

## **Pemex in the context of the global oil company: investment policy and lessons learned**

*A Pemex no contexto da petroleira global:  
política de investimentos e lições aprendidas*

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RESUMO: O artigo analisa a política de investimentos da Pemex para o período 1980-2019, com base na gestão de outras empresas petrolíferas. A questão central é se, nas últimas quatro décadas, foi conveniente para a Pemex se especializar na extração de petróleo, enquanto outras empresas focaram no desenvolvimento integral da cadeia de suprimentos. A resposta é negativa. A venda de petróleo bruto e o abandono do refino fizeram do México um importador líquido de combustíveis, tendência que, hoje, busca ser revertida, em um ambiente de alta carga fiscal e alto endividamento da empresa.

PALAVRAS-CHAVE: Pemex; petróleo; investimento; companhia de petróleo; extração de petróleo; refino.

ABSTRACT: The article analyzes Pemex's investment policy for the period 1980-2019, based on the management of other oil companies. The central question is whether in the last four decades, it has been convenient for Pemex to be specialized in oil extraction, while other companies focused on the comprehensive development of the supply chain. The answer is negative. The sale of crude oil and the abandonment of refining made Mexico a net importer of fuels, a trend, which, today, is seeking to be reversed, in an environment of a high fiscal burden and high indebtedness of the company.

KEYWORDS: Pemex; oil; investment; oil company; oil extraction; refining.

JEL Classification: F23; O47; O11; Q43; Q48.

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## INTRODUCTION

The article analyzes *Petróleos Mexicanos* (Pemex) investment policy in the context of the global oil companies, including state-owned, private and mixed companies. The aim is to draw lessons for Pemex. Oil plays a crucial role in development, but several studies point out that in Mexico there is a contradiction in this aspect, since revenues from oil exports do not translate into investment aimed at strengthening the value chain and, in general, productive spending (Huizar, 2015; Lopez & Nava, 2018; Vargas, 2019). Pemex has lagged behind in key areas such as infrastructure, technological development, human capital training and transition to less polluting processes. Despite being a cost-competitive company, its extraction orientation has led it to replace its role as a state-owned enterprise with productive and development purposes by that of a public funds provider through its fiscal obligations to the State (Pemex, 2020b). This reality affects its financial stability by leading it to a situation of extreme scarcity, in which, in order to meet its needs and adjust to the tax burden imposed, it has had to increase its debt.

Investment is fundamental to the productivity and competitiveness of a company that manages a scarce and differentiated resource such as oil and, moreover, provides the country with an income that cannot be generated in non-oil producing countries (Bartra, 2013; World Bank, 2021). Globally, Mexico ranks 22 in proven reserves and 13 in crude oil exports (EIA, 2017 and 2020). Throughout its history, Pemex has gone through different economic conceptions that have determined the type of energy policy implemented. With the oil expropriation in 1938, nationalism and resource sovereignty emerged (Maurer, 2011); until 1970, and a time of little industry development and inward growth followed. After 1970 with the discovery of Cantarell, oil became one of the pillars of economy. The opening initiated in the 1980s did not affect state ownership, but specialized Pemex in oil extraction, the main currency-generating business. In subsequent years, private capital was allowed to access some secondary activities, and it was with the 2014 energy reform that exploration and extraction were opened. Since 2018, in the search for fuel self-sufficiency, the pertinent government's policy favors sovereignty. This vision has been accompanied by an impulse for refining, which has revitalized this line of Pemex and is palpable at a corporate and national level in spending statistics (PND, 2019).

In this context, our contribution is the analysis of Pemex's investment policy in the context of the business model and the productive scheme of other oil companies over the past four decades; the purpose is to draw lessons to improve oil management in Mexico. The general conclusion is that the investment policy of the last forty years had no positive effect on the development of the production chain, specifically in refining, an activity that was deliberately abandoned to favor extraction. The country's six refineries continued to operate at less than 40% of their capacity; today, the surplus value of Mexico's foreign trade in crude oil contrasts with the deficit in that same line in oil products and natural gas (Pemex, 2020a). While, worldwide, refining was being promoted in countries like the United States of America (USA) – which is among the top ten places in countries with proven

reserves in the world – (EIA, 2020) and China, which came to consider it a high-priority issue due to the fact that they do not have large oil reserves (Nava, 2021).

The order of the document is as follows: Section 1 describes the global context, starting with oil as a source of energy; then it highlights Mexico's position on some energy issues and, given its state-owned nature, places Pemex within the concept of the state-owned companies and among the top 13 companies by production capacity worldwide, according to Forbes. It also describes the main features of its business model, examined separately. Section 2 analyzes the investment trajectory in parallel with that of price; it provides data on the trade in crude oil and fuels to contrast their value; and finally, debt data are presented. Section 3 presents the most significant lessons Pemex can draw from other firms regarding its production scheme and market experience. Conclusions are presented in Section 4.

