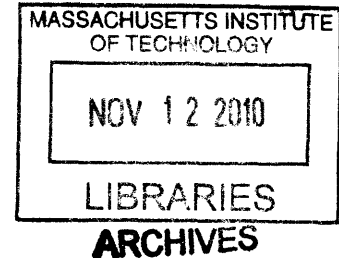


Explaining the Behavior of State-Owned Enterprises:  
Mexico's Pemex in Comparative Perspective

by

Francisco José Flores-Macías

B.A., Social Studies  
Harvard University, 2002



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Submitted to the Department of Political Science on August 13, 2010 in Partial  
Fulfillment of the Requirements for the Degree of  
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**Abstract**

In spite of the wave of privatization of the 1980s and 1990s, state ownership of enterprise remains a very important part of the political economies of both developing and industrialized nations. The conventional wisdom in industrial organization states that public enterprises are inefficient; nevertheless, it says very little about the wide variation among these firms both within and across countries. This dissertation provides a new analytical framework to explain differences in behavior among state-owned enterprises. New insights are possible thanks to the use of theoretical and methodological tools from three different fields: political science, economics, and organizational sociology. State-owned enterprise behavior is conceptualized as having two elements, business efficiency and policy utilization, and it can largely be explained with only three variables: the ideology of the government's ruling coalition, the degree of competition in the business environment, and the level of cohesion of the company's managers. Subsequently, this study applies the framework to explain the puzzling variation in the behavior of the subsidiary companies of the Mexican state-owned petroleum enterprise, *Petróleos Mexicanos* (Pemex). Throughout the dissertation, statistical analysis and qualitative research—including over 100 in-depth interviews conducted with government and oil industry officials from Mexico, Brazil, Venezuela, and the United States—provide empirical support.

Thesis Supervisor: Chappell H. Lawson

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## CHAPTER 1 INTRODUCTION

### 1. The Different Faces of Pemex

Upon arrival at the airport of Ciudad del Carmen, the city on the coast of the Gulf of Mexico that houses the main regional headquarters of Pemex Exploration and Production (PEP)—one of the subsidiaries of Mexico’s state-owned oil company, *Petróleos Mexicanos* (Pemex)—I was greeted by an assistant manager. He had instructions from the national headquarters in Mexico City to pick me up and make arrangements for my visit. When we finally reached the Southwestern Offshore regional offices of Pemex, I noticed that everything appeared to be run in a well organized fashion. The building, while modest, was spotless. Employees worked in cubicles surrounded by a handful of offices for the managers and assistant managers. The computing equipment seemed relatively new and the staff all behaved professionally. Most of the people had received their college degree in Mexico, and some of them had master’s degrees from the National University in Mexico City.

This did not resemble the Pemex generally portrayed in the popular press: the paragon of a dysfunctional state-owned enterprise (Hoyos 2007; Luhnnow 2005; Geri Smith 2004; Economist 2009). It might not have gathered petroleum engineers seasoned in international endeavors, but this was a place of order, not disorder. In fact, the dynamics of the building were hardly different from those of the offices of private oil companies like Shell or Anadarko that I had visited in Houston. “Pemex has very good engineers, although they lag in technology and managerial expertise compared to the international standards,” told me an industry expert.<sup>1</sup>

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<sup>1</sup> Author’s interview with an industry expert (Int.Exp.#1) who requested anonymity in order to provide a candid assessment of Pemex (June 2009).

The following day, I met with PEP's two regional deputy directors in Ciudad del Carmen. Their secretaries had called the previous evening to confirm the meetings, just like they said they would. One of the managers, who had worked at Pemex for 28 years, eagerly showed me the Emergency Response and Attention Center located in the top floor of the building. Its main meeting room was surrounded by state-of-the-art screens with real-time images of production platforms offshore. There was a carefully detailed protocol stipulating what to do in the event of an emergency; it seemed like every detail had been taken care of ahead of time. "I got the idea to create this Center after visiting the BP facilities in Aberdeen," said the regional director proudly. "It proved to be very useful last year when we had a tragic accident in one of the platforms."<sup>2</sup>

My arrival would be very different at the Pemex refinery in Tula, Hidalgo, one of the six production facilities of Pemex-Refining. Despite having an "oficio" with me, that powerful document that transmits official orders down to the lower levels in the Mexican government, meeting with the managers was more difficult. First, I was delayed nearly an hour at the front entrance by the security employees arguing they were not notified of my visit. Once inside, I noticed widespread disorganization. The manager of the refinery refused to meet with me, asking me to see his assistant-manager, who immediately asked me to go to his assistant. I then walked into an office with several men chatting around a desk, eating breakfast, feet on the table. After cracking a joke at my expense, one of them asked the lowest ranking assistant in the office to meet with me.

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<sup>2</sup> Author's interview with Javier Hinojosa, director of the Northeastern Offshore Region (PEP), Ciudad del Carmen, Campeche, 25 June 2008. He was referring to an accident where the "Usumacinta" rig hit a production platform in the Gulf of Mexico due to bad weather in October of 2007. Twenty-two oil workers died.



As I sat in a small, dark cubicle at the end of the hallway and began talking to the assistant's assistant—a polite chemical engineer who had just been promoted from the technical ranks—I wondered why Pemex-Refining looked so different from Pemex Exploration and Production. In part, I thought, it could be due to better public relations awareness in Ciudad del Carmen. Yet, I wondered if the refinery management often disregarded orders from Mexico City, just like they had done with my “oficio.”<sup>3</sup> A former Pemex executive had earlier explained to me that “when you deal with Pemex-Refining, it is as if you went back in time to the Mexico of the 1970s.”<sup>4</sup> I then understood what he meant.

Hours later, as I was leaving the refinery, I noticed that the security guard was listening to classical music on his portable radio—by no means a common occurrence in Mexico. I turned around to look at him—an unassuming young man in his late twenties or early thirties—only to be further impressed by his choice of reading: Nietzsche's *Thus Spoke Zarathustra*. I could not help but think that things in Pemex-Refining were upside down. “A company named Solomon ranks the refineries worldwide,” explained a former top executive asked to compare Pemex-Refining to other refining companies around the world, “and the refineries of Pemex are always at the bottom.”<sup>5</sup>

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<sup>3</sup> When I returned to the Pemex national headquarters in Mexico City, the people I spoke with were shocked that an “oficio” had not been respected. That is the weight that such documents carry in the Mexican public sector. A top corporate official then explained: “Refinery managers see themselves as kings in charge of their territory” (author's interview, 2 July 2008).

<sup>4</sup> Author's interview with a former Pemex executive (Mex.Exp.#9) who requested anonymity in order to provide candid assessments of the subsidiary companies of Pemex, January 2008.

<sup>5</sup> Author's interview with a former Pemex executive, July 2008. The Solomon rankings are not publicly available, and each company only knows what its own ranking is. The poor performance of Pemex refineries in the Solomon rankings has been independently corroborated by other top Pemex officials, speaking under the condition of anonymity given the sensitive nature of the information (author's interview, 20 October 2009).

When I arrived at the offices of *Petróleos Mexicanos Internacional* (PMI) in Mexico City, I could hardly believe that I was dealing with a Mexican state-owned enterprise. PMI is the marketing and trading branch of Pemex, charged with selling Mexican crude in foreign markets and importing and exporting gasoline and other refined products. “PMI is the jewel of the crown,” had told me one of the former Pemex executives referred to above.<sup>6</sup> Former Pemex CEO Raúl Muñoz Leos would agree: “The people who created PMI hit the nail on the head. They left a very valuable legacy for the company.”<sup>7</sup>

After meeting with me, the director of PMI insisted on giving me a tour of their offices. I noticed the fingerprint recognition device that unlocked the doors to every room, the state-of-the-art computing system, and the rows of desks with staffers staring at their screens and making rapid phone calls. In short, PMI was no different from the trading floors of a New York City firm.

The director was proud of his recruiting efforts to gather a highly competent staff. We walked by a woman “who just returned from studying oil market economics at Oxford” and a man “that we persuaded to join us after he got his MBA at the Stern business school in New York.”<sup>8</sup> Just like in PEP and in Pemex-Refining, all employees at PMI were Mexican—except that, at PMI, graduate degrees abroad were common.<sup>9</sup> Since then, every time I have talked to an industry expert in Houston or elsewhere familiar with

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<sup>6</sup> Author’s interview with a former Pemex executive (Mex.Exp.#9) who requested anonymity in order to provide candid assessments of the subsidiary companies of Pemex, January 2008.

<sup>7</sup> Author’s interview with Raúl Muñoz Leos, former Pemex director-general (2000-2004), Mexico City, 30 July 2008.

<sup>8</sup> Author’s interview with Rosendo Zambrano, Mexico City, 12 June 2008.

<sup>9</sup> PMI has several “offices of representation” abroad, which do hire foreign staff. In the Mexico City headquarters, however, all employees are local.

PMI I ask them how it compares to its counterparts in other private or state-owned firms. The vast majority of them has said that it ranks among the best in the business.

PEP, Pemex Refining, and PMI are all subsidiary companies of Pemex, chartered as separate state-owned enterprises (SOEs) that conduct arm's length transactions with each other. A reasonable *a priori* expectation would be that all these state-owned enterprises, when compared to their international counterparts in terms of their technical or commercial performance, would rank at similar levels. In other words, the presumption would be that the Exploration and Production (E&P) company would be placed at a similar level among international E&P companies as the refining company would among international refining units. After all, they all belong to the same parent company, respond to the same ministries in the Mexican government, draw workers from the same labor pool, and have a common chief executive officer (CEO) and corporate headquarters.<sup>10</sup>

Yet, the observed outcome could not be farther from that expectation. PMI has excelled in a way that PEP has not, and Pemex-Refining has consistently fared poorly in technical performance vis-à-vis its international counterparts. A fourth subsidiary company, Pemex Gas and Basic Petrochemicals (henceforth, Pemex-Gas), charged with gas processing, storage, and distribution, is often regarded by Mexican oil industry experts as a highly efficient firm.

What accounts for the differences in behavior among these different state-owned enterprises? Given that country- and parent company-level factors are constant, why do some of these firms succeed in the Mexican oil industry while others fail? The culture of

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<sup>10</sup> In Pemex (as in other state-owned enterprises in Mexico), the chief executive officer of the company has the title of director-general. Throughout the dissertation, the terms director-general and CEO are used interchangeably.

the country cannot explain why there is variation across business units of Pemex, since they are all subject to the same cultural constraints. The same can be said about the political system, the level of rule of law, and the country's overall level of education and development. This dissertation provides an answer to this puzzle. In so doing, it sheds light on the factors that determine the wide variation in the behavior of state-owned enterprises more generally.

## **2. A Framework to Analyze Differences in State Enterprise Behavior**

In spite of the wave of privatization of the 1980s and 1990s, state ownership of enterprise remains a very important part of the political economies of both developing and industrialized nations. Moreover, state ownership tends to be concentrated in “strategic” industries with high economic and political importance, such as oil and gas, electricity, water distribution, transportation, health care, and banking (OECD 2005). The conventional wisdom in industrial organization states that public enterprises are inefficient; nevertheless, it says very little about the wide variation in the behavior of these firms both within and across countries. Current frameworks, for example, do not explain how come two state-owned enterprises (SOEs) in the same country, responding to the same ministry, drawing workers from the same labor pool and facing similar regulatory regimes can perform very differently. Mere knowledge that private firms are on average more efficient lacks relevance for countries politically unwilling or unable to divest state firms. This shortcoming has serious practical implications, given the political and economic ramifications of poor management of strategic sectors.

This dissertation provides a new analytical framework to explain differences in behavior among state-owned enterprises (see Chapter 2 for a detailed explanation). Much of the variation, it argues, can be captured with only three variables: the policy preferences of the government's ruling coalition, the degree of competition in the business environment of the firm, and the level of cohesion of the managerial staff. It thus greatly advances the study of state firms by synthesizing the large number of political, economic, and sociological factors affecting state-owned enterprises into a tractable analytical method. In particular, it integrates—rather than neglect—the political goals of these companies as well as the role of the organizational variables.

Subsequently, this study applies the framework to explain the large observed variation in the behavior of the subsidiary companies of the Mexican state-owned petroleum enterprise, *Petróleos Mexicanos* (Pemex). It finds that the policy mandates of the SOEs reflect the policy preferences of the government. For example, rightist governments view them simply as instruments of fiscal policy, while leftist governments also view them in terms of industrial promotion and income redistribution.

Second, firms that operate in competitive business environments are much more efficient than those that do not. This finding stands in contradiction to the expectation of both neoclassical economics and public choice theory. The former assumes that all firms minimize costs regardless of the structure of the market, but the case of Pemex shows that market competition matters greatly. Similarly, public choice arguments state that government ownership and the concomitant rent-seeking behavior inevitably dooms state companies to a path of mediocrity. Instead, this dissertation shows how an SOE in a competitive environment can achieve high levels of efficiency.

Third, the level of cohesion of the managerial staff explains behavioral differences among those companies that face similar levels of market competition. In the subsidiaries of Pemex, team cohesion played a key role to create a sense of shared responsibility for improving firm efficiency and enhanced the managers' ability to overcome collective action problems and prevent the appointment of underqualified politicians to top executive positions. Managerial cohesion, therefore, determines the "porosity" of the state enterprise to political interference and helps shape the policy orientation and operational capacity of the company.

### **3. The Methodological Approach**

#### *3.1 The Sub-Organizational Analytical Method*

This dissertation employs a "sub-organizational analytical method" to study differences in firm performance. The method can be understood as a variant of the sub-national method commonly used in comparative politics (Snyder 2001). The latter's guiding principle is the desire to achieve better causal inference in social science research—both qualitative and quantitative—by holding as many confounding variables as possible constant and allowing the independent variables of interest to vary. The appeal of selecting cases subnationally is that many institutional, cultural, and sociodemographic characteristics can vary considerably (and in unobservable ways) across countries, but they are relatively fixed within them. Thus, the significance of a particular independent variable can be observed more clearly and explained more persuasively when the heterogeneity across cases has been addressed.

The sub-organizational approach follows the same logic, except that it selects cases within an organization instead of within a country. In doing so, confounding variables common to all sub-units of the organization are controlled and the role of independent variables can be discerned with greater precision. The method is applicable to the study of business enterprises, government agencies, and international organizations, and it has its greatest potential in maximizing the comparability of cases when the sub-units operate also in the same political administrative entity (country, state, province, etc).

Scholars such as Trebat (1983), Ramamurti (1987), and Schneider (1991) have adopted a related methodological approach to the study of state-owned enterprises, although theirs fall more in the camp of the strict sub-national method. In all those instances, different state-owned enterprises within one country are selected. However, unlike the present study, they do not compare sub-units within each state-owned enterprise.<sup>11</sup>

In a manner analogous to the sub-national method, the sub-organizational method is exposed to the criticism of “external validity” (Gerring 2007). Such concern is valid, although it is worth emphasizing that the contribution of the sub-organizational method lies in improving internal validity. Efforts should still be undertaken to determine whether the findings are applicable to different settings, but researchers who apply the method can be more certain that, at least in the particular context under study, the results are more robust.

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<sup>11</sup> A recent study that closely matches the sub-organizational approach pursued in this dissertation is Long’s (2009), who examines differences in organizational culture among different services in the United States military. Holding country-level variables and profession-level variables constant, he is able to analyze the impact of differences in group formation and socialization patterns across branches.

