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THE PETROCHEMICAL ARM OF PEMEX: A TALE OF BOOM AND BUST

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“The Petrochemical Arm of Pemex: A Tale of Boom and Bust”

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Introduction

Petrochemicals, inputs obtained by processing hydrocarbons, are essential for manufacturing activities (such as the production of plastics, fertilizers, paints, textiles, detergents, packaging materials, automobiles, steel, etc.) that are central to Mexico's economy. Regrettably, the strategic nature of the petrochemical industry has been largely misunderstood and underestimated by the last three presidential administrations (2010-2018) in Mexico, which have not done enough to boost domestic production. This has contributed to an increase in imports to meet domestic demand and to the dismantling of the associated domestic value chains. As a result, over the past two decades, production levels in the petrochemical complexes of *Petróleos Mexicanos* (Pemex) have severely fallen (Figure 2).¹

With the outbreak of Covid-19 and the plunge of oil prices hitting both Mexico's economy and Pemex's revenues, it remains to be seen if President Andrés Manuel López Obrador will eventually address the deterioration of the state-owned petrochemical industry. Even though the president has made public remarks in that respect, a proper strategy is yet to be divulged to encourage this sector to add value beyond Pemex's production of crude oil and natural gas.² The extraordinarily high level of debt carried by Pemex³ and the president's primary focus on upgrading the refining, exploration, and production activities of Pemex, do not bode well for the prospects of the petrochemical plants.

Considering the adverse context described above, this paper contends that it is worth evaluating which state-owned petrochemical assets could be strengthened (potentially with the participation of private firms) to support both economic recovery and President López Obrador's agenda.

The potential impact associated with revitalizing the state-owned petrochemical industry is consistent with the socioeconomic approach of Mexico's government and, with the correct incentives, could be an avenue to encourage investment after the growth conditions affected by the coronavirus pandemic are restored. It is important to emphasize that a large share of the installed capacity is currently idle (Figure 1), while a sizeable domestic demand is being served through imports. The ammonia-urea value chain is one of the cases that serves said arguments in the sense that production of these two petrochemical products can help enhance both agricultural productivity and regional economic imbalances.

¹ Of the eight petrochemical complexes that Pemex reports to own, four of them are in southern Veracruz. Of them, *Morelos* and *Cangrejera* continue to operate, while *Pajaritos* ceased activities in 2013, and *Cosoleacaque* remained idle from September 2018 to February 2020. Of the four petrochemical facilities outside Veracruz, only one is in operation.

² Ronald Buchanan, "Mexico's President, Energy Minister Vow to Revamp Country's Petrochemical Sector," *Natural Gas Intelligence*, June 20, 2019, <https://bit.ly/2Ocx7R>.

³ Pemex, "PEMEX Presents Third Quarter Results in 2019," October 28, 2019, <https://bit.ly/2XF5Pqf>. Pemex is dubbed as the world's most indebted oil and gas company. As of September 30, 2019, overall debt stood at \$99.6 billion.

The Petrochemical Arm of Pemex

The eight petrochemical complexes the company reports owning used to comprise a single division within Pemex. However, due to the reorganization of the company in 2015, they are now scattered throughout the subsidiaries of Pemex Industrial Transformation, Pemex Fertilizers, and Pemex Ethylene (Figure 1). The aromatic-based assets of *La Cangrejera* in the state of Veracruz and the *Independencia* petrochemical complex in the state of Puebla belong to Pemex Industrial Transformation. *Cosoleacaque* in Veracruz and *Camargo* in the state of Chihuahua are part of Pemex Fertilizers. The ethane-based plants of *La Cangrejera*, along with *Morelos* and *Pajaritos* in Veracruz, constitute Pemex Ethylene.

The southern tip of the state of Veracruz is certainly the center of the petrochemical arm of Pemex. The region is home to four state-owned petrochemical complexes (*Cosoleacaque*, *Pajaritos*, *La Cangrejera*, and *Morelos*) that, as of 2018, represented 93.6% of Pemex's installed petrochemical capacity and 95.5% of its production.⁴ These numbers, however, say little about the poor standing of the complexes. *Cosoleacaque*, with a capacity to yield up to 4.3 million metric tons (MMt) and once considered the world's largest producer of ammonia, only yielded 0.151 MMt of ammonia in 2018, remaining idle since September of that year until February 2020.⁵ *Pajaritos* ceased petrochemical production in 2014.⁶ That leaves *La Cangrejera* and *Morelos* as the only regional petrochemical complexes still operating, albeit at 52% of their combined installed capacity in 2018.⁷ Outside the region, three petrochemical complexes remain inactive. *Camargo* in Chihuahua stopped producing in 2003, while both *Tula* in Hidalgo and *Escolin* in Veracruz stopped producing in 2008.⁸

⁴ Pemex, *Anuario estadístico 2018*, <https://bit.ly/37wxJcq>. Of the four petrochemical complexes outside the region, only *Independencia* in the state of Puebla operated in 2018, as indicated by the latest annual report.