## 1. GLOBAL CONTEXT

### Oil and gas as energy sources

The industrial revolution was a turning point in terms of the use of energy since it changed the use of renewable to non-renewable energies, by altering the magnitude of what was produced and the resources required in order to keep the global energy generation system in operation (Graf, 2018). Today, it is not possible to see oil as a mere commodity; it is present in exchange transactions, but also in financial markets; it also has a geopolitical and geostrategic component (Jalife, 2007). Non-oil producing countries are vulnerable to oil shocks, as are oil-producing countries that face their own challenges; it is not easy to manage a resource that feeds the world's productive system and where price influences supply to Western industrialized nations (Graf, 2018, pp. 88-89). According to Henry Kissinger – National Security Advisor to Richard Nixon, President of the US in the 1970s –: The amount of energy is finite in relation with demand and competition for access to it is becoming a life and death matter for societies even reaching the equivalent of the colonial disputes of the nineteenth century (Jalife, 2007). The exploitation of energy sources, including oil and gas, are strong cards for many countries and are used strategically. An example of this today is Gazprom's Nord Stream 2 gas pipeline, a Russian company, which seeks to supply gas to Germany, without passing through Ukraine (with which conflicts arose due to the annexation of the Crimea peninsula to the Russian Federation in 2014). Russia ranks first in natural gas reserves in the world and second in production after the United States (SIE, 2021); it is also the largest gas supplier for Europe, which has become a matter beyond the mere supply of a fuel. Between 35% and 40% of Europe's gas comes from Russia. Of the countries of the Organization of Petroleum Exporting Countries (OPEC), Saudi Arabia and Iran, whose companies are Saudi Aramco (ARAMCO) and National Iranian Oil Company (NIOC), have the second and third place in proven oil reserves (Statista, 2021), and they are in the second and fourth place of the non-OPEC countries. In

the same group, Russia is eighth with Gazprom and Rosneft. China, which sold its oil demand with imports, is in the thirteenth place; that is why, despite the fact that it is not in the top reserve places, it is a key player in the crude oil market and much of its investment is leading to refining activities. In the case of Mexico, as a result of the fuel self-sufficiency policy, the example is Pemex's purchase of Shell's majority stake in the Deer Park refinery in Texas to meet the country's gasoline and diesel requirements of almost two million barrels a day.

### Indicators for Mexico

Mexico's position in different energy issues is described in Table 1. It is among the first twenty to twenty-five places in several country rankings (EIA, 2020). In contrast to fuels, its place in proven reserves, production and crude oil exporter stands out. Production has fallen in recent years, but, in general, extraction has given Mexico large revenues and a considerable oil rent (difference between prices and costs), which is one of the highest in Latin America, only surpassed by Venezuela (World Bank, 2021).

Table 1: Mexico: Position in energy indicators

Concept	Place	Countries	Unit of measure
Total energy production	18	174	British Thermal Unit (BTU)
Total energy consumption	14	216	BTU
Proven crude oil reserves	22	96	Millions of barrels
Production of oil and other liquids	14	127	Barrels per day (BPD)
Exportation of crude oil and condensates	13	82	BPD
Refinement	19	108	BPD
Consumption of refined products	11	216	BPD
Natural gas production	25	97	Cubic feet
Natural gas consumption	10	114	Cubic feet

Source: Prepared by the author based on data from (EIA, 2020).

### The global oil company: productive scheme and business model

The position of the oil companies in the market depends on the natural oil supply of each country, the degree of technological development and the business model implemented. On the global scenario, private transnational companies, state-owned companies and mixed companies coexist. In the 1970s, private multinational companies almost entirely controlled the market, but as state-owned enterprises gained bargaining power with OPEC, they lost control. Most of the companies presented in this section are state-owned companies and some belong to OPEC, which means they have a great influence on pricing. In its broad sense, the state-owned company is an organization that supplies goods and services, has budgetary autonomy, some

managerial discretion and which, in principle allows for privatization (Florio, 2014). These firms play an important role in promoting their countries' growth, as they generate "spillover" effects (Hirschman, 1989). In several of them, the State has exclusive ownership and control of hydrocarbons, while in others, private capital can only participate in some secondary activities. It is essential to mention that the legitimacy crisis of public administration linked to corruption and lack of transparency has built a perception of inefficiency that also includes state-owned companies (SFP, 2015). But not in all cases such claim is correct, and especially when it comes to oil: major private oil companies such as Exxon Mobil, Chevron, British Petroleum, and Shell share the market with others in the Middle east, Russia, and China state-owned companies that have had an effective performance.

Of the list of companies presented in Table 2, seven are state-owned ones; Pemex ranks 9 among them (Pemex, 2020a). Similarly, of the 25 largest oil publicly-traded companies, some are state-owned and are at the top of the list. Companies such as Gazprom, Rosneft and Petrochina focus their utmost attention on the comprehensive management of the industry, transparency, performance, innovation, among other aspects that are decisive in the market. According to the analysis by Isakov *et al.*, (2019), to date, Rosneft's oil services have proved their effectiveness. The company has also focused on the training and strengthening of groups of institutes, specialized in each of their areas, which allows them to more precisely identify the problems and design the best solutions (Timashev *et al.*, 2020). The areas of interest of these institutes cover all the vectors of activity of the company, starting with geological exploration, development, design and field facilities, the creation of new technologies for oil refining, petrochemistry, specialized software development, the development of computer-assisted instruction and robotics. Something similar happens with others like ARAMCO and NIOC. In short, the assumption of inefficiency of the state-owned oil company is not an absolute concept. There are countries where there are major challenges in terms of transparency and accountability, but that does not predispose the state-owned companies to be inefficient and, in fact, they are obliged to optimize their productive processes, as technological development improves and new methods in balance with the environment are required.