### 3.2 *Why Pemex?*

This study applies the analytical framework outlined above to understand the behavior of the subsidiary companies of the Mexican state-owned oil and gas company, *Petróleos Mexicanos* (Pemex). Several SOEs could have been rightly chosen for this study, yet Pemex is particularly useful for a sub-organizational study of SOE behavior. First, internally, it is clearly divided into sub-units—subsidiaries—that operate at arm’s length from each other with their own human resources, financial, and legal teams. Second, there is variation in the business efficiency and policy mandates of each of these sub-units. Third, as mentioned earlier, these differences cannot be readily explained by country-level or parent company-level factors, since these are held constant across cases.

Pemex has additional advantages for a study on SOE behavior. For example, it enables a better understanding of the petroleum industry, a highly relevant economic sector. Second, within the industry, Pemex is one of the most important companies. In fact, throughout most of the 2000s, it ranked third in total oil production worldwide, only behind Saudi Aramco and the National Iranian Oil Company. Moreover, it has a relatively large refining capacity, providing gasoline for approximately 2% of the world market (Energy Intelligence 2007). Table 1.1 presents general operational statistics for Pemex and other large oil companies around the world.

[TABLE 1.1 HERE]



**Table 1.1 Major Oil Companies Around the World (2005 Operational Figures)**

Company	Country	Percent State-Owned	Oil Reserves (Millions of Barrels)	Oil Production (Thousands of Barrels per Day)	Total Refining Capacity (Thousands of Barrels per Day)	Total Revenue (Millions \$US)	Number of Employees
BP	UK	-	9,565	2,562	2,832	251,003	96,200
Chevron	United States	-	8,146	1,701	2,195	189,481	59,695
ConocoPhillips	United States	-	6,189	1,447	2,608	166,327	35,600
ENI	Italy	30%	3,773	1,111	701	92,471	72,258
ExxonMobil	United States	-	11,229	2,523	6,350	338,992	83,700
Gazprom	Russia	50.0023%	9,829	811	750	63,824	397,000
KPC	Kuwait	100%	101,500	2,643	1,075	40,250	20,340
Lukoil	Russia	-	16,114	1,819	1,175	56,215	150,000
NIOC	Iran	100%	137,500	4,049	1,451	45,500	115,000
NNPC	Nigeria	100%	21,540	1,548	439	30,650	15,000
PDVSA	Venezuela	100%	79,700	2,650	3,045	85,700	35,000
<b>Pemex</b>	<b>Mexico</b>	<b>100%</b>	<b>13,671</b>	<b>3,710</b>	<b>1,707</b>	<b>87,262</b>	<b>139,171</b>
Petrobras	Brazil	32.20%	9,716	1,847	2,156	59,510	54,000
PetroChina	China	90%	11,962	2,270	2,337	67,427	439,220
Petronas	Malaysia	100%	7,599	715	367	44,282	33,682
Repsol YPF	Spain	-	1,167	531	1,233	63,056	35,909
Rosneft	Russia	75.16%	8,404	1,498	210	25,305	70,000
Saudi Aramco	Saudi Arabia	100%	264,200	11,035	2,440	180,000	51,843
Shell	UK/Netherlands	-	5,382	2,093	4,026	306,731	110,000
Sinopec	China	71.23%	3,294	764	2,997	101,652	364,528
Sonatrach	Algeria	100%	11,712	1,934	450	41,200	49,869
Statoil	Norway	70.90%	1,761	704	325	60,792	25,644
Total	France	-	6,592	1,621	2,708	151,902	112,877

Source: Energy Intelligence (2007), *The Energy Intelligence 100: Ranking the World's Oil Companies*, New York, NY.

Additionally, Pemex is more open than other firms in terms of granting access to researchers to conduct interviews or consult its archives. The Mexican Freedom of Information Law requires all government agencies to respond to citizens' requests for information that has not been explicitly filed as classified. Unlike Middle Eastern or

private oil companies, which are known for their reluctance to provide information,<sup>12</sup> Pemex is relatively transparent. In terms of quantity and quality of data collected for a study that requires inside access to the internal environment of a firm, this fact cannot be underestimated.

### *3.3 Case Selection within Pemex*

This study compares four out of the five major subsidiaries that perform oil and gas activities in Pemex. These are Pemex Exploration and Production (PEP), Pemex Refining, Pemex Gas, and *Petróleos Mexicanos Internacional* (known as PMI). The fifth subsidiary, Pemex Petrochemicals, was not selected following the advice of several experts on the Mexican oil industry who noted that it was not truly comparable with the others.<sup>13</sup> Since the mid-1990s, the Mexican government has sought to sell Pemex Petrochemicals and has provided extremely limited investment funding. Hence, given those structural constraints, it would not necessarily be representative of state-owned enterprise behavior in the Mexican oil industry.

All the subsidiaries were created as separate legal entities following a reform in 1992. Before that year, this study traces the behavior of their precursors, which were divisions of Pemex that did not operate at arm's length from each other. A brief description of their activities is provided below, and a more extensive discussion can be found in the chapters that analyze the behavior of each one of them.

Pemex Exploration and Production (PEP) is in charge of finding oil and gas reserves, drilling and developing wells, and managing the production of hydrocarbons. It

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<sup>12</sup> Marcel's (2006) study is a rare exception in terms of a high level of access to Middle Eastern oil companies.

<sup>13</sup> For example, author's interview with Bernardo de la Garza, Mexico City, 7 April 2008.

is divided into four geographic regions in Mexico—South, North, Marine Southwest, and Marine Northeast. Its activities are concentrated in the Mexico City headquarters and in those areas with prolific oil reservoirs—in particular the Sound of Campeche. As of 2008, PEP had 50,273 employees. The dominant worker is the petroleum engineer. PEP has no competitors in the Mexican market.

Pemex-Refining is in charge of processing crude oil into products suitable for industrial and residential consumption. It operates six petroleum refineries scattered throughout Mexico, in addition to the grid of pipelines and the domestic transportation, storage, and distribution of products at the wholesale level. Accordingly, its activities are scattered throughout the entire country. As of 2008, it had 45,510 employees. Front-line workers at Pemex-Refining are mostly chemical engineers, although finding professionals with different training is not uncommon.

As in the case of PEP, Mexican law also prohibits private participation in refining and distribution activities. Thus, Pemex-Refining has a monopoly in the domestic market. Pemex-Refining does not operate at the retail level; instead, the law allows private owners to apply for concessions set up gasoline stations. Yet, they must buy their supply from Pemex-Refining. The subsidiary is required to purchase its crude oil inputs from PEP, regardless of whether these are optimal for its refineries. Unlike PEP, which sells to other subsidiaries at market prices, Pemex-Refining only makes purchases at market prices. Further downstream, prices are regulated by a government-run price board.

Pemex-Gas is in charge of processing the natural gas coming out of the wells so that it is suitable for industrial and residential use. Additionally, Pemex Gas operates the transportation, storage, and distribution of natural gas and liquefied petroleum gas (LPG)

in Mexico. As of 2008, it had 12,976 employees. Unlike the cases of PEP and Pemex-Refining, Pemex-Gas faces partial market competition in some segments of its operations. A legal reform enacted in 1995 liberalized the market for transportation, storage, and distribution of gas and thus in principle allowed the private sector to operate alongside Pemex. In practice, however, the entry of competitors into the industry has been limited.

*Petróleos Mexicanos Internacional* (PMI) is in charge of marketing Mexican crude and refined products in international markets, as well as purchasing products for import.<sup>14</sup> Additionally, PMI engages in trading activities for refined products for hedging purposes and oversees the international joint ventures of Pemex—with Shell at the Deer Park, Texas refinery and with the Spanish company Repsol in the Petronor refinery.

PMI is the only entity allowed to export and import crude oil and petroleum products. It has a considerably smaller workforce than the other subsidiaries; in 2008, it only had 322 employees. PMI's personnel consists in economists, lawyers, and engineers. Moreover, while approximately 80% of the staff of PEP, Pemex-Refining, and Pemex-Gas is unionized, PMI does not have unionized employees. Yet, this was not always the case—in the 1980s, the union voluntarily withdrew from PMI, a fact that is discussed in Chapter 4. PMI's offices are more scattered geographically, since it has branches in the United States, the United Kingdom, Spain, and the Netherlands. Its transactions with PEP and Pemex Refining are made at market prices.

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<sup>14</sup> Unlike the other subsidiary companies, PMI was created in 1989. See Chapter 4 for a detailed overview of the creation of PMI.

### *3.4 Determining the Behavior of Pemex*

This study draws from an extensive array of primary materials. Academic research on the Mexican oil industry virtually disappeared after the late 1980s, thus leaving a void of secondary sources for most of the time period under consideration. Fortunately, both current and former employees of the company granted me access to a vast amount of information. Completion of the fieldwork entailed traveling to Mexico several times over the course of two years, from 2008 to 2010. The majority of the field research was completed in the months of June, July, and August of 2008, when I was permitted full access to the Pemex headquarters in Mexico City and provided with a cubicle in the area where the advisors to the CEO worked. The data gathered in Mexico was complemented with information collected during research trips to Houston, Texas, Washington, DC, and Rio de Janeiro, Brazil. Several interviews were also conducted by telephone from Cambridge, Massachusetts.

Four complementary methods were used to assess the behavior of the different subsidiaries of Pemex: in-depth interviews, archival research, statistical analyses, and participant-observation. In this study, over 100 formal interviews (and dozens more of informal ones) with Mexican and international oil industry experts were conducted to determine how the subsidiaries of Pemex compared with their international counterparts. Archival data consists primarily in minutes from Board of Directors meetings, old statistical yearbooks, and company annual reports spanning from 1965 to 2009. Statistical analyses complement expert opinion by providing a common metric applicable to several companies. Data is generally scarce in the industry, and indicators are not always comparable—for instance, the geology of a region, which is hard to quantify statistically,

may affect the productivity of a firm. Moreover, much of this analysis consists in descriptive statistics, since sample sizes are too small to allow more sophisticated techniques. However, whenever possible, statistical results add reliability to the views of industry experts. Finally, first-hand analysis of the behavior of the personnel via participant-observation provides information not available in other sources.<sup>15</sup> In this particular case, the research stay in the Pemex headquarters proved to be a remarkable opportunity to observe a state-owned company “from within.” Additionally, I had the opportunity to travel to several of Pemex’s industrial facilities to speak with the engineers on the field.

#### **4. Structure of the Dissertation**

The dissertation is structured as follows. Chapter 2 presents the analytical framework to study differences in state-owned enterprise behavior. It provides definitions for the concepts used throughout the study, discusses prior research, and explains the causal mechanisms at stake. It also applies the analytical framework in order to explain cross-sectional differences in outcomes among the subsidiaries of Pemex. Chapter 3 offers an overview of Pemex as a state-owned enterprise. Its early history, current organizational structure, and symbolism as an entity of Mexican nationalism are explained in detail.

Once Pemex, the parent company, has been presented, the contemporary history of each subsidiary is introduced. The longitudinal analysis is made with special emphasis on tracing the effects of the independent variables of interest and on explaining the causal

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<sup>15</sup> Participant-observation consists in immersing the researcher in the day-to-day activities of the units under study (Becker 1958; Fenno 1986; Glaser 1996).

mechanisms at stake. Therefore, some aspects are left out in favor of others that add clarity to the role played by the explanatory variables. Thus, Chapter 4 describes the evolution of PMI, while Chapter 5 discusses the history of PEP. Chapter 6 is different in that it analyzes two subsidiaries concurrently, Pemex-Refining and Pemex-Gas. This method of presentation is employed in order to highlight the effect of the introduction of market competition in an industry where previously it did not exist.

The concluding chapter revisits the analytical framework presented in Chapter 2, but with the advantage that the reader is already familiar with the history of the subsidiaries. Additionally, an argument is made to show how knowledge of the behavior of the different subsidiaries allows understanding the parent company better than it would have been possible otherwise. Finally, the conclusion discusses avenues for comparative research and compares and contrasts Pemex to other state-owned enterprises around the world.

## **CHAPTER 2**

### **A FRAMEWORK TO ANALYZE THE BEHAVIOR OF A STATE-OWNED ENTERPRISE AND AN APPLICATION**

#### **1. What are state-owned enterprises?**

State-owned enterprises (SOEs) are government-administered commercial entities. This generally refers to companies where the state owns 50 percent plus one of the voting shares, although this need not be the case. On occasion, governments may administer enterprises even though they are minority shareholders.

State ownership of enterprise has been a ubiquitous policy tool for both developing and industrialized capitalist countries at least since the nineteenth century (Aharoni 1986; Toninelli 2000). While the number of SOEs around the world decreased considerably in the 1980s and 1990s, by no means did they disappear, even in industrialized countries. In fact, of the fifty largest companies worldwide in terms of revenues in 2009, eight were state-owned.<sup>16</sup> In 2003, for example, the asset value of SOEs as a percentage of GDP was over 50% in Finland and the Slovak Republic, and between 15% and 35% in Sweden, Italy, France, South Korea, Turkey, the Czech Republic, New Zealand, and the Netherlands. Similarly, in India, SOEs are key players in the coal, petroleum refining, steel, and fertilizers industries and, in Russia, public firms produce 20% of the country's industrial output (OECD 2005).

At the start of the 21<sup>st</sup> century, important companies across a variety of sectors are owned by the state. For example, Codelco, the largest copper producer in the world (Craze and Attwood 2009), is owned by the Chilean government, and the railroad transportation company Amtrak is run by the government of the United States. Singapore Airlines, ranked among the top 50 most admired companies worldwide by Fortune

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<sup>16</sup> See <http://money.cnn.com/magazines/fortune/global500/2009>, accessed on 30 June 2010.



magazine (Fortune 2009), the Canadian Broadcasting Company, and Meridian Energy—New Zealand’s largest electricity company—are also all state owned. Finally, with regards to petroleum—the most important commodity in the world in terms of value traded and number of transactions (BBC News 2007; James L. Smith 2009)—state-owned enterprises dominate the global supply of proven reserves. In fact, Exxon-Mobil, BP, and Chevron, the three private oil companies with the largest reserves, rank 14th, 17th, and 19th worldwide in this regard, significantly behind their state-owned counterparts (Baker Institute 2007).

Furthermore, state-owned enterprises may be on the rise around the world.<sup>17</sup> Between 2006 and 2010, several governments nationalized or intended to nationalize major private companies. The Venezuelan government, for example, expropriated cement, steel, and banking firms,<sup>18</sup> and the Bolivian government nationalized companies in the oil and natural gas sectors.<sup>19</sup> In Ukraine, in late 2008, Prime Minister Yulia Tymoshenko called for the nationalization of Prominvest, one of the country’s largest banks.<sup>20</sup> Last but not least, in the aftermath of the global financial crisis of 2008, the United States government became the primary owner of the insurance company AIG and the automobile company General Motors, and in 2009 it debated at length the possibility of creating a government-run health insurance firm.

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<sup>17</sup> In academic circles, this resurgence of state ownership of industry—and of state intervention in economic activity, more generally—has been associated with Karl Polanyi’s (1944) interpretation of change in political economy, which suggested that market liberalism and state intervention interacted in a pendulum-like “double movement.” While Polanyi was writing about the 19<sup>th</sup> century historical processes, the rise, demise, and potential resurgence of state-led capitalism seems to fit his theory of change.

<sup>18</sup> See Alonso, Juan Francisco, “Chávez expropia la cementera Cemex tras fracasar en el intento de comprarla” (*El País*, 20 August 2008, p. 9) and Romero, Simon, “Bank Tries to Allay Fears of Instability in Venezuela” (*The New York Times*, 2 August 2008, p. 7).

<sup>19</sup> See Schneyer, Josh, “Bolivia’s Morales nationalizes energy firms; Move comes ahead of key referendum in energy-rich eastern province” (*Platt’s Oilgram News*, 5 May 2008, p. 7).