⁵ *Cosoleacaque* resumed operations in late February 2020, producing close to 1,400 tons of ammonia per day. But production had ceased at the time this paper went to press.

⁶ Pemex, 2018 Annual Report submitted to the U.S. Security Exchange Commission, Form 20-F, <https://bit.ly/2YtkcA6>. In addition to idle petrochemical plants, *Pajaritos* also contains one gas processing plant, which was non-operational in 2018 due to a lack of auxiliary services.

⁷ Latest year reported.

⁸ Pemex, *Anuario estadístico 2018*, <https://bit.ly/37wxJcq>.

Figure 1. Installed Capacity and Production of Pemex’s Petrochemical Complexes, 2018 (in MMt)

Subsidiary	Petrochemical Complex	Installed Capacity	Production (in MMt)	Status
Pemex Industrial Transformation	Cangrejera*	1.516	0.826	Operational
	Independencia	0.217	0.151	Operational
Pemex Fertilizers	Cosoleacaque***	4.300	0.523	Idle
	Camargo	0.333	N.A.	Idle since 2003
Pemex Ethylene	Cangrejera**	1.321	0.507	Operational
	Morelos	2.277	1.323	Operational
	Pajaritos	0.207	N.A.	Idle since 2014

* Figures refer to aromatics.

** Values relate to ethylene and its byproducts.

*** Cosoleacaque has been intermittently operational since February 2020, but production had ceased at the time this paper went to press.

Source: Pemex.⁹

The presence of these petrochemical complexes in the south of Veracruz prompted the clustering of firms seeking to take advantage of the local production of industrial inputs.¹⁰ The original role of Pemex was to produce and supply petrochemical raw materials that local private firms required to yield (intermediate) petrochemical inputs. This form of industrial organization is the outcome of state planning, with Pemex’s firms situated closer to hydrocarbons raw materials, and private local firms (also known as buyers) carrying out activities closer to users. In this vertical relationship, Pemex has usually exercised a considerable degree of authority over input transactions due to its role as the only domestic producer—and hence supplier—of many petrochemical products demanded locally. This feature, along with the hazardous nature of petrochemical products and the lack of storage infrastructure on the part of local private firms, turned many private players into captive buyers.

Lack of alternatives to source feedstock locally has been a setback for private petrochemical firms in the region and elsewhere. As production at state-owned petrochemical complexes has either declined over the last decade or stopped altogether,

⁹ Ibid. Production values per complex are not yet available for 2019.

¹⁰ The petrochemical cluster in the neighboring municipalities of *Coatzacoalcos*, *Minatitlan*, and *Cosoleacaque* in the state of Veracruz is made up of four state-owned petrochemical complexes, one state-owned refinery, private petrochemical firms, and a collection of local institutions such as universities, industry-orientated associations, a pool of specialized service firms, and an infrastructure network that facilitates sourcing and distribution of inputs throughout and beyond the region.

buyer firms have been hard hit. Overall, Pemex's production has dropped from a peak of 19.27 MMt in 1995 to 5.3 MMt in 2019 (Figure 2).

Three overarching factors can help explain the downturn: 1) government policies prioritizing short-term investment objectives like the maximization of crude oil production and exports, 2) the role of Pemex in financing the federal budget, and 3) recent sinking production and infrastructure bottlenecks that constrained the availability of natural gas in southern Mexico.

The point is that shoring up certain state-owned petrochemical plants may result in positive spillovers along domestic value chains, from buyer firms in the locality to user industries elsewhere in Mexico.