In a global oil market dominated by state-owned companies, the optimal combination of productive, financial and environmental objectives is a requirement. Evidence indicates that, in the oil market, the share of state-owned companies is effective and tends to increase. An example of this are the firms from the Middle East, Russia, and China. If internationalization is measured by export capacity, these companies succeed under state ownership, and from an energy security approach, the key concept in terms of accessibility, supply, and management of foreign policy by oil producing-countries (CEPAL, 2018, pp. 11-12). Oil is a strategic resource because other industries depend on it; it affects tax policies of exporting countries either through revenue from taxes on production or consumption, or expenses made in foreign currencies to import other products and financing of public subsidies (CEPAL, 2018). Several considerations about oil are at play in the geopolitical game that has led the "black gold" price to dramatic rises, making it an instrument serv-

ing purposes beyond the classic supply and demand (Jalife, 2006, p. 20). Major oil producers maximize their earnings in the market and have the State as manager of the national interests. Among the top thirteen companies by production capacity, the most of them are state-owned (Table 2).

Table 2: Leading oil companies by production capacity, 2019 and 2020

Level	Company	Country	Production capacity (millions of daily barrels)	Type of property	Production scheme	Business management principles
1	Saudi Aramco (ARAMCO)	*Saudi Arabia	12.0	State	- Oil and gas exploration and extraction - Refinement - Petrochemistry	- Environmental sustainability - Solutions in the energy field with low carbon emissions - Strategic investment
2	Gazprom	Russia	8.3	State	- Gas and oil production - Gas transmission systems (Russia and abroad)	- Integral focus - Synergy among subsidiaries - Sustainable development
3	National Iranian Oil Company (NIOC)	*Iran	6.0	State	- Oil and gas exploration and extraction - Petrochemistry	- Profitability, competitiveness modernization - Skilled labor training - Drive research in R&D centers
4	Exxon Mobil	USA	4.7	Private	- Oil exploration and production - Refinement - Transportation - Supply and services	- Large-scale investment - Prevention of conflicts of interest - Protection of the tangible and intangible (information) assets of the corporation
5	Rosneft	Russia	4.7	State	- Oil and gas production - Refinement - Petrochemical	- Transparency - Confidence for the investors - Maximum yield for the shareholders
6	Petro China	China	4.0	State	- Oil and gas production - Refinement - Commerce	- Continuous improvement - Modern corporate governance - Innovation
7	British Petroleum	United Kingdom	3.7	Public Limited Company	- Oil exploration and production - Refinement - Transportation - Supply and services	- Good governance - Operational and financial efficiency
8	Royal Dutch Shell	Anglo-Dutch	3.7	Private	- Oil exploration and production - Refinement - Transport and supply	- High performance standards - Strategic decision-making - Long-term profitability

9	Pemex	Mexico	3.6	State	<ul style="list-style-type: none"> <li>- Oil and gas exploration and extraction</li> <li>- Refinement</li> <li>- Distribution</li> <li>- Commerce</li> <li>- Services</li> </ul>	<ul style="list-style-type: none"> <li>- Contribution to energy security through the processing, distribution and commercialization of hydrocarbons and their derivatives</li> <li>- Profitability and sustainability criteria to benefit national development</li> </ul>
10	Kuwait Petroleum Corporation (KPC)	*Kuwait	3.4	State	<ul style="list-style-type: none"> <li>- Oil exploration and production</li> <li>- Refinement</li> <li>- Commercialization</li> <li>- Petrochemistry</li> <li>- Maritime transport</li> </ul>	<ul style="list-style-type: none"> <li>- Global leadership and profitability</li> <li>- Development of new methods to better compete in the market</li> <li>- Creation of value</li> </ul>
11	Chevron Corporation	USA	3.3	Private	<ul style="list-style-type: none"> <li>- Oil and gas exploration and production</li> <li>- Refinement</li> <li>- Transport and services</li> </ul>	<ul style="list-style-type: none"> <li>- Operational excellence</li> <li>- Competitiveness and profitability in the global market</li> </ul>
12	Abu Dhabi National Oil Company (ADNOC)	*United Arab Emirates	3.1	State	<ul style="list-style-type: none"> <li>- Oil and gas production</li> <li>- Storage</li> <li>- Refinement</li> <li>- Petrochemistry</li> <li>- Distribution</li> </ul>	<ul style="list-style-type: none"> <li>- Maximization of the value of each barrel of oil seeking the best return for the business</li> <li>- Operational efficiency</li> <li>- Development of technology</li> </ul>
13	Petrobras	Brazil	2.9	Majority state-owned	<ul style="list-style-type: none"> <li>- Oil and gas production</li> <li>- Refinement</li> <li>- Maritime transport</li> <li>- Transport and services</li> <li>- Innovation and technology development</li> </ul>	<ul style="list-style-type: none"> <li>- Innovation and technological development</li> <li>- Technologies that contribute to reduce reservoir uncertainties, promote integration, increase accessibility and quality of reservoir databases and petroleum systems.</li> <li>- Technologies and practices to reduce costs and increase revenues, along the entire logistics chain, for upstream and downstream.</li> </ul>