<sup>20</sup> See “Two Ukrainian MPs take over troubled Prominvest” (Forbes.com, 11 November 2008, available online at <http://www.forbes.com/feeds/afx/2008/11/11/afx5677416.html>).

## 2. The behavior of a state-owned enterprise

### 2.1 Basic Definition of SOE Behavior

The behavior of a state-owned enterprise can be broadly defined as the set of activities carried out by the firm during a given period of time. For the purposes of this study, SOE behavior is narrowed down to two elements: a “policy utilization” component and a “business efficiency” component. This particular definition results from the fact that SOEs are hybrid entities—part government agencies and part commercial enterprises—and hence, in addition to their commercial mandate, they are often used as instruments of public policy. Evidently, SOE behavior must be conceptualized and assessed differently from that of the textbook profit-maximizing firm (Vernon and Aharoni 1981).<sup>21</sup>

To clarify these two components, Pfeffer and Salancik’s (1978) distinction between organizational “effectiveness” and “efficiency” is helpful. The policy orientation of the firm can be associated with the concept of “effectiveness” of organizations. Following Pfeffer and Salancik,

Organizational effectiveness is an *external* standard of how well an organization is meeting the demands of the various groups and organizations that are concerned with its activities... The effectiveness of an organization is a sociopolitical question. (p. 11, emphasis in original.)

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<sup>21</sup> From a theoretical perspective, a private firm can serve several functions—legal, administrative, productive, planning and allocative, etc.—(see, for example, Chandler 1992). State-owned enterprises perform all these functions in their pursuit of their objectives.

Effectiveness, however, is often a subjective standard that depends upon the particular concerns and cost-benefit calculations of those who oversee the organization. For this reason, the analysis of effectiveness in this study is descriptive, seeking to identify the policy orientation of the SOE, rather than prescriptive.

The business component of behavior refers to the commercial activities proper of a company, and it can be associated with the concept of “efficiency.”<sup>22</sup> Again, citing Pfeffer and Salancik (1978),

Organizational efficiency is an *internal* standard of performance. The question whether what is being done should be done is not posed, but only how well it is being done. Efficiency is measured by the ratio of resources utilized to output produced. (p. 11, emphasis in original.)

Aharoni (1986) puts the distinction between efficiency and effectiveness as follows:

“Efficiency measures gauge whether things are done right and effectiveness is purported to measure whether the right things are done” (p. 170).

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<sup>22</sup> Neoclassical studies—which focus on exchange—usually assume that firms minimize costs and operate at the technological frontier determined by a production function. Production-based theories, on the other hand, allow for inefficiencies in the process of attaining the technological frontier and suggest that social losses due to allocative inefficiencies can be trifle compared to productive inefficiencies. Leibenstein (1966) coined the term “X-Inefficiency” to refer to the failure to reach the production frontier, and Jones and Papanek (1983) argue that X-Inefficiency is rather feasible in the case of state-owned enterprises. Following Gillis (1982), this dissertation allows for both productive and commercial inefficiencies to take place, and makes an explicit distinction between them to make the analysis more clear. In all likelihood, however, technical and commercial efficiency are interdependent.

## 2.2 Varieties of State-Owned Enterprise Behavior

State-owned enterprises around the world vary widely both in terms of their business efficiency and their policy utilization. Emphasis on privatization has led some authors to neglect that some SOEs have attained a high level of business efficiency or have been very effective instruments of policy.<sup>23</sup> This section lists just a few examples to illustrate the divergence in behavior that has been observed among SOEs.

In terms of business efficiency, Ramamurti (1987), for example, analyzed the financial record of SOEs in high-technology industries in Brazil and India and found wide disparities within each country.<sup>24</sup> In the oil industry, Brazil's Petrobras is often ranked as one of the top performing national oil companies. Yet, within Petrobras, stark differences exist between its deepwater exploration and production activities—unequivocally rated as world class by industry experts<sup>25</sup>—and its petroleum refining subsidiary.<sup>26</sup> Similarly, Venezuela's state-owned oil company, *Petróleos de Venezuela* (PDVSA), is today considered to have lost its luster of the 1980s and 1990s (Mares and Altamirano 2007)—yet, its refining company, Citgo, has remained as one of the top firms in the United States market (Francisco Flores-Macías 2009).

The variation in policy mandates is similarly extensive. This is hardly surprising, since the creation of an SOE in capitalist economies has been justified in a variety of ways. From a national security standpoint, the objective of SOEs can be to provide goods

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<sup>23</sup> For a study that emphasizes the need to privatize rather than alternatives to reform SOEs within a state ownership regime, see the World Bank's report *Bureaucrats in Business* (1995).

<sup>24</sup> Variation in state-owned enterprise behavior is analogous to variation across government-run entities. Wilson (1989), for example, points out the need to explain the striking differences in behavior between federal prisons, schools, etc.

<sup>25</sup> Author's interview with Richard Sears, former vicepresident for deepwater exploration and production at Royal Dutch/Shell, 27 August 2009. This view has been corroborated independently by top executives at private oil companies such as Total and Anadarko.

<sup>26</sup> Author's interview with a Brazilian oil industry expert who requested who requested anonymity, May 2010.

and services “that cannot be cut off without danger of total and partial collapse of an economy” (Bös 1986). Due to the strategic importance of many of these industries, control over public companies can also be associated with questions of economic and political power—providing leverage in negotiations between states and between states and multinational corporations (Richard P. Nielsen 1982). From a developmental perspective, SOEs can provide a “helping hand” for the private economy, creating forward and backward linkages in order to break industrialization bottlenecks (Jones and Papanek 1983; Hirschman 1958). The idea is that public enterprises create demand for intermediate goods produced by domestic firms and can also supply other companies at subsidized prices. From a social security standpoint, SOEs can afford the luxury of not firing workers during economic recessions, thus mitigating the impact of business cycles via *de facto* unemployment insurance. Traditional sectors for SOEs are public utilities, coal, oil, steel, banking, education, transportation, and healthcare.

The energy company Gazprom, for instance, has been considered by many to serve as a powerful geoeconomic instrument for the Russian state (Larsson 2006; Goldman 2008).<sup>27</sup> The Venezuelan oil company, PDVSA, has been steered by the government of President Hugo Chávez towards the implementation of “missions” for the economic development of low-income rural areas (Mares and Altamirano 2007). In the services sector, the Indian transportation company, Indian Railways, has been geared at least in part towards maintaining high employment, but it has managed to do so while

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<sup>27</sup> “Russia has not hesitated in the past,” writes Goldman (2008), “to cut off the flow of both petroleum and gas to strengthen its side of a political dispute, a practice it inherited from its forebears in the Soviet Union’s Ministry of the Gas Industry and Ministry of the Petroleum Industry” (p. 3). Yet, Abdelal (Emmons 2009) disagrees with this interpretation.

staying profitable (Musacchio and Francisco Flores-Macías 2009).<sup>28</sup> Other transportation-sector SOEs have consistently pursued income redistribution policies by subsidizing low-income urban dwellers. Similar examples abound.

In the case of the subsidiary companies of Pemex, the variation in business efficiency is particularly striking given the number of characteristics that are common to all. Elsewhere in Mexico, one electricity SOE, *Comisión Federal de Electricidad* (CFE), was generally regarded as more technically competent and less corrupt than another, the now defunct *Luz y Fuerza del Centro*.<sup>29</sup> And within CFE, industry experts regard the subdivision CFE-Generation as much more efficient than CFE-Distribution. As one international expert familiar with the company said, “CFE-Generation is an 8 in a ten-point scale; CFE-Distribution is in the dark ages.”<sup>30</sup>

Within Pemex, the different business units have also pursued multiple policy mandates at different points in time. Thus, at one point the trading and commercialization branch—the precursor of PMI—ventured into the negotiation of economic assistance treaties with developed nations in exchange for oil supply contracts, although this practice was abandoned in the 1980s (Snoeck 1988). Some observers believe that, during the presidential administration of Vicente Fox (2000-2006), Pemex-Refining aimed to enhance the political standing of the president’s National Action Party (PAN) in the eastern state of Veracruz.<sup>31</sup> Moreover, in the early 2000s, Pemex Refining served as an

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<sup>28</sup> As of 2005, with 1.6 million employees, Indian Railways was the largest commercial employer in the world (OECD 2005).

<sup>29</sup> For example, according to Chacón (2008), in 2007 the average time to connect a new CFE user to the grid was one day, while for *Luz y Fuerza* users it was 6 days. Similarly, the average time of interrupted service at CFE was 100 minutes per user per year, while for *Luz y Fuerza* it was 114.8.

<sup>30</sup> Author’s interview with an industry expert who requested anonymity, April 2009.

<sup>31</sup> Several Pemex employees referred to “horror stories” regarding the activities of Pemex Refining during those years. A former Pemex top executive interviewed for this study argued that the director of Pemex Refining was actively utilizing the company to assist a potential run for governor of Veracruz. See also

instrument of fiscal policy, whereas in the 1970s and early 1980s it was a tool to promote regional development.

### *2.3 Unexplained Variation of SOE Behavior*

Much of the empirical research in economics dealing with SOEs has focused on the privatization debate, concluding that private enterprises are more efficient than state firms (Boardman and Vining 1989; Dewenter and Malatesta 2001; Megginson and Netter 2001; Sheshinski and López-Calva 2003; La Porta and López-de-Silanes 1999).<sup>32</sup>

However, this finding is largely unhelpful to understand the wide variation within the subgroup of SOEs. Given that governments around the world continue to retain ownership of certain industrial enterprises, how to account for the fact that some operate at world-class levels of efficiency while others become highly inefficient?

Differences in efficiency between state-owned enterprises of radically different countries may be readily accountable by cultural or economic factors. For example, Norway's state-owned oil company—StatoilHydro—is considered much more efficient than its counterpart in Nigeria (Eller, Hartley, and Medlock 2007). While both SOEs face similar challenges—primarily overseeing the production of crude oil in inhospitable offshore environments—the Nigerian National Oil Company suffers from technological backwardness and corruption (Nwokeji 2007), both of which are absent in Norway (Gordon and Stenvoll 2007). Yet, many social and political indicators already suggest that any government entity in Norway would be better run than in Nigeria. Norway's per

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Cruz Serrano, Noé, “Buena Torio deja Pemex, en medio de indagación” (*El Universal*, 16 December 2005).

<sup>32</sup> Although see Caves and Christensen (1980) and Bartel and Harrison (2005) for alternative findings. Laffont and Tirole (1993) readily acknowledge that it is not theoretically possible, *a priori*, to determine whether state-owned enterprises are intrinsically less efficient than private firms.

capita income in 2007 was \$49,359, while Nigeria's was \$1,859.<sup>33</sup> Similarly, Norway ranked #9 in the "Corruption Perceptions Index" published by Transparency International, ahead of countries like the United Kingdom, Germany, Ireland, and the United States, while Nigeria ranked #147 out of 179.<sup>34</sup> In an index of the level of political and civil liberties, published by Freedom House, Norway scored an average of 1 (highest), while Nigeria scored an average of 4 (where 7 is the lowest).<sup>35</sup> Yet, little has been said about differences among SOEs operating under very similar circumstances.

Furthermore, there is a conspicuous lack of a broad-based theoretical understanding of state-owned enterprises that conceptualizes them as bureaucratic organizations embedded in the intersection of political and economic decision-making. There is extensive theoretical and empirical research on the efficiency of public enterprises, but the findings are partial for two main reasons. First, they generally shirk at the task of analyzing the policy goals of the firms. How these goals arise in the political domain, how they are implemented, and how they shape firm behavior are central issues, yet existing analytical frameworks do not account for them.

Second, much of the published literature treats the public enterprise like a "black box" and does not address organizational variables. Organizational sociologists and, to a lesser extent, political scientists have analyzed the internal workings of bureaucratic organizations and found them to be important drivers of behavioral differences. At least since the works of Kaufman (1960), Crozier (1964), and Wilson (1968), the role of

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<sup>33</sup> In constant 2005 dollars, adjusted for purchasing power parity (source: World Development Indicators, World Bank).

<sup>34</sup> Source: Transparency International, available online at [http://www.transparency.org/policy\\_research/surveys\\_indices/cpi/2007](http://www.transparency.org/policy_research/surveys_indices/cpi/2007); accessed on 8 September 2009.

<sup>35</sup> Source: Freedom House, available online at <http://www.freedomhouse.org/template.cfm?page=366&year=2007>; accessed on 8 September 2009.



organizational culture has been shown to explain behavioral differences among government agencies that at the outset appear similar. Extending their findings to the study of public enterprises is a natural step forward.<sup>36</sup>

### **3. Two Dependent Variables: Unpacking the Concept of SOE Behavior**

#### *3.1 The Relationship between the Dependent Variables*

This study explicitly considers two jointly dependent variables—business efficiency and policy utilization—and an intermediate, “linking” variable that serves as a bridge between them. This approach seeks to provide a framework for the analysis of SOE behavior that acknowledges both the fact that government firms pursue commercial and policy objectives and that these goals often entail tradeoffs. The result is a more realistic, yet still manageable view of the activities of SOEs than that presented in prior research.

Early scholars of public enterprise recognized the multiplicity of objectives among SOEs and the potential tradeoffs among business efficiency and policy mandates (Vernon and Aharoni 1981). In spite of this, the academic literature on privatization in the 1990s focused almost exclusively on the business efficiency of government firms relative to their private counterparts (Megginson and Netter 2001). The findings of this

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<sup>36</sup> Furthermore, little has been written on the role of the industrial activity in shaping governmental mandates and SOE efficiency. A vast literature in industrial economics analyzes industrial sectors under the structure-conduct-performance (S-C-P) paradigm (Chamberlin 1939; Edward S. Mason 1939; Grether 1970). The market structure of a particular industry, according to this view, shapes the conduct of the individual firms. The primary determinants of the structure of the market are the size of the firms, the barriers for the entry of new firms into the industry, and the degree of differentiation among the products of the companies (Grether 1970). Nevertheless, as Porter (1979) points out, this framework assumes a high degree of homogeneity among firms that is not warranted by empirical observation. More importantly for our purposes, the S-C-P paradigm does not allow for the examination of sociological outcomes that result from the industrial activity itself. Similarly, it does not explore whether certain industrial activities transmit more clear signals of performance to those in charge of oversight or whether or not they create more rent-seeking opportunities.

method underscored the potential losses in efficiency of state firms from a partial equilibrium framework.<sup>37</sup> The approach is sensible given that efficiency is an important consideration and, perhaps more importantly, it can be quantified more easily. Yet, the understanding of the policy utilization of SOEs and of the relationship between their policy role and their business efficiency was seldom pursued.