From Boom to Bust

The development of the petrochemical industry in Mexico has been marked by a significant degree of state intervention. During the early stages of development (establishment and rise) from the 1960s to the 1980s, the rapid expansion of petrochemical production was the outcome of heavy government involvement, with the objective to industrialize the country. Processing hydrocarbons into raw materials to later transform into consumer goods was critical to encourage the creation and expansion of a much broader industrial base. The expansion of petrochemical capabilities was therefore meant to support the development of numerous infant industries such as plastics (and users of plastics), fertilizers, textiles, and consumer goods.

During that time, the progress registered by the industry was shaped directly by the policy decision to differentiate the scope of state participation from that of the private sector. The petrochemical industry was divided into "basic" and "secondary" sectors, with Pemex given exclusive authority over the so-called "basic" petrochemical products. The private sector was permitted to participate (alone or in association with Pemex) in the production of "secondary" petrochemical inputs.¹¹ The government sought to create favorable demand conditions for Pemex's petrochemical products and to take advantage of the country's economic expansion at that time.¹²

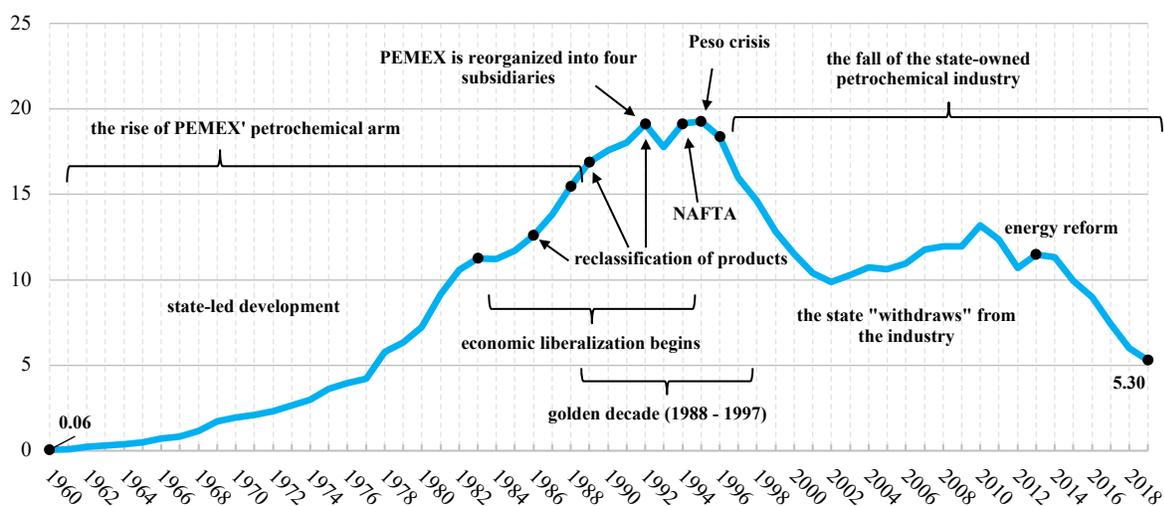
¹¹ DOF (Diario Oficial de la Federación), *Decreto de la ley reglamentaria del artículo 27 constitucional en el ramo del petróleo*, November 29, 1958, <https://bit.ly/2pJOX4o>; DOF, *Reglamento de la ley reglamentaria del artículo 27 constitucional en el ramo del petróleo*, Capítulo VIII, August 25, 1959, <https://bit.ly/31zVU5p>. "Basic" industrial raw materials are the result of petrochemical processes based on the first important chemical transformation of hydrocarbon resources and its sub-products, while "secondary" petrochemical products are the outcome of subsequent petrochemical processes.

¹² M.D. Ramírez, "Mexico's Development Experience, 1950-85: Lessons and Future Prospects," *Journal of Interamerican Studies and World Affairs* 28, no. 2 (1986): 39-65. Mexico's economic growth rate averaged 6.3% between 1960 and 1966, and 6.4% between 1967 and 1972.

The Petrochemical Arm of Pemex: A Tale of Boom and Bust

Between 1960 and 1976, production at state-owned petrochemical complexes grew from 0.056 MMt to 3.95 MMt. In the following years, this expansion continued at an even faster pace, principally driven by the discovery of hydrocarbon resources¹³ and the substantial foreign borrowing Mexico engaged in to develop these reserves.¹⁴ For example, in its 1981 report, Pemex claimed that during the preceding five years, the company put 25 petrochemical plants and 21 auxiliary process units into operation. This is equivalent to opening one plant every 40 days. Pemex also reported that operations began in the same year in the petrochemical complex of *La Cangrejera*, and two ammonia plants opened at the complex of *Cosoleacaque*, making it the world's largest ammonia production center.¹⁵ By 1982, Pemex produced 10.59 MMt of petrochemical inputs, a volume 2.7 times larger than that of 1976.

