN, (BBC News Mundo, 2019).

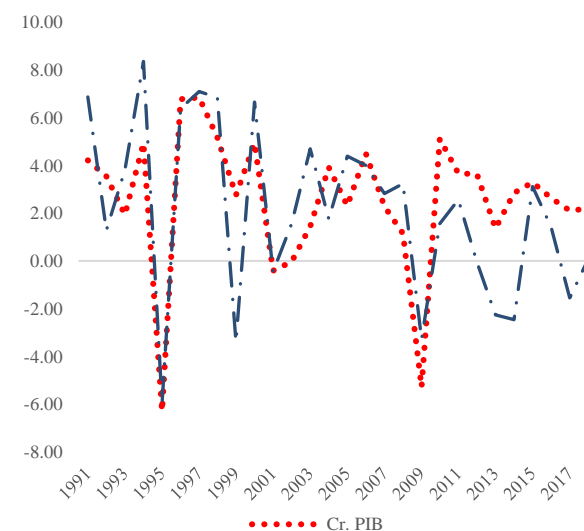


Figure 3 GDP growth rates and CO₂
 Source: Elaborated with data from the World Bank (2021)

Econometric analysis

The model was expressed as:

$$\begin{aligned}
 PIB = & 2403230 + 2.03251FBC_{t-1} - 1.31442Ycrudo_{t-1} \\
 & - 1.38304Xspetroleras_{t-1} \\
 & - 35242.7 Coef. gini_{t-1}
 \end{aligned}$$

The model proposed is characterized by the use of lags in its explanatory variables, which means that the impact that these variables have on GDP is not immediate, but responds after a period of time, so that the effects can be cumulative in the medium and long term.

As for the economic interpretation of the model, the estimated parameters yield the following:

Gross capital formation has a direct relationship with GDP, this means that if BCF increases GDP increases, on the contrary, if BCF falls GDP decreases. Based on the model parameter, if GFCF increases by \$1 million, GDP will increase by \$2.03 million.

Contrary to the CBF, the relationship between crude oil production, the value of oil exports and the Gini coefficient have an inverse relationship with GDP, which implies that if any of the mentioned variables increases, GDP decreases, or if they decrease, GDP increases.

If crude oil production increases by 1,000 barrels per day, it generates a negative impact on GDP, causing a drop of 1.31 million dollars. On the other hand, if the value of oil exports increases by 1 million dollars it causes a drop in GDP of 1.38 million dollars. The Gini coefficient is an indicator that measures inequality in Mexico; its inverse relationship with GDP indicates that a one-unit increase in the Gini index causes a decrease in GDP of 35,242.70 million dollars.

The estimated parameters showed the expected signs, where the volume of crude oil production and the value of oil exports have an inverse relationship with GDP, evidencing the negative effects of oil dependence, despite the economic importance of oil for the Mexican economy, indicating that, although there is an increase in the value of crude oil exports, economic development is not being generated in Mexico related to this indicator.

The variables that are statistically significant at a 99 percent confidence level are: gross capital formation and the Gini coefficient. The value of oil exports is significant at a 95 percent confidence level. In other words, the aforementioned variables influence the behavior of GDP.

The R-squared is 94 percent, it is considered a good fit of the independent variables on GDP. Where 94 percent of the model is explained by the independent variables.

Model: OLS, using 1991-2020 observations (T = 30).

Dependent variable: GDP

	Coefficient	Standard Deviation	Statistic t	p-value	
Const	2.40323e+06	517871	4.641	<0.0001	***
FBC_1	2.03251	0.447517	4.542	0.0001	***
Ycrudo_1	-1.31442	23.5267	-0.05587	0.9559	
Xs_petroleras_1	-1.38304	0.576017	-2.401	0.0241	**
Coef. gini_1	-35242.7	8600.19	-4.098	0.0004	***
Average of vble. dep.	993859.7	D.T. of the vble. dep.	194970.5		
Sum of squared residuals	5.58e+10	T.D. of regression	47253.41		
R-squared	0.949363	Corrected R-squared	0.941261		
F(4, 25)	117.1769	p-value (of F)	8.23e-16		
Log-likelihood	-362.7317	D.T. of the vble. dep.	735.4635		
Schwarz criterion	742.4695	T.D. of regression	737.7047		
Rho	0.232705	Corrected R-squared	1.513362		

The results of our model go hand in hand with what Payan & Rodriguez (2021) affirm according to a study conducted by the author at Rice University, in which he argues that Pemex hinders Mexico's economic growth, proof of this is that the government has injected 1.4 percent of GDP to support PEMEX, (budget higher than that invested in overcoming the pandemic of covid19 which was 1.1 of the GDP in the same year), which calls into question not only the economic recovery, but the country's destiny can be seen anchored to the destiny of Pemex, since all the money injected to Pemex, lacks investment plans, is not destined to the development of new technologies, nor does it have a long-term strategic business plan to avoid greater losses (Payán & Rodríguez, 2021:4).