The framework advanced here posits that the outcomes of the SOE's business efficiency and policy utilization are determined simultaneously. The connection between the two dependent variables is provided by an intermediate, "linking" variable that measures the degree to which the government is able to intervene in the internal operations of the SOE and utilize it as an instrument of public policy. The variable includes those government actions that are not explicitly intended to enhance the business efficiency of the company, instead seeking to achieve goals on a public policy space distinct from the strictly productive and commercial aspects of the SOE. In other words, it makes an assessment of government action that is not aligned with the business objectives of the firm. For this reason, this variable is labeled "non-aligned government intervention" (or NAGI).<sup>38</sup>

The two dependent variables are affected by three primary explanatory variables: market competition, managerial cohesion, and government ideology. The basic insight is that these factors affect business efficiency and policy utilization both directly and indirectly through their effect on NAGI. Definitions for the dependent, explanatory, and linking variables are provided in the following pages. Figure 2.1 presents a schematic

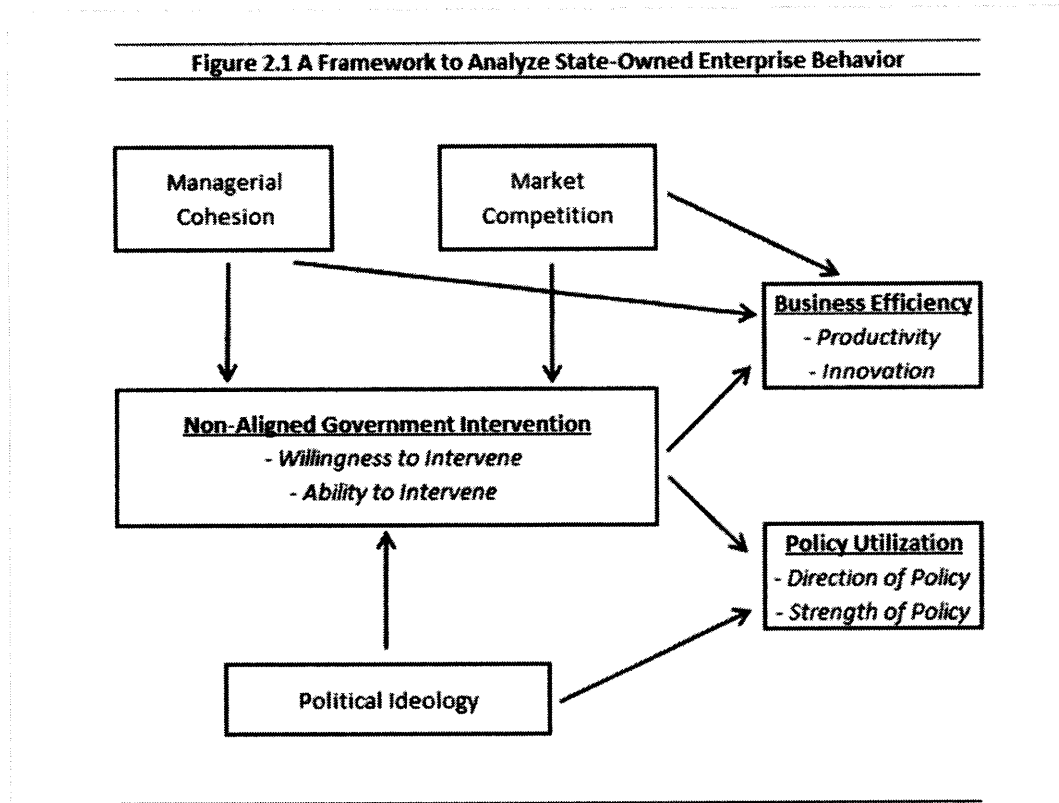
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<sup>37</sup> That is, analyzing the economic sector where the SOE operates and not the economy as a whole.

<sup>38</sup> This term serves to underscore that governments can and occasionally do implement policies that enhance the business efficiency of the firm.

representation of the framework that helps explain the outcomes in the two dependent variables.

[FIGURE 2.1 HERE]



### 3.2 Definition of Business Efficiency

At a fundamental level, business efficiency occurs when the firm is able to accomplish its tasks well. From a static perspective, this may mean either achieving a given level of production with the minimum amount of resources possible or maximizing production given a set amount of inputs. From a dynamic view, it means innovating and

absorbing others' innovation in order to remain at the frontier of production possibilities. For simplicity, these two processes can be conceptualized simply as productivity and innovation.

Productivity and innovation, the components of business efficiency, are easy to conceptualize but difficult to measure. For example, in the industrial organization literature, scholars have followed several different approaches to measure efficiency, and comparisons of labor productivity and total factor productivity (TFP) growth are common approaches to the study of the business efficiency of a firm (La Porta and López-de-Silanes 1999; Bartel and Harrison 2005; Nickell 1996; Ehrlich et al. 1994). In technical terms, TFP growth can be understood as “the ability to produce more output from the same inputs, which can be thought of as a shift in the production function” (Jorgenson, Ho, and Stiroh 2005, p. 292). Its main appeal rests in its construct validity (that is, it measures production given a set level of inputs) and in its widespread use in industrial organization to gauge relative firm performance.

However, there are several shortcomings with TFP approaches. First, errors in measurement are highly problematic (Coelli et al. 2005). Since it is estimated as a residual, it is difficult to disentangle actual efficiency improvements from simple errors in the data. Second, in some instances it is not readily clear how to measure the inputs or outputs for the TFP estimation.<sup>39</sup> In some applications, this may not be a problem; but if the purpose of the analysis is to examine the effect of a particular managerial decision, TFP is unlikely to yield clear results. Third, precise estimation of TFP depends on choosing the correct production function. If this function is unknown by the social

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<sup>39</sup> Inputs are difficult to measure in extractive industries, where the valuation of the input in the reservoir is not clearly defined. Outputs are difficult to determine in the services industries.

scientist, the result may be biased (Coelli et al. 2005). Alternative ways to measure productive efficiency are not necessarily better. The so called “frontier approaches” such as data envelopment analysis and stochastic frontier analysis can also render highly biased estimates in the presence of measurement error.

Another popular way to measure efficiency is by analyzing earnings, although even in this case there are a variety of different variables that can be employed. Thus, sales, net earnings, earnings before interest and taxes, return on assets, and return on equity have all appeared in the literature (Dewenter and Malatesta 2001; Omran 2004). A common concern with earnings estimates is that they are dependent on the fluctuations of the differentials between product prices and factor prices. Moreover, in instances when prices or rates of return are regulated, earnings data may also be a biased measure of efficiency.

The direct measurement of successful innovation activity is also challenging, as innovative activity is difficult to quantify.<sup>40</sup> A popular method in industrial organization studies consists in comparing the number of patents obtained by a firm (Griliches 1995). While not void of information, this approach is susceptible to criticism. First, this method does not assess the relative worth of an innovation. Some patents are given to paradigm-shifting inventions that transform the outlook of an industry, while others simply provide the most marginal of improvements. Second, actually assessing the value of an innovation is a subjective process that demands time and is feasible only for a handful of innovations (Patel and Pavitt 1995). Finally, much innovative activity centers on improving processes rather than products (Stoneman 1995). Process innovation is more

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<sup>40</sup> As opposed to TFP growth, which is an indirect method to measure innovation.

difficult to observe by an outside researcher and its impact on productivity more difficult to quantify.

These concerns with the operationalization and measurement of the two components of business efficiency lead to the following conclusions. First, in an imperfect world with measurement error problems, no single method tracks business efficiency without problems. Second, alternative analytical approaches are necessary in instances where data is not readily available. The use of qualitative information and expert opinion, in some instances, may be a helpful approach to obtain robust results.

In this dissertation, statistics are employed whenever they are available and comparisons are sensible. Otherwise, expert opinion is presented in order to gauge the relative ranking of firms in terms of their business efficiency—even if numerical estimates of their productivity cannot be obtained. In the case of innovations, in-depth interviews with industry observers are the preferred method to determine their impact.

### *3.3 Definition of Policy Utilization*

For analytical purposes, the variable “policy utilization” is disaggregated into two components. First, “the direction of policy” describes what policy mandate is given to the SOE. Governments may pursue a wide range of policy objectives with their SOEs, such as fiscal revenue maximization, industrial promotion, income redistribution (including *de facto* unemployment insurance), the enhancement of geopolitical power, and the allocation of political patronage. These policies may be pursued simultaneously, and they are seldom explicitly stated by governments.<sup>41</sup>

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<sup>41</sup> “It has been possible,” writes Vernon (1981), “for the managers of state-owned enterprises to argue that any disappointing financial performance was the result of costly policies and programmes, mandated by

This study focuses on the explanation of one type of policy that can be pursued by SOEs—industrial policy. Most SOEs are used as instruments of fiscal policy and will be seen as natural tools for political patronage. However, an industrial policy orientation is a defining characteristic. Other policy mandates pursued are acknowledged but no explicit attempt is made to determine why a particular government seeks to implement them.

In the words of Katzenstein (1985), industrial policy refers to measures whose purpose is “to influence industrial competitiveness and through it achieve objectives such as employment, investment, growth, or an improved balance of payments” (p. 25). The idea consists in the view that the state ought to correct market failures and actively pursue economic development by injecting dynamism into industrial activity. As Rodrik (2004) explains, few recommend today the type of industrial policy of the 1950s and 1960s, but the claim that the state can alter the structure of the economy in beneficial ways has hardly disappeared. Actual implementation varies and may include creating backward and forward linkages throughout the economy, promoting industrial growth in underdeveloped regions, safeguarding industrial relations, and creating employment opportunities.

The second component of policy utilization is the “strength of the policy mandate.” Casual observation of government policy suggests that policy preferences exist in a continuum. For example, one government may endorse industrial policy, but only moderately, while another one may prefer a more extreme form. This element of policy utilization addresses that distinction.

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their government masters, which were intended as a contribution to social welfare” (p. 17). In the same vein, Raiffa (1980) writes that “a multiplicity of vague objectives serves to protect the inefficient” (p. 57).

Furthermore, it is important to clarify that the “strength of the policy mandate” is different from the actual strength of the policy implementation observed in practice. The former is the *a priori* preference of the government. The latter, on the other hand, is what is executed by the SOE after other variables have come into play.

The measurement of policy utilization is perhaps more challenging than business efficiency, and it is further obfuscated when the same government pursues apparently conflicting mandates simultaneously. Reliance on in-depth interviews and on secondary sources is necessary to describe the policy utilization of the SOEs, and it is generally justified in relative terms—that is, comparing one subsidiary against another one or one time period against another.

Overall, the following outcomes are used. Direction of policy is described as “industrial policy” or “no industrial policy.” Strength of policy is described as “strong” and “weak.” It should be clear, however, that this typology is a purposeful simplification for ease of analysis. Evidently, the policy dimension is more complicated and the discussion that follows later in the dissertation is mindful of that.

#### *3.4 The Linking Variable: Non-Aligned Government Intervention*

In the analytical framework, the jointly dependent variables “business efficiency” and “policy utilization” are linked by an “intermediate” variable: the degree of non-aligned government intervention (NAGI). The level of NAGI is different from the direction of the policy mandate, since it measures the extent to which the government is actually able to intervene in the internal operations of the firm and not what is the preferred policy orientation of the government in an abstract policy space. A higher level



of NAGI decreases the business efficiency of the state-owned enterprise while increasing the actual strength of its policy utilization.

A given level of NAGI can be understood as the combination of two variables: (i) the willingness of the government to intervene in the internal operations of the company and (ii) its ability to do so. Both of these are necessary, to some degree, for NAGI to occur. If either of these variables is low, then the level of NAGI is also likely to be low.

Non-aligned government intervention can take place in several ways. It can occur through the appointment of politicians to top executive positions in the company. These politicians, for ideological or pragmatic reasons, may adopt government policies with much greater strength than the managers who are brought from within the firm. Additionally, NAGI can occur through regulatory or budgetary decisions made outside the realm of the SOE. Regulations approved by other government agencies or by legislatures can constrain managerial actions even if the top executive positions are filled with career company professionals. Similarly, the government can add strength to a policy orientation depending on the allocation of the company's budget. The degree of intervention can increase when the government has the capacity to provide more resources to certain areas or by refusing to fund projects that are not to the politicians' liking.

Business efficiency is not a direct result of the policy orientation, but rather of the degree of NAGI. A government that pursues industrial policy through its SOE may not be able to affect the firm's productivity if the level of NAGI is low. By contrast, with a high NAGI, business efficiency may suffer even in the absence of industrial policy. In those

instances, fiscal policy or patronage considerations may be hurting the operations of the firm.

Conceptually, the degree of NAGI is a continuous variable. In practice, however, it is easier to measure it qualitatively (low, medium, high) and in comparison to other cases. Some elements of NAGI can be quantified, such as the number of politicians appointed to executive positions. In their book on legislative control of bureaucratic agencies, Huber and Shipan (2002) measure the length of the statute creating a government agency in order to estimate its degree of operational autonomy. A similar approach could be pursued in the case of SOEs, although in a small sample these quantitative approaches may not be able to capture qualitative differences as well as an actual close reading of the statutes or of the impact of politicians at the helm of the companies.

#### **4. The Analytical Framework: Explaining the Behavior of SOEs**

The analytical framework (displayed in Figure 2.1) posits several claims regarding the business efficiency and the policy utilization of the company. First, both are intrinsic elements of the concept of state-owned enterprise behavior. Second, they are both determined jointly in part due to the effect of the degree of non-aligned government intervention in the company. Third, business efficiency and policy utilization are also affected by other explanatory variables. This section discusses the relationship among the variables and explains the theoretical underpinnings of the causal mechanisms at stake.

The framework emphasizes six “independent” or explanatory variables. Of these, three are of primary importance and three are “auxiliary” or of secondary importance.

The primary variables are the level of market competition in the business environment of the SOE, the level of cohesion among the managers of the company, and the political ideology of the government. The auxiliary variables are whether or not the government faces a context of severe fiscal jeopardy, the presence of persons or institutions in the political system that can effectively alter the policy mandate coming from the government (i.e., veto players), and the skill of individual managers to take advantage of structural opportunities and constraints.

For heuristic purposes, the framework is presented as a system of equations (without making assumptions regarding the functional specification of each). The two jointly dependent variables are the following:

$$\text{Business Efficiency} = f(\text{Competition, Managerial Ability and Cohesion, NAGI}) + \varepsilon \quad (1)$$

$$\text{Policy Utilization} = f(\text{Ideology, NAGI}) + \varepsilon \quad (2)$$

As explained above, NAGI can be disaggregated into two components:

$$\text{NAGI} = \text{Willingness to Intervene} + \text{Ability to Intervene} \quad (3)$$

where,

$$\text{Willingness to Intervene} = f(\text{Ideology, Competition, State Jeopardy}) + \varepsilon \quad (4)$$

$$\text{Ability to Intervene} = f(\text{Managerial Cohesion, Veto Players}) + \varepsilon \quad (5)$$

Put in words, the system of equations states the following. Business efficiency is a function of the degree of market competition, managerial ability, the cohesion of the managers, and the degree of non-aligned government intervention or NAGI. The first

three variables enter with a positive sign—that is, they increase business efficiency. The level of NAGI, however, has an expected negative sign. In the case of policy utilization, the ideology of the government has a positive sign—meaning the desire to use industrial policy—as well as the level of NAGI, which also increases the actual policy utilization of the company.

In the case of NAGI, the willingness to intervene is a function of the desired strength of policy utilization, the degree of market competition, and the existence of fiscal jeopardy. Strength enters the equation with a positive sign, while competition and fiscal jeopardy decrease the government’s willingness to intervene inside the company. The government’s ability to intervene, on the other hand, is constrained by the level of managerial cohesion and the number and effectiveness of veto players in the political system.

The outcomes of non-aligned government intervention can be described as follows. For a fixed level of government ideology, fiscal jeopardy, and veto players, the level of distortionary government intervention is low if market competition and managerial cohesion are low and it is high if both explanatory variables are high. If cohesion is high but competition is low or viceversa, NAGI will be medium. Table 2.1 portrays this relationship.

[TABLE 2.1 HERE]

Table 2.1 Setting the Level of Non-Aligned Intervention			
		Market Competition	
		Low	High
Managerial Cohesion	Low	High	Medium
	High	Medium	Low

Table 2.2 describes the relationship, in terms of business efficiency, between market competition and a managerial cohesion in a public enterprise. Holding other variables constant, low levels of competition and cohesion greatly increase the probability of inefficient behavior. In these instances, the operation of a state-owned enterprise is more similar to that of a government agency. Conversely, high levels lead to efficiency in the business performance of the firm, which behaves more like a commercial enterprise. Low market competition with high specialization and high market competition with low specialization are likely to lead to moderate levels of efficiency, as the absence of signals of performance or capacity and solidarity prevents the firm from reaching its full potential. In these “mixed” cases, market competition provides a stimulus for an upward trend, while cohesion without competition leads to a downward trajectory. Without competition, the managers lack incentives to modernize the company as quickly as their counterparts in competitive environments.