Figure 2. Trajectory of Mexico's State-Owned Petrochemical Industry, 1960-2019 (in MMt)



Source: Pemex and Mexico's Energy Information System (SIE).¹⁶

The external debt Mexico accumulated over those years, along with other factors such as the shifting international environment, the growing public deficit, and the lack of a diversified export base, triggered a profound economic crisis that lingered for the rest of the 1980s. Despite this challenging economic environment, Pemex continued to add

¹³ Ibid. Proven reserves increased from 11,160 million barrels in 1976 to 72,008 million barrels in 1982.

¹⁴ N. Lustig, *Mexico: The remaking of an economy* (Washington, D.C.: Brookings, 1998). Meanwhile, the country's public external debt soared from \$20.8 billion in 1976 to \$59.7 billion in 1982.

¹⁵ Pemex, *Memoria de labores*, 1981, <https://bit.ly/32zCKOI>. The report mentions that Pemex put into operation one plant every 45 days.

¹⁶ Data compiled from multiple sources: Pemex, *Anuario estadístico*, 1977, <https://bit.ly/32E9gyQ>; Pemex, *Anuario estadístico*, 1988, <https://bit.ly/2Bt1Suq>; Pemex, *Memoria de labores*, 1989, <https://bit.ly/33Rci2W>; Pemex, *Anuario estadístico*, 1990, <https://bit.ly/33O0tL1>; SIE (Mexico's Energy Information System), "Pemex Petrochemical Production," 1990-2019, <https://bit.ly/2p4aPHP>.

capacity, and by 1990 its petrochemical production reached 17.59 MMt, an increase of 66% in comparison with 1982.

Such a notable growth in petrochemical capabilities took place in line with the trajectory of oil production in Mexico, which expanded from 0.894 million barrels per day (MMb/d) in 1976 to 3.001 MMb/d in 1982 and then slightly declined to 2.941 MMb/d in 1990.¹⁷ The evidence suggests that the country's hydrocarbon wealth hardly contributed to preventing economic unrest during the 1980s. Thus, to restore economic growth conditions, the country began shifting towards a development model characterized by market-friendly, export-driven policies and, as a result, the abandonment of inward-looking strategies. This emerging policy eventually moderated the degree of public intervention in the petrochemical sector.

The momentum experienced by the state-owned petrochemical industry in the 1980s persisted during the first half of the next decade (Figure 2). In this period the government also sought greater participation of private players. To achieve this goal, it reassigned most of the so-called "basic" petrochemicals to the category of "secondary" petrochemical products. Through decrees published in 1986, 1989, and 1992, the government intended to deregulate the industry and to allow the participation of private companies.¹⁸

This effort was also accompanied by divestiture attempts. Coerced by the peso crisis, the Zedillo administration (1994-2000) moved closer to privatization. In November 1995, Pemex announced a public tender to sell petrochemical plants from the *Cosoleacaque* complex, although the tender did not draw bidders.¹⁹

Even though the government moves failed to attract private investors, they hinted that policy makers were determined to gradually downgrade the strategic character of the petrochemical industry.