Source: Prepared by the author based on data from: Forbes (2020), ARAMCO (2020), GAZPROM (2020), NIOC (2020), EXXON MOBIL (2020), ROSNEFT (2020), Petro China (2020), British Petroleum (2020), SHELL (2020), Pemex (2020c), KPC (2020), Chevron Corporation (2020) and ADNOC (2020), Petrobras (2021).

\*Member of the Organization of the Petroleum Exporting Countries (OPEC).

In the case of oil, state ownership does not necessarily lead to inefficiency; on the contrary, mechanisms for a better competition are devised and explored. For instance, the corporate governance of ARAMCO is focused on a high-performance culture and at the same time on achieving its business objectives. Saudi Aramco became the highest valued company with its debut on the stock market in November of 2019. In its first days on the stock market, it reached a value of more than two trillion dollars (Aramco, 2020). The business parameters of NIOC are profit-

ability, competitiveness, modernization, training of specialized labor, and research promotion (NIOC, 2018). Contrary to belief, Petro China has modern corporate governance designed to defend its interests in the global market (Petro China, 2020). Only three companies are privately owned (Exxon Mobil, Chevron and Shell). The four ones from the Middle East (Aramco, NIOC, KPC and ADNOC) are state-owned and are members of the OPEC, a key organization to determine the price of oil, as it contributes with more than 40% of the global production and controls 81.5% of the world's proven oil reserves, from which 65.5% are located in the Middle East (OPEC, 2019). Pemex ranks number 9 and there are two lessons to be learned from this group of companies. The first one is the productive approach comprising the whole value chain: exploration, extraction, refining, and trade. The second one has to do with the management model: the action plans of other state-owned companies are consistent with competition, strategic investment, maximum shareholder yield, maximization of the value of every barrel of oil, operational excellence, global leadership, and financial efficiency. In contrast, in the last four decades, Pemex's industrial model specialized in extraction, isolating it from other key aspects.

Analyzing the Mexican oil boom in the 1970s, the dates when refineries were established, their production capacity and the urge to open the economy in the 1980s, the energy sector was not given the chance to define its own production scheme based on experience and pursuing the national interests (Pemex, 2020a).<sup>1</sup> The obstinacy caused by a public inefficiency that did prevail in other state-managed companies, even smaller and less strategic, prevented Pemex from positioning itself as an integrated and robust company within an increasingly demanding market; failures were mostly attributed to ideological reasons, as well as administrative and technical ones. In financial terms, the possibility was supported by oil prices, which had important peaks from 1977 to 2019 and whose tendency, by logical sequence, was overlapped with that of government income from oil production. Primary specialization, as a public policy objective, became a reality with the energy reform of 2013, which legally turned the extraction of oil and gas into a priority activity and opened it to private investment (Pemex, 2014). That year, refineries were operating below 40% of their capacity. The political conflict to reconcile government royalties with the company's solvency disappeared with the preference for taxes on extraction, the most taxed activity. From 1977 to 2019, the tax payments accounted for an average of 98.46% of Pemex's annual profits. On that matter (Ramírez & Paz, 2017), in a comparative analysis between Pemex and Petrobras show that the role of Pemex remained in the confines of tax concerns; to date, it still is the largest taxpayer in Mexico and one of the most important exporters, only second to the manufacturing industry (INEGI, 2020).

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<sup>1</sup> Year of creation of the refinery of Azcapotzalco: 1946, capacity: 50,000 barrels a day; Salamanca: 1950, 25,000 barrels a day; Minatitlán: 1956, 50,000 barrels a day; Tula: 1976, 150,000 barrels a day; Cadereyta 1979: 100,000 barrels a day; Salina Cruz: 1979, 160,000 barrels a day.