[TABLE 2.2 HERE]

**Table 2.2 Typology of SOE Business Efficiency**

		Market Competition	
		Low	High
Managerial Cohesion	Low	Inefficient (Behaves like Government Agency)	Moderate Efficiency, trending upward
	High	Moderate Efficiency, trending downward	Efficient (Behaves like Commercial Enterprise)

Holding market competition and managerial cohesion constant, the effect of the secondary variables—veto players and state jeopardy—on the level of NAGI can be described by the relationship in Table 2.3. These differences are “second-order effects,” small compared to the effect of the primary variables. Yet, they allow for an understanding of SOE behavior in a more nuanced manner. These variables do not affect business efficiency independently from their effect on the level of NAGI—and thus they are excluded from those equations.

[TABLE 2.3 HERE]

The following paragraphs describe in greater detail the definition and causal mechanisms of the explanatory variables. In each case, a brief review of the literature is combined with an account of the expected effect on SOE behavior. The chapter concludes with a brief application of how the framework affects the subsidiaries of Pemex, although the more detailed explanation is presented in Chapters 4 through 6.

**Table 2.3 Setting the Level of Non-Aligned Intervention**

		Veto Points	
		Low	High
State Jeopardy	Low	High	Medium
	High	Medium	Low

**5. Theoretical Underpinnings of the Explanatory Framework**

*5.1 The Role of Market Competition*

Competition exists as long as the entry of rival companies in the market is not legally forbidden. If a monopoly is granted by statute to a state-owned enterprise, by definition the level of market competition is zero. This has been historically the situation of PEP and Pemex-Refining. Yet, when competition does exist, there can be different degrees. In this dissertation, at least three additional scenarios are identified. If entry of rivals is very difficult due to high capital costs or risks to investment, competition is low. This has been the context of Pemex-Gas since 1995. If several players exist in the market, yet demand for their goods is so high that, in practice, companies do not face any difficulty to sell their products, competition is low as well. This has been the market environment of PMI at some points in its history. Finally, if several players exist in the market and the level of demand is such that a significant effort is required to find and maintain customers, then market competition is high. The only subsidiary of Pemex that has been in this situation has been PMI during some periods.

Since market competition plays a major role in this study, it is worth defining the concept in greater detail. In the words of Paul J. McNulty, a scholar of the meaning of competition in the writings of Adam Smith and other classical economists, “the essence of [competitive] behavior [is] the active effort to undersell one’s rival in the market” (1967). Put differently, under market competition, supply chains are fixed and in order to sell an additional unit, one firm must displace another one’s output by providing better quality or a lower price. Moreover, competition demands the effort to undersell—if no such behavior exists, even in the presence of multiple firms, then competitive forces are low. Finally, competition is not restricted to the product market, but can also occur in the capital and labor markets.

Several scholars have argued that state firms can be as efficient as private ones when they operate in a competitive product market (Caves and Christensen 1980; Teeple and Glyer 1987; Bartel and Harrison 2005).<sup>42</sup> Moreover, state enterprise efficiency is improved, according to Gupta (2005), after the emission of shares in a stock market. Besides raising capital, the so called “partial privatization” means that the company is participating in a competitive capital market where investors can buy and sell shares based on performance evaluations (or, in the jargon of financial economics, the capital market is “monitoring” the company).<sup>43</sup>

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<sup>42</sup> Other authors disagree, claiming that SOEs are always less efficient, even under market competition (Boardman and Vining 1989; Ehrlich et al. 1994; Vining and Boardman 1992). Ramamurti,(1987b), in his study of Brazilian and Indian high technology SOEs, argues that the more protected companies were the ones that managed to develop better. It is feasible that an “infant-industry” logic could apply for public enterprises in competitive sectors, since they would otherwise have greater difficulty surviving upon their creation.

<sup>43</sup> The argument is that, unlike private shareholders, the ultimate owners of an SOE—the taxpayers—cannot sell their stake in the company if it is underperforming. The consequence is a lack of interest in monitoring the state-owned enterprise. This concept is analogous to that of the role of “exit” in Hirschman’s (1970) classic work. Yet, others disagree with this interpretation, suggesting that participation in the stock market may push the management towards short-sighted activities to maximize the value of the



However, studies of privatization have not delved into the causal mechanisms that could propel an SOE in a competitive market to behave more efficiently. The level of competition in the business environment influences SOE behavior to the extent that it provides signals of performance to measure if goals are being met. Given the reluctance of public enterprises to fire workers and the fact that politicians have multiple concerns—of which SOE behavior is only a part—the absence of signals of performance provides incentives not to pay attention to the optimization of SOE behavior.<sup>44</sup>

From the perspective of the managers of the firm, the signals of performance provide “*pressures to change*,” since the company must adjust to changing industry conditions and keep their rivals at bay. Furthermore, competition also diminishes non-aligned government intervention due to the risk posed by destabilizing a company that may lose money rapidly if it is mismanaged, if its investment budget is restricted, or if the regulatory framework prevents it from making swift entrepreneurial decisions. Thus, as it lowers the level of NAGI, market competition provides the SOE with the “*means to change*.”

How exactly does competition provide signals of performance? First and most clearly, competition gives customers an “exit” option (Hirschman 1970). If the public enterprise provides lower quality or higher prices than the alternative firms—or if its commercialization strategy is deficient—its market share will decrease and financial results will suffer. If the gap between the public and the private firms is large and

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shares, sacrificing valuable investments that have returns farther into the future (Stein 1989)—precisely a potential advantage of state ownership in the first place (Laffont and Tirole 1993).

<sup>44</sup> The literature on bureaucratic politics has focused on the effects of asymmetric information on the political control of government agencies (e.g., Bendor 1988). I argue that absent signals of performance, the state-owned enterprise also lacks information on its own operations. Rather than a context of asymmetric information, the problem is one of lack of information by all actors.

customers can exit quickly enough, losses can be severe, hurting fiscal revenues and creating a political embarrassment for the ruling coalition. Similar causal mechanisms occur under competition in the capital markets—where investors punish poor behavior—and in the labor market—where qualified talent exits in search of higher salaries or better working conditions.

Second, once the public enterprise reaches an “equilibrium” market share under competitive conditions, the presence of rival firms provides benchmarks to assess inefficiencies in SOE operations. Arguably the most important of these benchmarks is the presence of a transparent reference price provided by a market average or by a representative product. A monopoly lacks the mechanism of price discovery afforded by market competition, and therefore politicians lack a way to measure the level of technical and commercial performance of the company and to estimate whether the policy utilization gains merit any losses in business efficiency. The presence of private sector companies provides this information and may compel politicians to act in response.

Third, the presence of rival firms provides examples for the public enterprise on how to conduct its operations. This signal, which does not necessarily originate due to a market exchange, can lead to a process labeled by sociologists as “isomorphism” (DiMaggio and Powell 1983; Mizuchi and Fein 1999). As the name implies, isomorphism refers to a phenomenon where organizations—e.g., firms in the same industry—come to resemble each other. When the SOE is exposed to more technologically advanced or more prestigious companies, it may choose to adopt similar practices out of a desire of company managers to “fit in” with colleagues of their

profession. Similarly, when faced with uncertainty in a given situation, managers may be more likely to choose a path that has already been tested by another company.

The signals from market competition are more clear in those industrial activities where performance can be measured rapidly—i.e., with short feedback loops—than in those where results become visible after several years—i.e., with long feedback loops. The former allow the managers and their political superiors to identify poor performance and respond accordingly. Marketing strategies usually have short loops, unless clients are bound by long-term contracts. Heavy capital investments, on the other hand, take several years to materialize and even longer for the political economy or business impact to be assessed.

Industrial activities with long feedback loops increase the odds of mismanagement and slack, given that the culprit is less likely to be identified. Even if he or she remains in the company, the politicians who were originally interested in the project are likely to have moved on to other government positions or to have been voted out of office. Likewise, when performance feedback loops are long, managers facing a dysfunctional company have an incentive to steer the company towards electoral objectives in order to earn the praise of their superiors and either keep their jobs or move up in the bureaucratic ladder. After all, results from good management would not only take too long to materialize, but they may never materialize at all.<sup>45</sup>

This dissertation measures market competition in a different way from many industrial organization studies. This literature often employs a “concentration ratio” that accounts for the number of firms that control the majority of the industry’s output or an

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<sup>45</sup> A question may arise regarding what constitutes a short, as opposed to a long, feedback loop. The distinction is certainly qualitative, but a good rule-of-thumb is the average time that supervising managers or politicians last in the same office.

indicator known as the Hirschman-Herfindahl Index (HHI) (Tirole 1988). The HHI is also estimated based on the market shares of the firms in the industry. These approaches are not adopted in the current setting because in many cases such level of detail is not necessary (in all cases except for PMI) and because they are less helpful to explain the nature of the international oil market. In the mid-1980s, for example, competition for a firm like Pemex was rising at the time when the market share of its dominant player, Saudi Arabia, was also rising. For the statistical analysis presented in chapter 5, the level of competition is approximated using a measure of rising world demand for petroleum. For all other instances, a qualitative assessment of the level of competition suffices.

### *5.2 The Role of Managerial Cohesion*

Cohesion is an element of the culture of the organization that describes the strength of the bonds among the different members of the managerial cadre. These bonds are important since they increase the group's esprit-de-corps and improve internal mechanisms of coordination towards achieving a common goal.<sup>46</sup> In a way, cohesion allows for the existence of an identifiable organizational "personality" and, in the words of James Q. Wilson (1989), "a sense of mission."<sup>47</sup> In the case of state-owned enterprises, cohesion has a direct effect on business efficiency and an indirect effect on policy utilization (by reducing the "porosity" of the company to non-aligned government intervention).

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<sup>46</sup> In more technical terms, cohesion helps overcome problems of collective action within a group of the sort that Olson (1965) describes.

<sup>47</sup> "When an organization has a culture that is widely shared and warmly endorsed by operators and managers alike, we say the organization has a sense of mission" (Wilson 1989, p. 95).

Cohesion primarily results from the accumulation of shared experiences among the membership. These experiences increase the similarities of the insiders and increase the differences with outsiders, creating bonds of solidarity within the organization.<sup>48</sup> If the intensity of these experiences is strong, the bonds will last longer and be more resistant to outside pressures. Specialized training and socialization in the workplace are common mechanisms for the creation of shared experiences.

Specialization develops a professional identity—with its common language, rituals, symbols, and normative guidelines (Parsons 1939). As Friedson (1988) points out, the medical profession is paradigmatic in this regard—in order to be admitted into the guild, individuals must undergo years of training in medical school (often using the same books), swear to abide by the Hippocratic Oath, take excruciating exams, and complete their residency training—a rite of passage. In consequence, physicians develop a connection with others in the profession and acquire a particular value system (Wynia et al. 1999).

Beyond the links created by a common training, cohesion is enhanced by the patterns of socialization.<sup>49</sup> Bonds are particularly strong among individuals who spend considerable amounts of time together outside of work or who participate in high stakes activities where success depends on everyone's contribution. Gouldner (1954), for example, recounts how dangerous working conditions lead coal miners to develop high levels of cohesion. Similarly, Wilson (1989) attributes the high cohesion among Japanese

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<sup>48</sup> The idea that solidarity can result from shared characteristics of the members of a group, and that this in turn leads to greater cohesion comes at least since Durkheim's concept of "mechanical solidarity," which appeared in his book *The Division of Labor in Society* (published in 1893). In the book, however, Durkheim dwells on the concept of "organic solidarity," which refers to the bonds of interdependence among different groups that allow a society to function.

<sup>49</sup> Socialization often also takes place while individuals undergo specialized training, but that is not necessarily the case.

government workers in part to their custom of regularly going to bars with their colleagues at the end of the workday.

Arguably the officer corps in the military epitomizes both drivers of cohesion—specialized training and socialization amidst high risk activities. In *The Professional Soldier*, Janowitz (1960) describes how military culture is acquired and sustained by the officers' prolonged training and adoption of a body of ethics. As Long (2009) emphasizes, the military's monopoly over specialized training for officers strengthens the development of cohesion—all members adopt the same values and combat doctrine in school in a process of "homogenization." In "The New Professionalism of Internal Warfare and Military Role Expansion," Stepan (1976) explains how Brazilian military members who fought together in World War II developed loyalty towards each other and developed a similar viewpoint of the military's role in political life. Their organizational culture would then be propagated with the creation of two specialized schools that would become the main doctrinal transmission mechanism for all future commanders.

The examples above suggest that managerial cohesion in a state-owned enterprise will increase if one profession is dominant in the organization. Moreover, cohesion will be higher if this dominant profession is characterized by intense bonds of solidarity among the members. The question that remains to be explained in greater detail is how exactly managerial cohesion affects the behavior of a government-controlled organization.

Efficiency can be enhanced, for example, due to the higher esprit-de-corps. Referring to the "sense of mission" that high cohesion provides, Wilson (1989) argues that "[it] is the chief way by which managers overcome the problem of shirking in

organizations that (like most government bureaus) cannot make the money wages of operators directly dependent on the operators' observed contribution to attaining the goals of the organization" (p. 95). Wilson uses the example of the U.S. Army Corps of Engineers to underscore the importance of high morale on employee performance. "The corps advertises itself as a prestige organization," says Wilson, "with exacting standards and difficult duties" (p. 99). Those who are admitted into the Corps of Engineers understand their work as a privilege as much as a responsibility, and thus seek to live up to the reputation of their organization.

Similarly, high cohesion improves the internal mechanisms of coordination. Following Arrow's (1964) classic analysis, coordination in a large organization depends on the existence of "operating rules" and "enforcement rules." The former "instruct the members of the organization how to act," while the latter "persuade or compel them to act in accordance with the operating rules" (p. 398). Managerial cohesion, with its shared specialized knowledge and code of conduct, increases the likelihood that both sets of rules will exist.

Enforcement rules require "the detection and the punishment of deviations from the operating rules" (p. 398), and they are particularly important in government-controlled organizations. In these instances, as mentioned earlier, the dismissal of workers who underperform is rare and good behavior cannot always be measured by increased profits (in the case that price controls or subsidies exist). Yet, if top managers are knowledgeable regarding the operating rules of the profession, transgressions will be detected more easily. Moreover, punishment often times at most entails shunning a person from the profession. For this punishment to have any meaning, the punished

person must also be a member of the profession (otherwise he or she might care little about the consequences), the profession must be tight enough that violations to the code of conduct are understood as attacks on the collective good, and the banishment must represent a significant social or financial loss.

Kaufman's (1960) study on the U.S. Forest Service illustrates the effect of cohesion on esprit-de-corps and coordination within a government agency. How is it, Kaufman asks, that a group of forest rangers, scattered throughout the country and with minimal supervision, carry out the mission of the organization so effectively? The expectation, given these "centrifugal" forces, would be for forest rangers to shirk at their jobs and be captured by the interests of the local populations rather than respond to the directives coming from the national headquarters. Kaufman's analysis provides the following explanations. First, the U.S. Forest Service has instituted a recruiting system that admits only those individuals most motivated to a career in forestry administration. These members feel especially proud to be part of the agency and are willing to make personal sacrifices in order to fulfill their central tasks. Second, the Forest Service provides a comprehensive system of socialization in the symbols and traditions of the organization—training courses, uniforms, high levels of mobility—so that the only thing that is constant in workers' lives is their sense of belonging to the bureaucratic agency. The result is loyalty, high technical ability, and discipline.