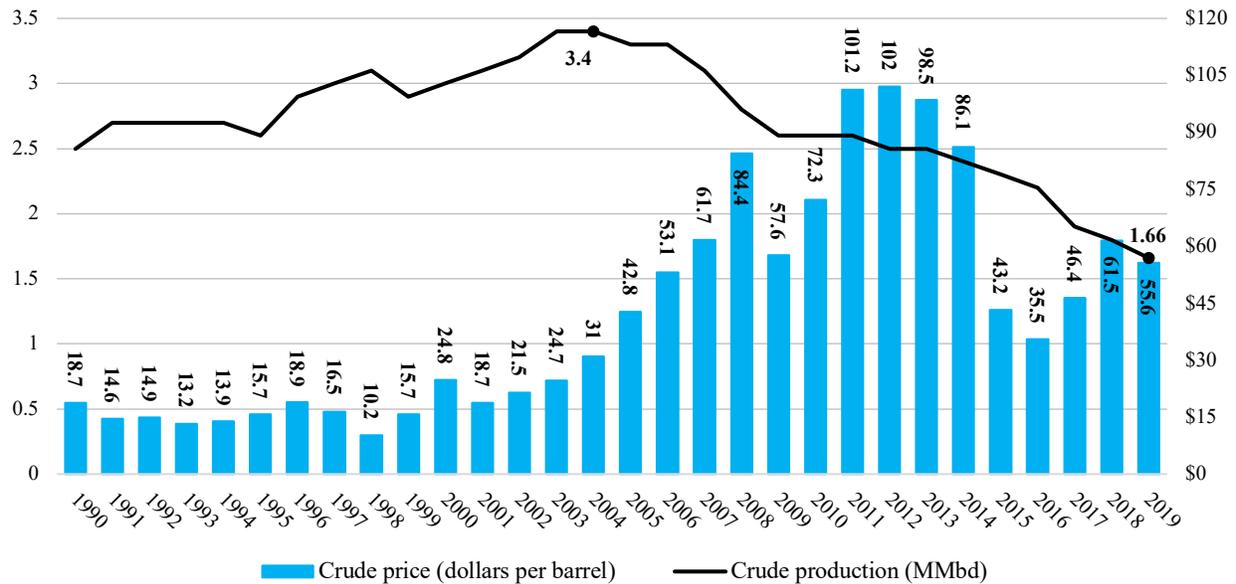
In the meantime, from 2000 to 2019, overall petrochemical production plunged by 54%, from 11.5 MMt to 5.3 MMt. Several factors are central to explain such a steep decline.

¹⁷ BP (British Petroleum), "Statistical Review of World Energy," June 2019, <https://on.bp.com/35XHP4m>. This includes condensates and natural gas liquids.

¹⁸ To review the objectives of the government decrees that reclassified petrochemical products, see: DOF, *Resolución que clasifica los productos petroquímicos que se indican, dentro de la petroquímica básica o secundaria*, October 13, 1986, 5-6, <https://bit.ly/2Mx5MIW>; DOF, *Resolución que clasifica los productos petroquímicos que se indican, dentro de la petroquímica básica o secundaria*, August 15, 1989, 22-23, <https://bit.ly/31t8Iuf>; DOF, *Resolución que clasifica a los productos que se indican, dentro de la petroquímica básica o secundaria*, August 17, 1992, 7-8, <https://bit.ly/33NO1eh>.

¹⁹ Pemex, 1996 Report submitted to the U.S. Security Exchange Commission, Form 20-F, <https://bit.ly/31Ci3QR>.

Figure 3. Pemex Crude Production and Price, 1990-2018



Source: Pemex.²⁰

Mexico’s fragile finances had turned Pemex into the country’s largest taxpayer. Also, crude exports were prioritized as they became more lucrative and produced more funds to support the weak government budget than any of the other Pemex activities. Pemex’s contributions, as a share of government revenues, grew from an annual average of 22% in 1990-1994 and 27% in 1995-2000 to 30% in 2001-2006 and 37% in 2007-2012. In 2013-2018, Pemex’s contributions as a share of government revenues fell to an annual average of 25% on the back of weaker oil prices and lower levels of production (Figure 3). The heavy tax burden of the company has largely discouraged investment in petrochemicals.