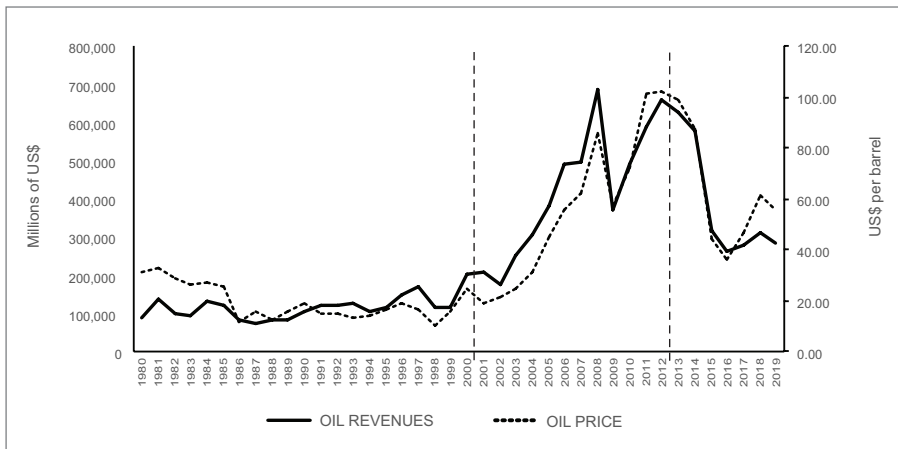


In the case of Latin America, Petrobras deserves special mention. It is a majority state-owned company that, like Pemex, has been influenced by different ideological and political stances since its foundation in 1953 (developmentalism, neoliberalism, interventionism), until it became a mixed company in which transnational capital also participates. The most remarkable and learning element is that it has been a key player in the development of Brazil’s capital goods industry, combining this function with investments in cutting-edge technology in the area of deepwater exploration – where it is a pioneer – to reach hydrocarbon reserves (García & Tahan, 2016; Erber, 2011; Alves & Polette, 2021). However, this does not imply that it does not have financial problems to solve (Fagundes, Vargas & Losekann, 2015).

## 2. PEMEX: INVESTMENT POLICY IN THE LAST FOUR DECADES

In Mexico, oil revenues from oil exports are linked to price evolution and are allocated to several items of the national economy through the public budget; oil contributes one third of national spending (SHCP, 2019; Pemex, 2020b). Between 2000-2014, for example, for almost fifteen consecutive years, Pemex had what can be considered, a “financial gold season” coming from price, with the exception of the fall of 2009, as a result of the 2008 crisis (Figure 1).

Figure 1: Mexico: oil prices and oil revenues, 1980-2019

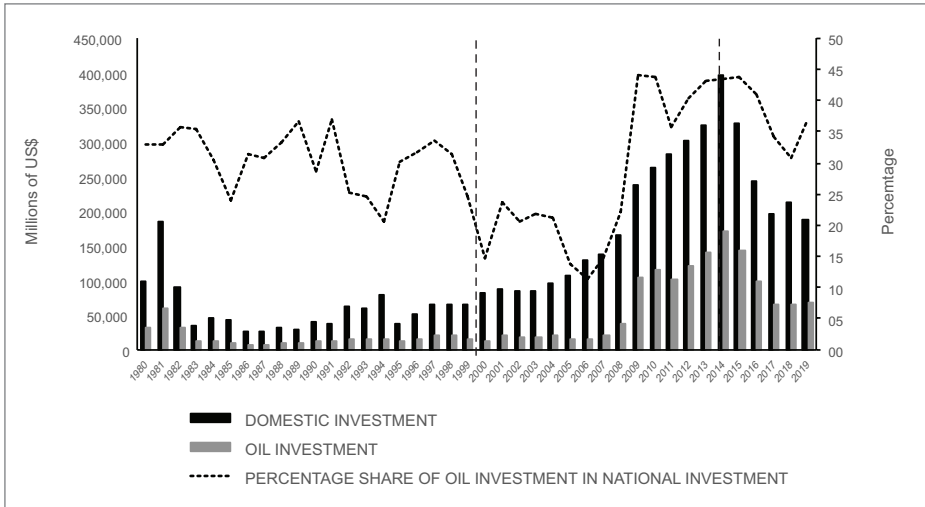


Source: Prepared by the author based on (SIE, 2021).

Figure 2 shows that the period of greatest investment growth corresponds, as in the figure above, to that of 2000-2014. However, there is no evidence of new assets or infrastructure works that have a significant impact on the productivity of the sector (Ara, 2020; Sánchez, 2016; Silva, 2021). This fact has a logical link with the economic policy of those years whose interest focused on specializing Pemex in crude oil, leaving refined products supply to the international market. A big boom

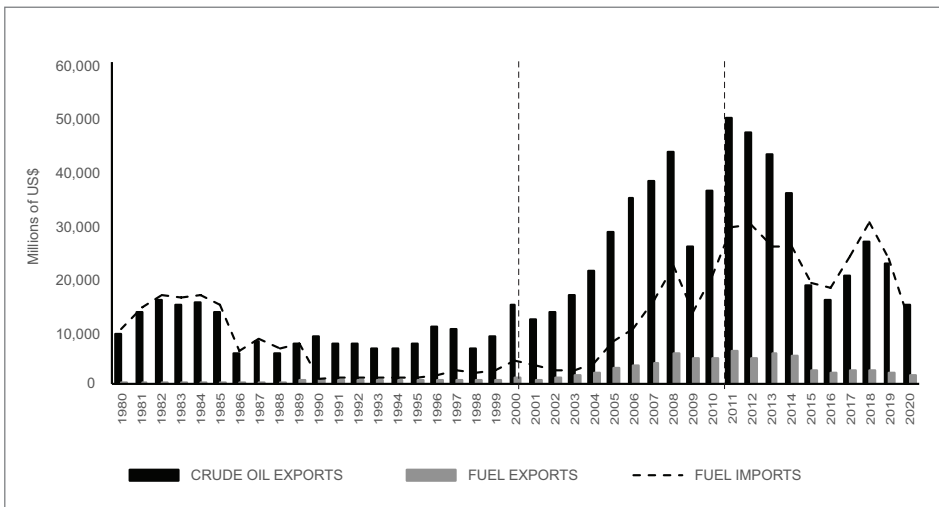
in oil resources took place for the governments of that period, but there is no certainty that they have been used productively. Since, in refining, the system remained operative at less than 40% of its capacity, it is unlikely that these price surpluses would favor it in some way. The fact is that at the same time, the import of fuels also increased (Figure 3).