The organizational personality and sense of mission afforded by a cohesive staff is particularly relevant for government organizations given the tension between the policy mandates issued by the political authorities and the technical interests of the career public servants. Cohesive government agencies have been known to "resist" orders from



politicians that run counter to the accepted best interests of the profession—whatever these may be at particular points in time. Aberbach and Rockman (1976), for instance, documented the reluctance of career bureaucrats in social ministries of the United States to implement Richard Nixon’s conservative policies in the late 1960s. Similarly, in the United Kingdom, the pro-Keynesian orientation of the bureaucracy may have slowed down the implementation of the more conservative economic policies advocated by Prime Minister Margaret Thatcher after her election in 1979 (Wilson 1989).<sup>50</sup>

In these instances, the staff may implicitly or explicitly coordinate to follow established professional norms. Katzmann (1980), for example, analyzed the behavior of the U.S. Federal Trade Commission (FTC) and found noticeable behavioral differences depending on whether lawyers or economists held the key operational posts. The FTC is charged with preventing unfair competitive practices by firms, but it has significant discretion deciding what constitutes an unfair practice. Lawyers, writes Katzmann, are prosecution oriented and choose to pursue instances of clear violation of the law. Economists, on the other hand, are welfare oriented. To them, cases of clear misconduct are of little interest unless consumer welfare is affected in a substantive way. Depending on whether lawyers or economists dominate positions that decide which cases are pursued, the FTC operates differently.

Behavioral differences may arise even with people from the same profession, since socialization and training can influence the way in which employees approach similar problems. Long (2009) shows that the practices of the different services of the

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<sup>50</sup> Yet, scholars of U.S. bureaucratic politics have argued that opportunities for autonomous managerial behavior are, in the end, limited. The powers to appoint and remove agency chiefs and to allocate the budget help the politicians retain control over the mandate (Calvert, McCubbins, and Weingast 1989; Wood and Waterman 1991; Daniel P. Carpenter 1996; Wildavsky 1964; Fenno 1966).

U.S. military, for example, can be traced back to the first war that each service fought. The “path dependence” of the lessons learned from the first wars persists even in light of changes in written doctrine. Another instance of these differences within members of the same group arose among employees of the Venezuelan state-owned oil company, *Petróleos de Venezuela* (PDVSA) (Villalba 1983). Prior to the nationalization of 1976, the two main foreign companies that operated in the country were Exxon and Shell. Among industry insiders, Exxon’s corporate culture is known for the tight control of the headquarters over the operations of its international offices. Shell, on the other hand, has a decentralized decision-making system. When PDVSA was founded, top executives soon realized that former Shell employees were experienced in managerial activities—such as planning. Former Exxon workers, while very precise in their technical work, lacked management experience.<sup>51</sup>

In short, managerial cohesion improves the business efficiency of a state-owned enterprise due to its concomitant esprit-de-corps and coordination mechanisms—namely, the introduction of clear operating and enforcement rules. Additionally, managerial cohesion has an indirect effect on the policy utilization of the SOE via its role in diminishing the non-aligned government intervention. Cohesive managers are more likely to possess both a professional identity that is at odds with most policy mandates and a capability to exercise collective action and block the implementation of those mandates. Thus, cohesive managers can neglect or even sabotage a professional politician appointed to an executive position and delay adoption of certain policies and attenuate their scope.

The proper way to measure the degree of managerial cohesion has been debated in the business literature for some time. In an influential article, Hambrick and Mason

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<sup>51</sup> Author’s interview with Ramón Espinasa, former chief economist of PDVSA, 19 May 2009.

(1984) suggest the use of demographic variables to examine the link between managerial characteristics and firm outcomes.<sup>52</sup> These authors acknowledge that these proxies are noisy, but emphasize that variables such as age or educational background could be used to analyze statistically some of the anecdotal accounts on managerial behavior.

This dissertation complements the qualitative evidence on managerial cohesion, obtained from the high number of in-depth interviews, with archival information that provides the educational background of all directors and deputy directors of each subsidiary company of Pemex from 1992 to 2010. More specifically, the analysis shows the extent to which top managers have had the same professional training at different points in time. Combined with more detailed information on the patterns of socialization and promotion of each of these professions, managerial cohesion is then measured as “low” or “high.”

### *5.3 The Role of Political Ideology*

The direction and strength of the policy mandates of state-owned enterprises respond to the particular preferences of governments. These preferences can result from a variety of factors, including economic reasoning, the pressure of interest groups, and political calculations. Furthermore, governments are seldom monolithic entities—generally they consist in a series of groups that form a ruling coalition.<sup>53</sup> Policy-making within ruling coalitions is seldom a straightforward process, even in authoritarian regimes

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<sup>52</sup> See Carpenter, et al. (2004) for a review of this so called “upper echelons” research agenda.

<sup>53</sup> The use of “ruling coalitions” as units of analysis is widespread in comparative political economy (e.g., Katzenstein 1978; Frieden 1992; Mares 1985; Crystal 1989). The ruling coalition is composed of those groups that provide legitimacy and sustain the highest decision-maker in the country, regardless of whether the regime is democratic or autocratic. The term is helpful to point out that governing elites are seldom homogeneous.

(Schneider 1991). Still, arguably the strongest factor in determining the *a priori* government preferences is the political ideology of the leaders of the ruling coalition.<sup>54</sup>

What is the relationship between political ideology and the policy utilization of state-owned enterprises? At least with regards to industrial policy, the choice often closely depends on the government's positioning along the Left-Right ideological spectrum. If the ruling coalition is located on the ideological left, the direction of the mandate will usually be towards industrial policy. On the contrary, if the coalition is placed on the right, industrial policy will be avoided.

The distinction between the Left and the Right, while imperfect, has withstood the test of time as a reasonable way to aggregate a set of policies espoused by a government or a political party (e.g., Bradley et al. 2003; Gabel and John D. Huber 2000; McDonald, Mendes, and Kim 2007; Benoit and Laver 2007). It is true that some aspects of the Left-Right distinction change over time. Nevertheless, as Bobbio and Cameron (1997) argue:

The terms 'left' and 'right' continue to be very much part of political terminology, in spite of all the arguments from various quarters which are used to challenge it... It is not surprising that a dyad, or dichotomy, is the most common way of representing the political world, which is, by its very nature, antagonistic and divided into opposing sides. (pp. 29-31.)

Despite the heterogeneity across time and across places and the usefulness of the terms to describe all individual politicians or parties, the Left and the Right certainly

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<sup>54</sup> The academic literature has discussed the impact of economic interests and ideology on policy-making at length. A reference on the role played by ideological considerations is Blythe (2002).

summarize identifiable policy packages (John D. Huber 1989; Benoit and Laver 2007; Klingemann et al. 2006).<sup>55</sup> On economic policy, the Left is generally concerned with social justice and income redistribution (Castañeda 1993; Cleary 2006; Eley 2002). On domestic affairs, it emphasizes political rights over internal security considerations. It is usually associated with labor unions and intellectuals, and its popular support is concentrated in urban areas. Conversely, the Right is associated with the implementation of free-market policies. It views attempts to redress social injustice as causing more harm than good, and it criticizes industrial policy for “misallocating” economic resources. Business organizations and rural areas provide most of its popular support.

With regards to state-owned enterprises, the leftist ruling coalitions seek income redistribution via, among other things, employment protection and income transfers to underdeveloped areas. Additionally, they prefer to utilize SOEs as generators of forward and backward linkages throughout the economy, and they are more willing to subsidize the training of domestic technical and managerial cadres. On the other hand, the Right prefers to use state-owned enterprises simply as an instrument of fiscal policy—thus being able to keep lower taxes on the private sector of the economy.

In democratic regimes, the battle for the mandate takes place during elections. In authoritarian regimes and in democracies where the ruling party comprises a broad-based coalition from both the left and the right, the struggle takes place inside the bureaucracy. As Ben Ross Schneider (1991) points out in his study of the bureaucracy in authoritarian Brazil, the “politics within the state” can be quite important for policy change even when electoral contestation is absent.

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<sup>55</sup> For a dissent, see, for example, Giddens (1994).

How to determine the ideology of a ruling coalition? This is not always a clear-cut issue, and it is complicated by the experience of several countries in the 1990s, when politicians elected on leftist platforms changed course and adopted neoliberal economic policies once they took office. The case of Argentina under the Peronist (i.e., traditionally leftist) government of Carlos Saúl Menem (1989-1999) is a paradigmatic case, but it is not the only one (Stokes 2001). With this consideration in mind, it is still usually possible to approximate the *a priori* preferences of a government based on the manifesto of its political party and the educational and professional background of the key cabinet members.

The strength of the policy utilization follows from the same positioning of the government along the ideological spectrum. Governments with a strong leftist orientation will pursue a higher level of utilization for industrial policy. Moderate leftist ruling coalitions will adopt instead more subtle means.

#### *5.4 Auxiliary Variables*

The auxiliary variables have a secondary, more limited impact on the behavior of state-owned enterprises. Yet, they can be very helpful to distinguish differences in performance among companies without discernible differences along the primary variables. Below, three auxiliary variables are discussed: state jeopardy, veto players, and managerial ability. The first decreases the government's willingness to intervene in the operations of a company, the second affects its ability to do so, and the third, as expected, increases the business efficiency of the firm.

#### 5.4.1 State Jeopardy

Regardless of the desired mandate of the ruling coalition, certain circumstances lead to temporary shifts in its policy positioning.<sup>56</sup> Threats to the autonomy of the state are one such instance. State autonomy is simply defined as the ability of the state to “formulate and implement its preferences” (Krasner 1984, p. 224).<sup>57</sup>

One kind of threat to state autonomy is easily identifiable and leads to fairly predictable changes in policy preferences: fiscal jeopardy. Fiscal jeopardy does not necessarily refer to those cases where the government is highly dependent on SOE revenues, since it is conceivable that these countries can enjoy high surpluses. Instead, fiscal jeopardy means that the government is close to defaulting on its debt—or, at the very least, foresees a serious disruption in the collection of its income. In these circumstances, the usual battle between leftists and rightists is likely to be suspended in order to address the need to raise government revenues, and even leftist ruling coalitions are expected to diminish their support of industrial policy given the need to economize on resources. Similarly, the willingness to implement non-aligned government intervention should decrease.

#### 5.4.2 Veto Players

Veto players, in the language of Tsebelis (2002, 1995), are individual or collective agents that must be in agreement before policy change is implemented. The

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<sup>56</sup> The interaction of institutional and external constraints with ideology or interests in policy-making has been discussed for the case of monetary policy, among others, by Franzese (2002).

<sup>57</sup> A debate exists in comparative politics regarding the agency of the state vis-à-vis other social actors. In the well-known book *Bringing the State Back In*, Skocpol, Evans, and Rueschmeyer (1985) asserted that the state apparatus can develop interests of its own independent from societal actors and should thus be treated as an agent in its own right. While acknowledging the importance of this debate, for the present purposes all that matters is that the national government has autonomy from foreign actors to implement its own policy.

underlying causal mechanism of veto player theory is straightforward. In the absence of veto players, governments can generally choose policy fairly unobstructed. Their presence, on the other hand, leads actual policy to differ from the desired mandate. In other words, veto players hinder the government's ability to interfere in the operations of the company.

Tsebelis (1995) identifies two kinds of veto players, institutional and partisan, although he acknowledges that other types may exist. Examples of institutional veto players are bicameralism and federalism. Two legislative chambers decrease the potential for policy change, especially when these represent somewhat different constituencies or when incentives for party discipline are weaker.<sup>58</sup> Federalism generally increases the number of players that must be in agreement before constitutional changes are enacted, again restricting policy change opportunities (Wibbels 2005; Weingast 1995). By contrast, partisan veto players are simply the parties that make up a government coalition in parliamentary regimes. Under certain assumptions,<sup>59</sup> Tsebelis shows that the potential for policy change decreases (or at least stays the same) if the number of veto players increases or if the policy distance—which he labels congruence—among these players increases.<sup>60</sup> Additionally, he explains that, for collective veto players (i.e., groups), greater cohesion in policy preferences decreases the possibility of policy change.

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<sup>58</sup> This is the case, for example, in federal systems where the upper chamber is designed to represent “states’ rights,” regardless of the size of their population. Similarly, in parliamentary regimes party discipline has been shown to be stronger than in presidential regimes, given that the stability of the governing coalition depends, to a large extent, on party discipline.

<sup>59</sup> Tsebelis assumes that veto players have “circular indifference curves” (i.e., that veto players are indifferent among all the policies lying within a circle).

<sup>60</sup> Cox and McCubbins (2001) introduce the term “effective number of vetoes” in reference to the fact that not all veto players will have different preferences on an issue. In their argument, these vetoes shape public policy, by influencing the “decisiveness” and the “resoluteness” of the government. With a high number of vetoes, changing policy is more difficult, but once policy has been set, the government is fairly steadfast in



Empirical work has shown the role of veto players in obstructing legislation (Immergut 1990; Tsebelis 1999) or in mitigating economic policy swings (Hallerberg and Basinger 1998; Franzese 2002; Swank 2002; Kastner and Rector 2003; Gustavo Flores-Macías 2009). In these studies, following Tsebelis's (1995) initial contribution, the role of political parties and governmental institutions is central. For state-owned enterprises, however, one additional veto players play a role: the level of operational decentralization of the company.

Decentralization has been shown to increase the opportunities to moderate the mandate of the ruling coalition.<sup>61</sup> Whenever a holding company separates a government ministry from operational subsidiaries, it introduces a "buffer" that enhances the autonomy of the public managers vis-à-vis the politicians (Treat 1983). For example, the companies of Brazil's Eletrobras have thus historically enjoyed relatively high levels of autonomy from the government's desired mandate. Similarly, prior to a reform in 1998, the operating firms of the Venezuelan state-owned oil company, PDVSA, also benefitted from the additional institutional separation from the government.<sup>62</sup>

Table 2.3 presents a list of the different veto players that affect SOE policy decision-making. In some contexts, some may not play a role. In general, however, as the number of veto players increases and the distance between their policy positions widens, the ruling coalition will have a more difficult time implementing its desired mandate. In the case of legislation related to the SOE, the statutes are likely to be "locked in." For

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its implementation. The logic of my argument is slightly different, since I argue that veto points, rather than preventing policy change, move policy towards the center of the spectrum of political preferences.

<sup>61</sup> This argument, in the context of regulatory agencies in the United States, has been made by Whitford (2002), who showed how decentralization in the Nuclear Regulatory Commission insulated it from the mandate set by the federal government during the Reagan administration. See also Carpenter (1996).

<sup>62</sup> Author's interview with Luis Pacheco, former PDVSA director of planning, 1 July 2009.

those policies that are renegotiated on a yearly basis—such as the budget, for example—number of players and distance of policy positions is likely to moderate actual policies. In the language of institutionalist approaches, the veto players will then have a “centripetal” effect.<sup>63</sup>

[TABLE 2.3 HERE]

Implicit in the variables of Table 2.3 is the role of democratization on state-owned enterprise policy mandates. While authoritarian regimes may also have some veto players, democratic politics institutionalizes policy contestation and provides clear rules for political actors to delay or block policy implementation. The expectation, then, is that democratization will make legislative change more difficult and will moderate those policies that are enacted annually.

#### *5.4.3 Managerial Ability*

For the most part, this study presents an account of state-owned enterprise behavior that emphasizes the impact of structural constraints—the market and political institutions, the professional identity of the managers, etc. It would be disingenuous to believe, however, that managerial talent does not play a role in effecting outcomes.