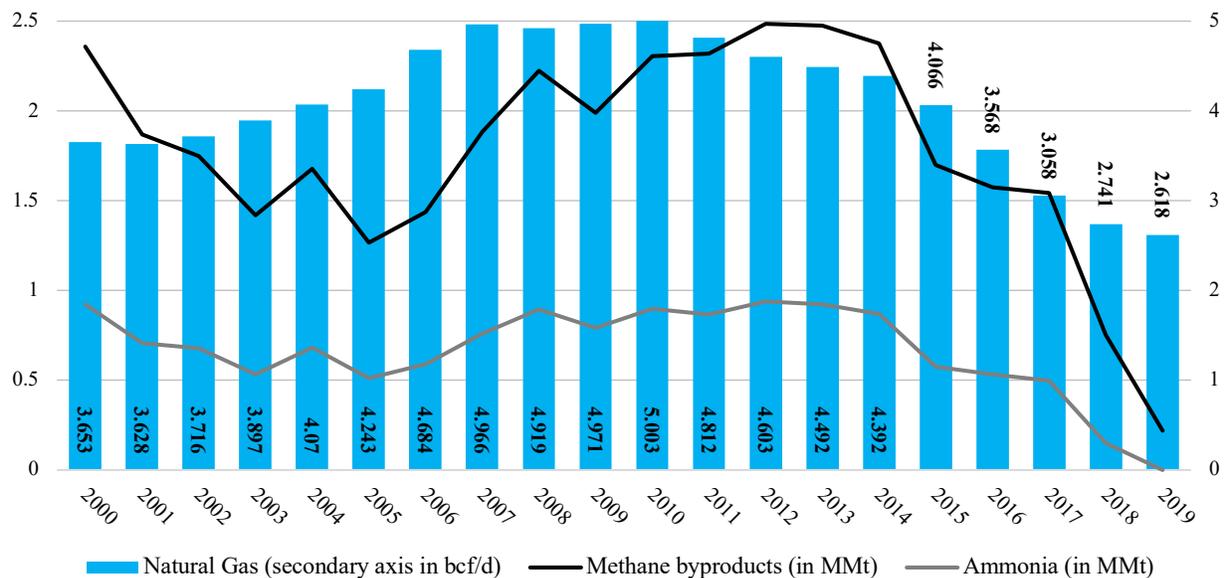
In addition, there was a shift in Mexico’s energy mix toward increased consumption of natural gas. Due to policies that supported the construction of combined cycle power plants, natural gas demand from the power sector rose accordingly. Meanwhile, domestic production of natural gas has been on a gradual decline for over a decade. Most of the available natural gas in Mexico has been channeled towards the power sector, whose demand expanded from an average of 1.01 billion cubic feet per day (bcf/d) in 2000 to 4.36 bcf/d in 2018, whereas domestic natural gas production contracted from 3.65 bcf/d to 2.74 bcf/d in the same years, according to Mexico’s Energy Information System (SIE).²¹ These trends compromised the supply of natural gas (methane) to Pemex petrochemical plants,

²⁰ Pemex, “Glosa del primer informe de gobierno,” October 28, 2019; Pemex, “Estadísticas Petroleras: Producción de Hidrocarburos Líquidos,” December 2019, <https://bit.ly/2uMxbyjv>. If Pemex’s partners are included, 2019 production stands at 1.678 MMb/d.

²¹ SIE, “Dry Natural Gas Balance,” <http://sie.energia.gob.mx/>. 2019 values reported by the SIE are not included as variations and are notable in comparison to 2018.

principally affecting the production of methane byproducts, among which ammonia is the most valuable (Figure 4).

Figure 4. Dry Natural Gas, Methane Byproducts and Ammonia Production, 2000-2019



Source: Mexico’s Energy Information System (SIE).²²

More recently, infrastructure bottlenecks to transport natural gas and the fall in the production and supply of ethane²³ (another key feedstock demanded by the state-owned petrochemical complexes in the south of Veracruz) also help to explain why petrochemical production continues to disappoint. Now, whether or not this issue garners the attention it deserves rests with the López Obrador administration.

What Comes Next Under López Obrador

The facts and figures depicted above leave no doubt that the Pemex petrochemical plants are confronting their most precarious position since 1990. This is linked to policy makers who have underestimated the broad impact of petrochemicals in strengthening industrial activities. The absence of suitable policies has weakened value chains of petrochemical origin, resulting in imports now fulfilling a sizeable share of domestic demand. The Bank of Mexico estimates that imports of petrochemical inputs grew from \$2.96 billion²⁴ in