Figure 2: Domestic investment and oil investment, 1980-2019



Source: Prepared by the author based on (SIE, 2021).

Figure 3: Value of crude oil exports and fuel exports and imports, 1980-2020



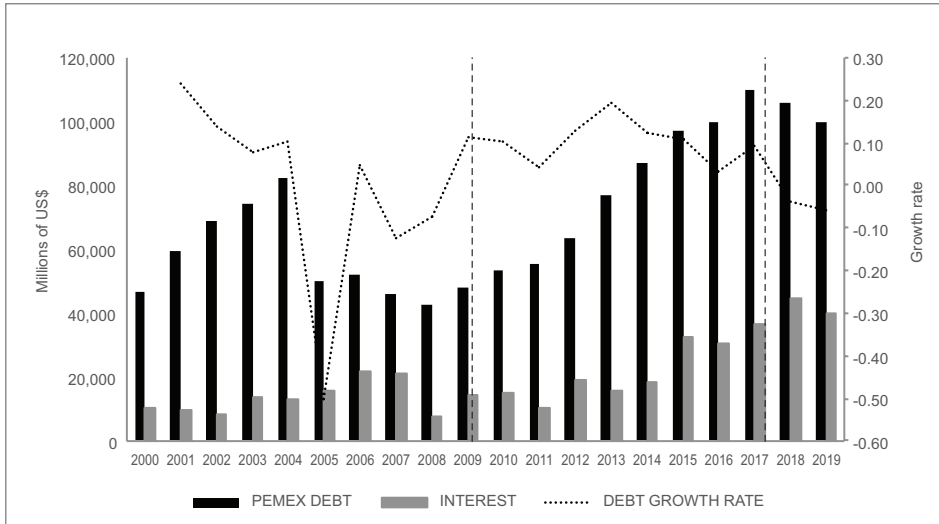
Source: Prepared by the author based on (SIE, 2021).

Mexico's daily demand for gasoline and diesel is 1,880,000 barrels per day; 1,200,000 of which can be produced internally with the six refineries working at their maximum capacity. For the medium term, production is planned for 380,000 at the new two-Bocas refinery and 300,000 at Deer Park. Energy policy in primary specialization (Huizar, 2015; Lopez & Nava, 2018), increased dependence on US imports of gasoline and diesel. Therefore, the self-sufficiency policy requires, in addition to the new refining infrastructure, new technologies with a strong emphasis on sustainability, so that the fuel supply is achieved with the least environmental damage. To date, about 30 billion dollars have been invested to rehabilitate the National Refining System (NRS).

Further, despite the fact that investment statistics show a growing trend between 2000 and 2014, the allocation of these resources is inaccurate and it is confirmed by additional data (Figure 4). Pemex's total debt, which is another key indicator of its finances (along with interest paid), had its biggest increase during the same period (Pemex, 2019), which is a great contradiction in terms of oil revenues. Part of the explanation is Pemex's high tax burden; however, it has to do with poor oil management that was unable to manage the price surplus. In the case of the debt, in 2000, it was \$50 billion dollars; in 2014, it was \$87 billion; that is, in the same period where the country had large price surpluses, debt also grew. It is worth saying that, in a desirable scenario, with the resources from this "financial gold season", the debt could have been repaid in full or a significant part of it, but it was not. It is in 2018 and 2019 that there is a slight decrease from 105 billion dollars to 99 billion dollars (Pemex, 2019); however, it increased again to 113 billion dollars in 2021 (Stillman, 2021). Reducing the debt pressure requires a substantial adjustment of Pemex's taxes on Earnings Before Interest, Taxes, depreciation and Amortization (EBITDA), that is, on gross profit before tax deductibility, as it is 105%, the most expensive in the world (British Petroleum's is 38%, Chevron's is 30% and Shell's is 25%) (Pemex, 2019; Pemex, 2020b).

In international law, sovereignty means that a government possesses and exercises full control over matters within its territory, which also includes sovereignty over its energy resources, which can be seen as an extension of the territoriality principle. Energy sovereignty requires territorial sovereignty as an obvious precondition (Vajda, Aleksic & Hunter, 2018). On the assumption that energy sovereignty focuses on the inherent right of humans and communities to make decisions about the energy systems they use, including decisions about sources, scales, and forms of ownership that structure access to energy (Schelly & Halvorsen, 2020), the reactivation of the six existing refineries, the production of the one under construction in the state of Tabasco, Mexico, and the one to be obtained from Deer Park in the US, will cover the national demand for gasoline and diesel that the current government has described as a top priority.