Variables such as high market competition and high managerial cohesion increase the chances for a state-owned enterprise to operate efficiently, but success is never

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<sup>63</sup> Centripetal forces have generally been studied regarding the role of electoral rules on subsequent policy outcomes (Cox 1990, 1997; Magar, Rosenblum, and Samuels 1998). In the case of state-owned enterprises, the centripetal forces arise from the institutional arrangement of the company or the cohesion and solidarity of the personnel.

guaranteed. Just like private companies in competitive environments often times go bankrupt, poorly managed SOEs can also fail or do much better than expected with the right CEO.

**Table 2.3 Veto Players in SOE Policy Utilization**

<i>Political System</i>	<i>Veto Mechanism</i>
Separation of powers	Presidentialist regimes may encounter greater difficulty in implementing policies if the president's party does not control the legislature; similarly, presidents with strong veto power may block congressional initiatives. In some instances, independent judiciaries may strike down SOE policy deemed to run contrary to a given statute (e.g., Tsebelis 2002).
Bicameralism	One chamber may effectively block the policy initiatives of the other (e.g., Tsebelis 2002).
Federalism	In some federal systems, the agreement of a majority of provincial governments is required before a change to constitutional provision is made (e.g., Wibbels 2005).
Political parties	Minority parties in parliamentary systems may veto particular policies as a condition to remain as a member of the coalition government (e.g., Tsebelis 1999).
<i>State-Owned Enterprise</i>	<i>Veto Mechanism</i>
Decentralization	Each decision-making layer adds a "buffer" between policy instructions and operational decisions (e.g., Trebat 1983; Carpenter 1996; Whitford 2002).

Good leaders, on the other hand, will recognize how to steer the public enterprise through the intricacies of both the government bureaucracy and the market environment. They can take advantage of positive structural conditions and circumvent or change the

negative ones. They can develop cohesiveness with a team of managers even if they do not share the same professional background, and they can learn to negotiate with politicians. Accordingly, this study pays attention to managerial agency, although underscoring the context in which decisions are made.

## **6. Application of the Framework: A Cross-Sectional Approach**

Chapter 4, 5, and 6 present detailed case studies of each subsidiary of Pemex. The historical approach employed allows tracing changes in the explanatory variables over time and discerning how they have affected the business efficiency and policy utilization. Accordingly, each account constitutes a rich longitudinal analysis of the effect of changes in the values of key variables with regards both to the same subsidiary at earlier points in time and to other subsidiaries. In order to explain how conclusions are drawn, each chapter begins with a brief overview of the activities of the different subsidiaries and the justification for the measurement of the different variables.

This section illustrates the application of the analytical framework by comparing the subsidiary companies cross-sectionally at one particular point in time. The year chosen is 2008, when most of the fieldwork for this study was conducted, although any time period since 1995 would have rendered approximately the same results. Values to the variables are assigned in relation to the other subsidiaries, an approach that differs from segments of the subsequent chapters that seek to make comparisons with international counterparts.

### *6.1 The Dependent Variables*

The business efficiency of the subsidiaries was measured by conducting a survey of Mexican oil industry experts—including former Pemex CEOs—between April and August of 2008. Respondents were asked the following question: “How would you rank the efficiency of the subsidiary companies of Pemex?” Table 2.4 presents the results, which show an overwhelming consensus.<sup>64</sup> All those respondents who ranked PMI consider it to be the most efficient subsidiary. Pemex-Gas is ranked number two by everyone who ranked PMI number one, with one exception. Moreover, all three respondents who did not rank PMI regarded Pemex-Gas to be more efficient than PEP and Pemex-Refining. Finally, Pemex-Refining was placed last by all participants except for one, who ranked it just above PEP.

[TABLE 2.4 HERE]

With regards to the policy utilization of the subsidiaries, industrial policy for all of them was low. In general, the government did not seek to use the companies to create forward and backward linkages with domestic firms throughout the economy.<sup>65</sup> This, however, did not mean that government intervention was low. All subsidiaries with exception of PMI were subject to fiscal and budgetary control from the Ministry of Finance and to a strict regulatory regime implemented by the Ministry of Public Service. Additionally, industry experts pointed out to the fact that in Pemex-Refining

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<sup>64</sup> Whenever an interviewee declined to rank a subsidiary, no further attempts to follow-up were made. Selection of respondents was based on long-term knowledge of Pemex or on having had a position in the company that allowed an assessment of multiple subsidiaries.

<sup>65</sup> Author’s interview with Raúl Muñoz Leos (Pemex CEO from 2000 – 2004), Mexico City, 30 July 2008. Informal interviews with top-level Pemex staffers confirmed this claim.

appointments of outsiders and politicians were not uncommon—thus serving as a better instrument for the allocation of political patronage.

**Table 2.4 Survey of Experts Ranking Subsidiary Business Efficiency**

Description	PEP	Ref	Gas	PMI
<i>Oil industry researcher</i>	3	4	1	
<i>Former CEO #1</i>	3	4	2	1
<i>Former CEO #2</i>	2	4	3	1
<i>Former CEO #3</i>	2	3	1	
<i>Pemex manager #1</i>	3	4	2	1
<i>Pemex manager #2</i>	3	4	2	1
<i>Ministry of Energy official</i>	4	3	2	1
<i>International observer</i>	3	2		1
<i>Former advisor to CEO</i>	2	3	1	
<i>Former comptroller</i>	2	3		1

Note: Survey conducted among Mexican oil industry experts, April - August 2008. Selection was based on respondents' knowledge of the industry and their willingness to provide a ranking of the business efficiency of at least three of the subsidiaries. It is not a representative survey of oil workers.

In other words, the level of NAGI was low for PMI, high for Pemex-Refining, and medium for PEP and Pemex-Gas (although for different reasons). In PEP, politicians were seldom—if ever—appointed to top executive positions, but fiscal and regulatory control was high. In Pemex-Gas, by contrast, taxation and regulation were less strict. Furthermore, PMI has historically been exempt from cumbersome procurement regulations to enhance the subsidiary's competitiveness in the international oil market. Interestingly, this government intervention did not translate into increased industrial policy implementation.

## 6.2 The Explanatory Variables

What values can be assigned to the explanatory variables? The political ideology of the ruling coalition in 2008 was decidedly on the right of the spectrum of preferences—which would explain the aversion to industrial policy. President Felipe Calderón, of the conservative National Action Party (PAN), had appointed cabinet members with a well-known neoliberal orientation. Among them stood out the Minister of Finance, Agustín Carstens—with a doctorate in economics from the University of Chicago—and the Minister of Energy, Georgina Kessel, formerly chair of the department of economics at Mexico’s *Instituto Tecnológico Autónomo de México* (ITAM, Autonomous Technological Institute of Mexico), a university known for its orthodox economics training (Babb 2001; Camp 2002).

Table 2.5 presents the values for the variables of market competition and managerial cohesion for each subsidiary. These levels are “stylized” in order to be presented easily in a single table. Nuances in the actual measurement of the variables are left for subsequent chapters.

[TABLE 2.5 HERE]

The justification for the levels of market competition is straightforward. Pemex-Refining and PEP have monopoly protection by law and thus do not face any market competition. PMI, on the other hand, markets crude oil internationally and must continuously make an effort to find clients. Pemex-Gas faces a higher level of competition compared to PEP and Pemex-Refining, although not at the same level as

PMI. Some parts of the natural gas market in Mexico were liberalized in 1995 and, thus, the entry of competitors is possible. In practice, however, competition has been limited due to the high costs of entry to the industry (and issue that is further discussed in Chapter 6).

**Table 2.5 Explanatory Variables for the Subsidiaries of Pemex, 2008**

		Market Competition	
		Low	High
Managerial Cohesion	Low	Refining (Behaves like Government Agency)	Pemex-Gas Middling, trending upward
	High	PEP Middling, trending downward	PMI (Behaves like Commercial Enterprise)

The explanation of managerial cohesion is developed in detail in later chapters. Suffice it to say here that a key difference between PEP and the other branches is the socialization of its dominant profession—petroleum engineering—which contrasts with that of chemical engineers, economists, and lawyers present in other subsidiaries. In a way, the socialization pattern for petroleum engineers is reminiscent of that of the forest rangers analyzed by Kaufman (1960). Upon graduating from college, small groups of petroleum engineers must work in production facilities in inhospitable conditions, developing bonds of solidarity along the way. Moreover, promotion opportunities are heavily controlled by a tight-knit community of older, more experienced petroleum engineers. This fosters discipline and cohesiveness among the ranks, who know that few



employment opportunities exist in Mexico outside of Pemex and do not want to see their promotion opportunities decrease.

On the other hand, the chemical engineers that manage industrial plants in Pemex-Refining and Pemex-Gas undergo a much less intensive socialization process. Top executive positions are not reserved for chemical engineers moving up through the ranks, thus removing an incentive to show loyalty to the supervisors. Additionally, chemical engineers usually can find employment outside of Pemex, since their training is much less specialized, and often they did not attend the same schools. All these reasons lead to lower cohesion.

In PMI, cohesion has been developed over time in spite of the absence of a single dominant profession. PMI is a relatively small company where personal bonds are easier to build. Moreover, the subsidiary has a long-lasting tradition of making promotions from within, strengthening discipline and loyalty among the lower and middle echelons. Finally, PMI has developed over time highly specialized marketing and trading methodologies which all employees learn upon entering the company—usually soon after graduating from college. This shared experience provides the managers of the subsidiary a common identity that transcends their professional background.

The analytical framework presented in this chapter provides clarity to the explanation of the behavior of these SOEs. Beginning with the level of NAGI, the following conclusions can be drawn. First, the willingness to intervene has been lower in those companies facing market competition, as regulations and budgetary restrictions have been relaxed to permit better performance in the market. Second, the ability to intervene has been lower in those with high managerial cohesion—politicians seldom

appear in PEP and in PMI, which have a strong tradition of making appointments from within their ranks. Lower levels of NAGI lead to higher business efficiency and lower policy utilization, and the interest of the government to implement industrial policy has been low.

In addition, market competition and managerial cohesion have a direct effect on business efficiency within the company—regardless of their impact on the external relationship with the government. PMI's efficiency is thus further enhanced, while Pemex-Refining falls to the bottom. Pemex-Gas and PEP have a mixed set of variables, but the presence of competition, over time, provides greater incentives for performance than managerial cohesion alone. In a monopolistic environment, PEP has remained insular, unable to keep up with the technological evolution of the industry (see Chapter 5).

## **7. Conclusion**

The study of the behavior of state-owned companies is complex and has defied scholars for several decades. Approaches that are not interdisciplinary have thus far rendered only partial explanations. The framework proposed in this chapter simplifies the analysis by separating the two different components of behavior—the policy utilization and the business efficiency—while integrating the relevant economic, political, and sociological variables. In so doing, it accounts for much of the observed variation among these firms and provides a foundation for further theoretical and policy analysis of government ownership of industrial enterprises.

While the analytical framework can be extended to capture the nuances of state-owned enterprise behavior, its essence is simple. There are two dependent variables that correspond to the two primary tasks of SOEs: business efficiency and policy utilization. Moreover, these two variables are determined simultaneously and are interrelated—business efficiency affects the degree of policy utilization and policy utilization affects the level of efficiency. In reality, this setup follows naturally from casual observation of SOEs around the world.

Perhaps the most difficult conceptual argument in the framework consists in the role played by the intermediate “linking” variable—the level of non-aligned government intervention (NAGI). This is simply an analytical tool to simplify the understanding of the relationship between the two dependent variables. For greater clarity, NAGI is divided into two components: the willingness of the government to intervene and its ability to do so.

There are three main explanatory variables: the level of market competition, the degree of managerial cohesion, and the political ideology of the government. Sometimes these variables have a direct effect on a dependent variable and sometimes they have an indirect effect. Managerial cohesion, for example, has a direct effect on business efficiency by increasing esprit-de-corps and facilitating coordination throughout the organization. Additionally, it has an indirect effect on both business efficiency and policy utilization by decreasing the level of non-aligned government intervention. Managerial cohesion reduces NAGI, for example, by lowering the government’s ability to appoint politicians to top executive positions. In turn, more professional managers help to further

improve business efficiency. Once this point is clarified, then the relationship among the variables in the system becomes straightforward.

Finally, the framework provides tools to add nuance to the analysis of state-owned enterprise behavior. The auxiliary variables—state jeopardy, veto players, and managerial ability—fulfill this task. They are not necessary to understand the primary structural determinants of SOE behavior, but they can play a key role in explaining different outcomes among two companies that operate in similar circumstances.

The framework can explain the cross-sectional differences in behavior of the subsidiaries of Pemex—precisely the puzzle described in Chapter 1. According to industry experts, these companies exhibited varying levels of efficiency in spite of the common characteristics shared by all. Yet, political ideology, market competition, and managerial cohesion were enough to explain much of a complicated reality of government mandates and incentives and disincentives for good performance.

Before discussing the contemporary history and evolution of each subsidiary in detail, the following chapter provides an overview of Pemex and its significance for the Mexican state. The background on the origins of the company and the most important changes in its history will allow for a better understanding of the individual subsidiaries. The analytical framework will be revisited in the concluding chapter, when Pemex is briefly compared to international companies.

## CHAPTER 3 THE SIGNIFICANCE OF PEMEX FOR THE MEXICAN STATE

### 1. Pemex as a Symbol of Mexican Nationalism

#### *1.1 Surrounded by “Adelitas”*

On April 17, 2008 I was en route to attend a conference in downtown Mexico City on the future of the Mexican petroleum industry. As I approached the venue of the event—the well known *Palacio de Minería*—I noticed a large group of people blocking access from all cross-streets. I tried to continue walking, but the demonstrators—hundreds of them, all women, all dressed in white—were holding hands and preventing pedestrians from passing through.

A few moments later, I identified the leader of that “section” and pleaded my case. “I’m a researcher,” I said, “and I am just attending a conference at the *Palacio de Minería*. I am not trying to access the Senate building.” “I understand,” the woman replied, in a considerably more polite way than her colleagues—some of whom were already surrounding me and yelling at me. “However, please understand our cause. We have orders not to let anyone near the Senate. Please go away and do not insist.” I tried to access via a different cross-street, but the response was the same and the demonstrators were growing in numbers. Disappointed, I had to walk away.

The demonstrators I encountered were the so called “*Adelitas*,” a group of women protesting against the efforts of the government to liberalize Mexico’s oil industry.<sup>66</sup> The group followed Andrés Manuel López Obrador, a former Mexico City mayor and former presidential candidate of the leftist Party of the Democratic Revolution (PRD) who

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<sup>66</sup> The term “*Adelita*” (literally meaning “Little Adela”) comes from the character of a folk song popularized during the time of the Mexican Revolution in the early 20<sup>th</sup> century. During the war, the term came to signify a brave and attractive woman.

vowed to defend the country's oil wealth from the conservative government's attempts to privatize it.<sup>67</sup> In his words, the push to liberalize the sector represented a "barbaric" act against the people: "What they try to do is to take away from us a piece of our nation, of our heart."<sup>68</sup>

Weeks earlier, the Mexican media had begun to speculate about the possibility that President Felipe Calderón would send an energy bill to Congress seeking to open the sector. For decades, Pemex had enjoyed a monopoly in the exploration, production, refining, and distribution of petroleum and petroleum products. Pemex had become a symbol of national sovereignty, but its high levels of corruption and inefficiency were equally well known. Some voices in Mexico called for a change in the corporate governance regime as a necessary step to modernize the company, while others charged that conservative governments were simply giving away a piece of the national patrimony.