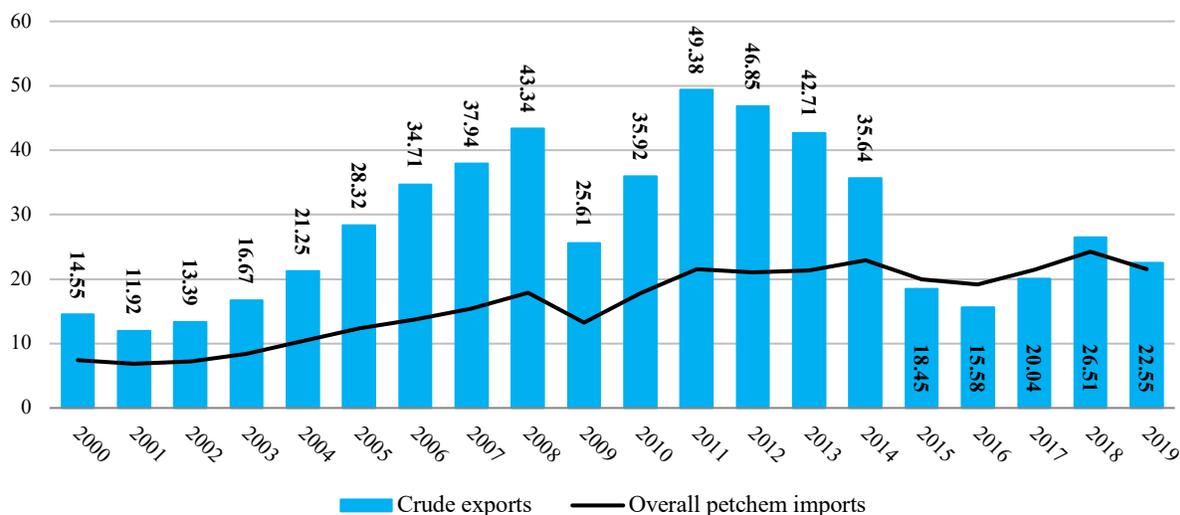
²² SIE, “Pemex Production of Methane Byproducts and Ammonia,” 2000-2019, <http://sie.energia.gob.mx/>. Methane byproducts include carbonic anhydride, ammonia, and methanol.

²³ Pemex, *Anuario estadístico*, 2018; Pemex, “Estadísticas petroleras: Proceso de gas y fraccionamiento de líquidos,” December 2019, <https://bit.ly/3aSYXvk>. Ethane is another key feedstock for Pemex petrochemical plants. More recently, the fall in petrochemical production can also be attributed to lower levels of ethane production, which shrank from 0.109 MMb/d in 2013 to 0.077 MMb/d in 2019.

²⁴ All monetary amounts in this paper are in U.S. dollars.

2000 to \$8.32 billion in 2019.²⁵ Even though this figure helps to measure the size of the market that state-owned petrochemical complexes have ceased to serve (Figure 5), it does not reflect the value of imports from those inputs situated further down the chain such as plastics, textiles, and chemicals. Imports of petrochemicals and products of petrochemical origin soared from \$7.45 billion in 2000 to \$21.54 billion in 2019.²⁶

Figure 5. Mexico’s Overall Imports of Petrochemical Products and Pemex’s Crude Exports, 2000-2019 (in billions of dollars)



Source: Bank of Mexico (Banxico).²⁷

The fall in domestic production of petrochemicals and the rise in the value of imports shed light on how policy makers have made Pemex prioritize production and exports of hydrocarbons, principally crude oil, at the expense of other areas of the company such as petrochemicals. For example, the ratio between petrochemical imports vis-à-vis crude exports, Pemex’s most important commodity, has changed considerably (Figure 5). Between 2010 and 2014, the domestic market imported petrochemical products to the tune of \$20.9 billion per year, while crude exports averaged \$42.1 billion. But in a context of falling crude production and lower prices, the tide has turned. From 2015 to 2019, annual petrochemical imports stood at \$21.27 billion, exceeding the \$20.62 billion of Pemex’s average crude oil exports.

²⁵ ANIQ (Asociación Nacional de la Industria Química), *Anuario estadístico*, 2018, <https://bit.ly/2K7ORer>; Banxico (Banco Central de México), “Sistema de información económica: Balanza de productos petroquímicos y de origen petroquímico,” <https://bit.ly/34Nh4Pu>. Mexico’s National Association of the Chemical Industry (ANIQ) puts the value of petrochemical imports at \$8.33 billion in 2018, its latest figure reported.

²⁶ Banxico, “Sistema de información económica: Balanza de productos petroquímicos y de origen petroquímico,” <https://bit.ly/34Nh4Pu>. Banxico’s import figures include propane, but do not specify whether fertilizers such as urea are considered.

²⁷ Banxico, “Sistema de información económica: Balanza de productos petroleros,” <https://bit.ly/3bQ7VZX>.

Is President López Obrador aware of this scenario? He surely is. But despite voicing his support to revamp petrochemical facilities,²⁸ little indicates that the issue is one of his primary concerns.²⁹ López Obrador's government must bear in mind that putting off the shoring up of state-owned petrochemical complexes, and those of the industry at large, means that Mexico is expected to deepen its dependency on imports. The competitive petrochemical producers located along the shores of Texas and Louisiana are first in line to profit.