Unfortunately, Pemex is the most indebted oil company in the world with 110 billion dollars of debt, which has strongly deteriorated both its credit profile and Mexico's country risk (Cota, 2021). The company has huge losses every year, and according to data from the same company in 2020 it lost 481,000 million pesos (Ibidem, 2021).

The Payan & Rodriguez (2021) study states that Pemex's financial situation will continue to deteriorate, "especially if it does not undergo a restructuring or partner with the private sector". Since there is a high probability that PEMEX will cause the greatest negative impact on the economy and contribute to the weakening of finances in 2021 (Payan & Rodriguez, 2021: p. 5).

It is important to mention that, in reality, after the reform, the necessary changes have not taken place and oil production has negative effects, since it is a natural resource that is extracted without giving a positive and defined direction to those revenues, in favor of a truly productive and successful economic model (Ofstehage, Wolford & Borrás, 2022), given this it is necessary to highlight that "after the reform, Pemex will continue to contribute financially to the federal budget, besides that it is still subject to spending and indebtedness restrictions; and its labor liabilities indicate that it has an urgent need to negotiate a new collective bargaining agreement, which will allow it to get rid of such an onerous burden that weighs heavily on the company's financial situation. All of the above added to its heavy indebtedness, "will not allow it to position itself strategically against its competitors" (Reyes Heróles, 2015, in Pérez & Clavellina-Miller, n.d. p. 83).

Oil production and exports also do not translate into profits that contribute to GDP, firstly, oil production in Mexico has increasingly high costs and its production in the last two decades, has fallen by 50 percent (Cota, 2020). Second, much of the revenue generated by oil production and exports goes to finance public spending. The fall in oil revenues and the lack of a fiscal reform may cause serious problems for federal financing, which depends on 17 percent of the resources obtained from oil.

The Mexico Association calculated in 2020 that for every 50,000 barrels of oil that were no longer produced in a year, the Treasury would lose 16.3 billion pesos (Cullell, 2020), and fewer resources for public spending would mean government cuts in investments in security, health and education (Ordaz, 2020).

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Conclusions

This research studies the case of oil extractivism in Mexico and analyzes its relationship with economic growth, economic development and, at the same time, it shows strong implications with social inequality from 1990 to 2020. It is highlighted that Mexico is highly dependent on oil resources to cover its public finances, there is a latent risk that the fall in production, productivity, high indebtedness and the lack of good business management of the Mexican oil company will negatively impact the economy in the coming years, with the serious consequences that this means for the economic and social sector.

In the analysis developed in this research we show that due to oil extractivism, Mexico's economic development has been diminished, being a process that has a negative impact on the country's economic growth.

Gross capital formation generates positive impacts on GDP, the value of oil exports and the Gini coefficient indicate a negative relationship with GDP. The estimated parameters are an indicator of the influence that investment, the value of oil exports and economic inequality have on GDP.

Oil production and exports, given the process of extractivism and based on expectations, do not translate into profits that contribute to GDP; on the other hand, a large part of these profits go directly to finance public spending, which, added to the poor business performance of PEMEX as a state-owned oil company, calls into question not only economic recovery, The money injected into Pemex lacks viable investment plans, nor does it develop new technologies, nor does it have a strategic business plan in the short, medium and long term to avoid greater losses and give the sector an entrepreneurial focus that will allow it to compete in the international market.

In addition, oil production in Mexico has increasingly higher costs and its production in the last two decades has declined alarmingly. After the reform, the necessary changes have not been made and oil production will have negative effects, since the extraction of natural resources, in this case oil, which is extracted without giving a positive and defined direction to those revenues in favor of a truly productive and successful business oil economic model, will end up depleting resources without obtaining the necessary growth cycles for the sector.

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