Figure 4: Pemex debt and interest paid, 2000-2019



Source: Prepared by the author based on (SIE, 2021).

Three situations characterize the management of oil wealth in the last forty years: 1) there was no productive investment; 2) petroleum imports grew; 3) debt has doubled and continues to show a growing trend until 2021. Since a state-owned company manages oil in Mexico, the formation of public capital, in reference to all investments destined to the creation of a new productive infrastructure and of technological impulse is fundamental (Aschauer, 1988 and 1989), since the likelihood of private investment financing due to ownership, the current sovereign view, and the lag in investment in production that took place with the 2014 reform is low (SHCP, 2015). With regard to territorial and energy sovereignty, investment policy will be predominantly state investment in the following years; therefore, it has to be redirected toward that new reality where the objective is development and the patterns of exploitation and trade effectively respond to it (Alvarez, 2014).

### 3. LESSONS FOR PEMEX

#### Similar characteristics

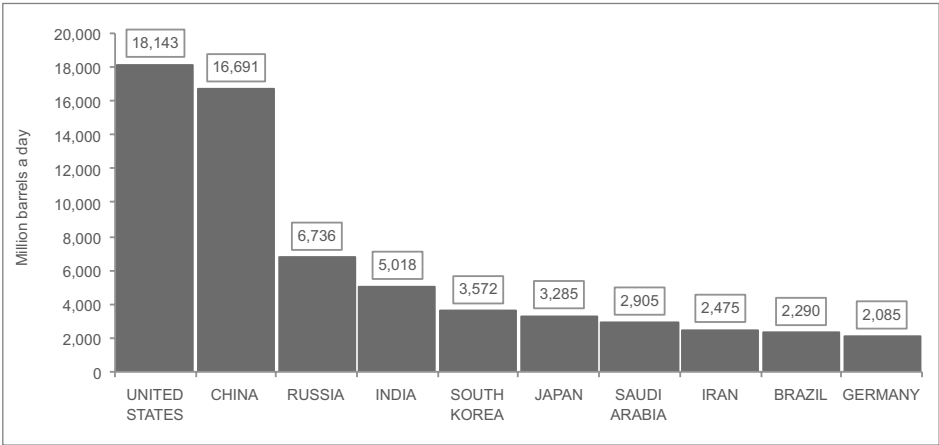
Regarding the production scheme and business management of companies presented in Table 2 of the first section, there are important similarities and lessons to consider. The majority of countries with oil supply owned by the state share a characteristic which is the high dependence on oil revenues or the “petrostates” status (Sanchez, 2016; Ma & Valencia, 2018; Bouoiyour, Hussain & Shahbaz, 2017; Alekperov, 2015). The cases of ARAMCO and NIOC are the most outstanding ones. ARAMCO’s oil management policy is being reconsidered given the Saudi economy’s

high dependence on that resource, which provides 39.1% of its GDP (World Bank, 2021). NIOC, the second oil company to be nationalized in the world, after Pemex, is the support of the Iranian economy and is in the process of diversifying its economic base: Oil and gas sales represent 80% of Iran’s total exports and 50% of public revenues (Bishop, 1950; Mahdavi, 2012). Mahdavi (2012), notes that Iran’s “resource curse” overtaxes the oil industry (rather than a broader economic activity) to sustain its spending. Mexico shares that characteristic and its great challenge is to reduce dependence on oil revenues or its status as a “rentier state” that overtaxes oil to finance one-third of its public budget.

**Production scheme**

The first lesson is the productive scheme. As long as oil exists, refining will be desirable. All the companies, state-owned and private ones in Table 2, with the exception of Gazprom, whose main product is gas, focus on the comprehensive development of the oil chain: exploration, extraction, refining, petrochemistry, trade and distribution. In this area, the three major economic and military powers, the United States, China and Russia, hold the first, second and third places in refining capacity with 18,100, 16,600 and 6,700 million barrels a day, respectively. From Latin America, Brazil stands out in the ninth place with 2,290 million barrels a day (Statista, 2021) (Figure 5).

Figure 5: Refining capacity in ten selected countries, 2020



Source: Prepared by the author based on (Statista, 2021).

By 2025, more than eighty refineries in the world will come into operation, mostly in the Middle East and Asia (Nava, 2021). It is expected that, in the short term, by investing in projects aimed at increasing its refining and petrochemical capacity, China will become the world’s largest refiner, surpassing the US. This indicates that it is a profitable business but that the profit sought is not only mon-

etary. China has experienced rapid growth in recent years and needs large quantities of fuels. PetroChina, its company, ranks sixth in oil production capacity, but, owing to lack of effective substitution and strong dependence on oil imports, oil security is the main concern of Chinese energy policy, which is addressed by diversifying its imports, improving pipeline conditions and preserving the stability of domestic oil production (Yuhua, 2017).