Large petrochemical investments associated with the shale revolution in the U.S. as well as the projected growing weight of petrochemicals in future crude demand suggest that the development of the petrochemical industry should be part of López Obrador's program. In the U.S. Gulf Coast alone, the supply of ethane has resulted in investments of around \$140 billion in the extension and construction of plants to produce ethylene—the most important feedstock for the making of plastics—and other inputs.³⁰ Likewise, it is estimated that the petrochemical industry will comprise around a third of the additional global oil demand by 2030 and almost half by 2050, which proves that production capacity is expected to be added in other regions of the world.³¹

In that context, the question is how competitive Pemex plants could be. The tightened supply of natural gas (mostly methane and ethane), technical setbacks resulting from years of underinvestment, and labor costs are among the most pressing challenges to deal with. However, on the other side of the coin, geographical proximity between state-owned petrochemical complexes and buyer firms in the south of Veracruz, as well as a sizeable domestic market, are conditions that could validate revamping certain Pemex plants.

There are some signs that the government could be building up the conditions to eventually upgrade its petrochemical complexes. The reconfiguration of the *Cempoala* compressor station in central Veracruz, which is believed to be in its final stages, will enable the flow of natural gas coming from the South of Texas-Tuxpan marine pipeline to the southeast regions of Mexico.³² Likewise, the development of *Ixachi*, one of Pemex's priority onshore fields in Veracruz that is meant to increase production of hydrocarbons, could feed the petrochemical plants of Pemex at some point.³³

²⁸ Andrés Manuel (@lopezobrador), “Sacaremos de la ruina a las plantas petroquímicas para producir fertilizantes y aumentar la producción en el campo,” Tweet, June 16, 2019. <https://bit.ly/2vBg1Wl>.

²⁹ It remains to be seen if Mexico's government will include petrochemical investments in the energy program. This was yet to be announced at the time this paper went to publication.

³⁰ Jordan Blum, “How the ethane molecule changed the Gulf Coast – and the world,” *Houston Chronicle*, September 14, 2018, <https://bit.ly/2p9L1W4>.

³¹ IEA (International Energy Agency), *The Future of Petrochemicals: Towards More Sustainable Plastics and Fertilisers*, 2018, <https://bit.ly/2J9BEkX>.

³² TC Energía, “El ducto marino sur de Texas–Tuxpan entra en operación comercial,” September 17, 2019, <https://bit.ly/2Ub3fs0>. Natural gas flowing through the South of Texas–Tuxpan pipeline can be sent to the *Cempoala* compressor station and then to the south of Veracruz and other southeastern states.

³³ Pemex, “Pemex incrementa su proyección de reservas 3P en el campo Ixachi,” Press release, November 27, 2018, <https://bit.ly/2GDJGAY>.

Once in operation, projects like the above may support the petrochemical arm of Pemex. But to achieve this, additional measures need to be taken. Public capital injections will help to carry out maintenance work at plants that have remained idle or underutilized. Furthermore, the participation of private firms is crucial, as, in light of tight public resources, overhauling state-owned petrochemical complexes is a mission that Pemex is financially unable to do on its own.

Conclusion

The deterioration of Pemex as a supplier of petrochemical inputs has reversed the progress attained by building value chains of petrochemical origin. A good example—also noticed by López Obrador—is the nitrogen fertilizer industry, which, after experiencing a phase of rapid expansion due to the abundant production of ammonia in the 1980s, began shutting down production facilities in 1999.³⁴ This is not an isolated case. Pemex's history is full of similar experiences that the government should find worth analyzing.

Despite all these challenges, President López Obrador could positively shape the outlook of the state-owned petrochemical industry. Some of the main factors that could help the petrochemical arm of Pemex to enter a phase of recovery in terms of production and investment are: 1) utilizing its existing infrastructure and technical capabilities; 2) taking advantage of a private petrochemical and manufacturing sector that are eager to invest and better able to serve the sizeable domestic market; 3) developing projects that could eventually upgrade the supply of natural gas to the region; and 4) maintaining access to Texas's abundant and affordable natural gas. This will result in gains not only for the government of López Obrador, but also for associated economic activities and Mexico's economy.

³⁴ N. Martínez Laguna, "Evolución y Expresión Territorial de la Industria Petroquímica en México," *Investigaciones Geográficas*, no. 46 (2001), <https://bit.ly/2KYbLVy>.