The lesson for Pemex here is the evaluation of its production scheme. During the period under review, an orthodox view of the international economy prevailed, which interpreted Ricardo's comparative advantage as convenient and anchored the primary export model. However, in several applied models of comparative advantage, faced with asymmetric balances in different trade areas, the possibility of government intervention exists (Toshihiro, 2011; Ara, 2020; Baomin, 2016). In Mexico, as the legal framework was adjusted to allow for entrance of private capital with the energy reform of 2014, that possibility was diluted and the opening policy came to be considered as the only solution to the financial requirements of the sector, which, in other words, was an ideological and erroneous argument, since, just before the reform, oil revenues were booming, as shown in Figures 1 and 2.

### **Protection of intangible assets**

The second lesson is the protection of intangible assets. Among private oil companies, Exxon Mobil's business parameter related to information protection as an intangible asset, is the most important one. It relates to financial, productive and operational data that the company considers confidential and cannot be disclosed or negotiated in any way (Exxon Mobil, 2020). As such, the information is an independent economic category; therefore, it is the subject of a number of disciplines (Shin, 2010; Manmud, 2013; Xia *et al.*, 2019). As far as the information generated in private companies is concerned, it is not an asset that is subject to barter or negotiation by those who have access to it due to their positions, as legal mechanisms are in place to safeguard it and avoid what is known as "revolving doors", a practice that consists of transferring privileged information from the company to other firms that can use it for their own benefit (Exxon Mobil, 2020). The lesson here is that Pemex must protect information as a high-value asset with strict regulations that prevent it from being transferred to other players, via the key positions held in the company. In this regard, Emilio Lozoya Austin, Pemex director during 2012-2016, is currently facing charges of corruption, influence peddling, money laundering and organized crime. On the other hand, Pérez (2012 and 2017), documents how senior officers used their position to favor certain contractors or how companies working with Pemex, conspired to demand compensation by using privileged information and legal maneuvers to the detriment of the company's finances.

## Finance and investment

The third lesson is finance and investment. Optimal use of oil resources depends on the place of oil in national economic policy and the type of vision and development planning (OECD, 2019). The efficient use of these resources implies a transition from a “rentier state,” to a state that diversifies its economic base as other oil-based economies are doing (Anis, 2020), and to do so, it is essential to expand the country’s non-oil tax revenues (OECD, 2019). In addition to price uncertainty, oil investment carries its own risks, and in new or existing projects, attention needs to be paid to the different implementation scenarios that influence efficiency indicators. The profitability of projects decreases in periods of low prices, especially in the drilling of new wells, which is an intensive activity in terms of capital (Kolbikov, Kolbikova & Alexander, 2014). In the case of Pemex, the financial pressure from the taxes it pays and the debt has limited the creation and strengthening of an exclusive savings fund for productive purposes, since part of the resources are transferred directly to the national budget and hence, toward other public programs. Meanwhile, other state-owned companies like Rosneft invest to reduce capital costs in the medium term (Noskov *et al.*, 2018), or in the design of cost-cutting and savings plans such as ARAMCO, whose entry into the stock exchange in 2019, was very successful (Ramady, 2018; Fattouh & Harris, 2017).

To advance on planning and start a deep change in Pemex management, it is essential to bear in mind the promotion of the value chain as a whole, financial efficiency, strategic decision-making, operational excellence and the protection of information as an intangible asset that other companies rely on to support their business model (British Petroleum, 2020; Shell, 2020; Chevron Corporation, 2020). In the field of deep water technology, Petrobras is the best example; its business dynamics should be thoroughly analyzed, what technology it is developing to reduce uncertainty, risk and costs, and how this affects its revenues and sustainability and sustainability in the long term. In our country, Mexico, it will be necessary to monitor the current energy sovereignty policy and its capacity to meet national demand for fuels, as well as its impact on Pemex’s finances.

## 4. CONCLUSIONS

The present paper proposed to analyze Pemex’s investment policy in the context of the global oil companies, taking into account the production scheme and business principles of other state-owned, private and mixed firms. In order to justify research and the need to rethink energy policy based on a strategic vision of investment and promotion of the value chain, the first section highlighted the role of oil as a source of energy; in addition, data were presented on Mexico’s position in different energy fields, with the production and export of crude oil prevailing over refined products. Accordingly, the second section described the trajectory of price, oil revenues, foreign trade in crude oil and fuels, and debt; the central finding was

that the investment policy of the last four decades neglected the integral development of the production chain and that price surpluses were not optimally managed.

In that sense, the lessons Pemex can draw from other firms have to do, first and foremost, with the productive scheme. All companies, without exception, are oriented toward the joint development of the production chain; the argument that refining is not profitable for Mexico is refuted by the global trend toward increasing the number of refineries, China's movement over the United States in refining capacity, and its handling of oil as a security issue. Second, taking Chevron's example, Pemex must transcend corporate standards that facilitate its performance in a market where competition with other larger firms predominates, as well as non-entirely transparent and regulated practices, with regard to the protection of information as an intangible asset. Finally, as regards investment, the price boom period between 2000 and 2014 – the most important so far – did not have an impact on infrastructure, technological development or human capital formation and therefore, on productivity. In the same period, both fuel imports and debt increased, which is a major contradiction, as other companies advanced in key aspects of the value chain.

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