On April 6, 2008, a López Obrador rally in Mexico City summoned as many as 10,000 female supporters, organized in twenty "brigades," and asked them to be ready, if need be, to lead a peaceful civic opposition to the government's energy reform bill.<sup>69</sup> Any attempt to liberalize, in his words, was a step towards privatizing Pemex. "We are not sucking our thumbs," he said. "Joint ventures are privatization; alliances with foreign companies are privatization; risk agreements are privatization; contracts with third parties

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<sup>67</sup> López Obrador is a very well known and highly polarizing figure in Mexican politics. He grew up in an oil producing municipality in the state of Tabasco and made national headlines in 1994 when he orchestrated blockades of Pemex wells to protest for an apparent electoral fraud against him in the gubernatorial elections of Tabasco in that year. A literature has appeared discussing López Obrador's political career. See, for example, Grayson (2006), Lajous (2006), and Trelles (2004).

<sup>68</sup> Morales, Alberto. 2008. "'Adelitas' levantan carpas; marchan contra televisora." *El Universal*. 12 April 2008. Available online at <http://www.eluniversal.com.mx/nacion/158769.html>.

<sup>69</sup> Mendez, Enrique and Alma E. Munoz. 2008. "Prevé AMLO que la resistencia por Pemex se inicie esta semana." *La Jornada*. 7 April 2008.

are privatization; multiple service contracts are privatization; managerial autonomy is privatization.”

On April 8<sup>th</sup>, President Calderón finally sent a bill to Congress—a bill that some observers believed was purposefully moderate in hopes of gaining the support of the left or, at least, of not prompting broad opposition.<sup>70</sup> Among other things, the government sought to allow private companies to own and operate petroleum refineries and pipelines in Mexico. One day later, López Obrador asked the *Adelitas* to demonstrate in the streets surrounding the Senate.<sup>71</sup> Simultaneously, federal representatives allied to López Obrador took over the podium of the Chamber of Deputies, effectively shutting it down, in order to prevent a vote on the president’s energy bill. A similar takeover of the Senate ensued soon after.<sup>72</sup>

By the time I encountered the *Adelitas*, the demonstrations had lasted one week. Eventually, the shutdown of the Mexican Congress would only be resolved with a pledge by the government’s party to open a lengthy public debate on the merits of a petroleum reform. On April 25<sup>th</sup>, the legislative sitdown ended, with the leftist opposition claiming victory upon securing a 71-day period for a national debate on the future of the oil industry.<sup>73</sup> Given the magnitude of the opposition to a moderate attempt to reform the industry, it is worth examining the meaning of Pemex for the Mexican public and the political elites.

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<sup>70</sup> See, for example, the opinion editorial published by José Carreño in *El Universal* on 10 April 2008, available at <http://www.eluniversal.com.mx/columnas/70834.html>.

<sup>71</sup> De Mauleón, Héctor. 2008. “El estreno del ejército de ‘adelitas’”. *El Universal*. 11 April 2008.

<sup>72</sup> Pérez, Ciro and Roberto Garduno. 2008. “Zavaleta rebasada; diputados del FAP tomaron tribuna.” *La Jornada*. 11 April 2008.

<sup>73</sup> Becerril, Andrea and Ballinas, Víctor. 2008. “Pactan FAP, PAN y PRI debate nacional sobre Pemex por 71 días.” *La Jornada*. 26 April 2008.

## 1.2 The “Third Rail” of Mexican Politics

In modern Mexican politics, arguably no other topic entailed more danger for a politician than the suggestion that the Mexican oil industry should be liberalized or that Pemex should be privatized. Calderón’s attempt to implement *any* kind of reform was bold, yet it did not seek to change the ownership structure of the company or its domestic monopoly on exploration, production, and marketing. The major proposed change—which would ultimately fail to receive support in Congress—was the suggestion to let private companies refine crude in Mexico on a fee-for-service basis.<sup>74</sup>

The presidential administrations of Carlos Salinas de Gortari (1988-1994) and Ernesto Zedillo (1994-2000), notorious for their neoliberal economic policies, never advocated the privatization of Pemex.<sup>75</sup> The Salinas administration, for example, privatized the state-owned telephone company, Telmex, and the television network, Imevision, among many others, but petroleum remained off limits.

Similarly, the Salinas administration explicitly resisted requests to end Pemex’s domestic monopoly during the negotiations for the North American Free Trade Agreement (NAFTA). In his memoirs (2002), Carlos Salinas recounted a cabinet meeting where the question of state ownership of Pemex was discussed. In his view, Mexican oil was off-limits for U.S. investors:

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<sup>74</sup> According to media reports, Calderón was warned by a prominent politician in the months before he presented the energy bill: “If you privatize Pemex, you give the presidency to López Obrador.” See Ricardo Alemán’s opinión editorial, *Itinerario Político*, published in *El Universal* on 10 April 2008.

<sup>75</sup> In his book *La Década Perdida*, Carlos Salinas disputes the notion that his government followed neoliberal economic policies (2008). However, most commentators catalogue him as neoliberal given the record of privatization and economic liberalization that took place during his administration (Murillo 2000; Teichman 1997).



On December 23, the Economic Cabinet evaluated the strengthening of the oil industry as the best antidote to the claims to privatize it. Faced with the offensive launched at us from different U.S. sectors to privatize it or at least open it to foreign investment, we decided to go directly to the Pemex technicians and workers to explain fully the reasoning behind the government's position. [Pemex CEO] Francisco Rojas undertook this task with special care and attention. I again insisted that the subject of oil was the most delicate in NAFTA, but that we would not modify the Mexican Constitution. We had privatized other companies because the public sector could not have provided the level of investment required for their modernization. But oil was not included in that strategy. (pp. 114-115)

Ernesto Zedillo sought to liberalize related branches of the energy sector, but did not dare push to open the core petroleum activities of exploration, production, refining, and marketing. He opened the transport, storage, and distribution of natural gas to private competition, and also attempted to reform the electricity sector and privatize the petrochemicals industry.<sup>76</sup> In these latter two areas, his efforts failed largely because too many key members of his ruling PRI (Institutional Revolutionary Party) remained opposed.<sup>77</sup> He never attempted, however, to divest the government's ownership of Pemex.

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<sup>76</sup> Author's interview with Adrián Lajous, Mexico City, 7 July 2008. Lajous was director-general of Pemex during the botched attempt to privatize the petrochemicals industry.

<sup>77</sup> Author's interview with Luis Téllez, 26 June 2009. Téllez was Secretary of Energy during the reform attempt in the late 1990s.

The conservative Vicente Fox of the National Action Party (PAN), president of Mexico from 2000-2006, was repeatedly questioned regarding his commitment to maintaining Pemex entirely in the hands of the state. In the 2000 presidential campaign, some of his opponents often charged that he would weaken Pemex and led him to explicitly commit never to privatize the company.<sup>78</sup> Years later, in his memoirs, Fox would lament about the state of Mexican politics where “if you want to open up energy to private investment, opponents say you have a ‘secret plan’ to privatize Pemex” (Fox and Allyn 2007, p. 226).

In short, even some of the most neoliberal governments avoided the mere suggestion of privatizing Mexico’s oil. The political risk was deemed too high. Even during the last years of Mexico’s one-party dominant regime, the president with the most neoliberal economic agenda—Ernesto Zedillo—found that relatively minor liberalization faced strong opposition from his own party. Adrián Lajous, the Pemex director-general from 1994-2000, explains that “Zedillo told me that it was a pre-requisite for my appointment that I commit to privatize the petrochemicals industry, and I tried but failed because a large segment of the PRI was opposed to it. The neoliberals of the PRI in the government were unable to impose the privatization on the rest of the party and on the union.”<sup>79</sup>

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<sup>78</sup> Olmos, José Gil, Juan Antonio Zúñiga, Juan Manuel Venegas, and Mireya Cuéllar. 2000. “Propuestas, acusaciones y un tema recurrente: el salinismo.” *La Jornada*. 27 May 2000.

<sup>79</sup> Author’s interview with Adrián Lajous, Mexico City, 7 July 2008.

### *1.3 Elite-Level Views of the Relationship between Pemex and the State*

What explains the reluctance of the Mexican political elite to consider the privatization of Pemex? Carlos Navarrete, the leader of the PRD in the Senate (2006-2012), explains contemporary elite-level views as follows:

The generation that is today in the Senate was brought in the tradition of the petroleum expropriation of 1938, with General Lázaro Cárdenas as its mastermind, and in the idea of oil as the great national property that permits the fulfillment of a set of economic needs...<sup>80</sup>

Thus, the expropriation of the oil industry became one of the pillars of the post-revolutionary Mexican regime, which provided a nationalistic rationalization to the authoritarian regime of the PRI. As the years went by, Pemex's status as the most important symbol of Mexican economic freedom was consolidated. In short, a state-owned Pemex became part of the Mexican lore, as much as other icons of national identity.

As a result, non-ideological debates regarding nuances in public-private relations in the industry were discouraged. A former chair of the Energy Committee in the Mexican Senate, Juan José Rodríguez Prats of the rightist PAN, lamented that "energy policy in Mexico is loaded with prejudices, with myths, with emotional issues."<sup>81</sup>

Diversity of opinions gradually arose with the advent of democratization, although by the year 2010 the voices of liberalization still moderated their discourse.

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<sup>80</sup> Author's interview with Carlos Navarrete, Mexico City, 28 July 2008.

<sup>81</sup> Author's interview with Juan José Rodríguez Prats, Mexico City, 9 April 2008. Rodríguez Prats was chair of the Energy Committee of the Senate from 2000-2006.

In the early 21<sup>st</sup> century, the political parties were positioned as follows. On the left, the PRD maintained a strong preference against allowing private participation in Pemex or loosening the company's domestic monopoly. This position was strengthened by the fact that the founder and traditional leader of the party, Cuauhtémoc Cárdenas, was the son of Lázaro Cárdenas, the mastermind of the expropriation himself. Additionally, the party's 2006 presidential candidate and most influential member in the early 2000s was none other than Andrés Manuel López Obrador—the leader of the *Adelitas* movement and staunch proponent of a fully state-owned Pemex (López Obrador 2008).

On the right, the conservative PAN displayed lukewarm support for liberalization. While the party's ideology was generally in support of a diminished role of the state in economic activity, not all of its members ventured to call for privatization—whether out of conviction or fear of being labeled as unpatriotic. In the end, however, the PAN had been founded in the 1930s largely as a response to the statist policies of President Lázaro Cárdenas (Loaeza 1999), and it seemed to be a matter of time before more of its members spoke openly in favor of liberalization.

Finally, the ideologically eclectic PRI had prominent members both in favor and against private participation. Zedillo and one of his top advisors, Luis Téllez, advocated liberalization. Other prominent members of the party, among them Manuel Bartlett, were devoted opponents (see, for example, Bartlett Díaz and Rodríguez Padilla 2008). In fact, ideological disagreements within the PRI had thwarted Zedillo's attempt to privatize Pemex's petrochemical assets.

#### *1.4 Public Opinion on the Relationship between Pemex and the State*

Public opinion in Mexico has also been shaped by the symbolism of the oil expropriation of 1938, taught in public school textbooks as one of the proudest moments in the country's history. In 2008, for example, the free national history textbook for the sixth grade—published at the request of the Ministry of Education—had six pages devoted to the facts and benefits of the expropriation. This manifested a trend, begun in 1960, whereby the virtues of state ownership of oil would be taught to Mexican students at a very young age.<sup>82</sup>

Survey results available confirm that a majority of Mexicans oppose private investment in the industry, although not necessarily by overwhelming margins. Interestingly, surveys on political attitudes in Mexico only began to include items gauging views on the oil industry in the 2000s. Presumably, prior to that decade researchers took public opposition to privatization for granted. In recent years, however, a sizable minority of the population is openly supporting private participation in the oil sector.

The Mexico Global Views Survey, conducted in 2004, provides an idea of the distribution of views on oil industry matters in the country several years prior to the reform attempt of 2008 by Felipe Calderón (Centro de Investigación y Docencia Económicas, Chicago Council on Foreign Relations, and Consejo Mexicano de Asuntos Internacionales 2005). The survey drew a nationally representative sample of 1,500 respondents and asked political questions of relevance for U.S.-Mexican relations.<sup>83</sup> In

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<sup>82</sup> See Martínez, Nurit, "Expropiación se adueña de libros de texto," *El Universal*, 8 June 2008.

<sup>83</sup> The sample was selected following a multi-stage process that combined probability-proportional-to-size and random sampling criteria. The methodological document states that the response rate was 60%,

response to the question “In your opinion, should the Mexican government permit or not that foreigners invest in oil production and distribution,” 60% of Mexicans were opposed and 34% were in favor.

Calderón’s proposed reform in 2008 triggered a series of surveys that sought to measure changes in public opinion after the issue had become more salient and once the government had orchestrated a media campaign urging Congress to authorize private investment in deepwater oil exploration and production. In early March of that year, the Mexico City newspaper *Reforma* published the results of a survey that specifically probed on views on the liberalization of the energy sector.<sup>84</sup> Table 3.1 presents some of the most relevant results.

[TABLE 3.1 HERE]

Table 3.1 shows that the majority of respondents support a statist control of Pemex, and most of those who are in favor of allowing private investment believe that the company should still remain under governmental control. This is not surprising, given that as many 63% of respondents believe that the oil expropriation was a measure that benefited the country. The survey also found that, as expected, public opinion on private investment in the company varied greatly with the partisan identification of the respondent. Among PAN supporters, 45% supported allowing private capital in the

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although it does not state the methodology to estimate this percentage. The margin of error for a 95% confidence interval is plus or minus four percentage points.

<sup>84</sup> This survey included 1,515 respondents also selected following a multi-stage process that included probability-proportional-to-size and random sampling criteria. The response rate, calculated based on the most stringent formula stipulated in the guidelines of the American Association for Public Opinion Research, was 34%. The margin of error for a 95% confidence interval is plus or minus 2.5%. See Gutiérrez, Roberto and Alejandro Moreno, “Divide opiniones apertura energética,” *Reforma*, 3 March 2008, p. 6.

company and 39% opposed it; among PRI supporters, 40% were in favor and 40% were against; and among PRD sympathizers only 29% supported such liberalization while 60% opposed it. Interestingly, 48% of non-partisan respondents also opposed the proposal, with only 34% supporting it. Thus, preferences at the mass level fairly mirrored those held by elites.

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**Table 3.1 Results of *Reforma's* Poll on Energy Policy**

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*Do you believe that Pemex is an efficient or an inefficient company?*

Efficient: 63%

Inefficient: 27%

*What are the causes of Pemex's inefficiency?*

Corruption: 44%

Bad government management: 22%

The Labor Union: 11%

Obsolete Infrastructure: 9%

*Are you in favor or opposed to allowing private capital investments in Pemex?*

In favor: 37%

Opposed: 46%

No opinion: 17%

*The 70th anniversary of the petroleum expropriation will be celebrated this March. In your opinion, did that measure benefit or hurt the country?*

Benefit: 63%

Hurt: 24%

Doesn't know: 13%

*In your opinion, what would be the best policy?*

Keep Pemex exclusively in the hands of the Government and do not allow private investment: 43%

Allow private investment in Pemex but keep the company under the Government's control: 37%

Privatize Pemex: 7%

Doesn't know: 13%

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Note: *Reforma's* poll was conducted between February 16 - 18, 2008 in 101 primary sampling units selected nationwide. The total sample included 1,515 respondents.

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The purpose of this section is not to explain the causes behind public preferences with regards to oil policy, but simply to describe what those preferences are. In this regard, two conclusions stand out. First, most Mexicans, in fact, oppose privatization. Second, many of them do oppose a nationalized industry—in spite of a public education system that emphasized the benefits of expropriation.

## **2. The Origins of Pemex**

### *2.1 Expropriation Decree and the Creation of the Company*

On March 18, 1938, President Lázaro Cárdenas issued a decree expropriating most of the petroleum assets in the country.<sup>85</sup> The legal rationale for the expropriation was the refusal of the foreign companies to accept a resolution that established more favorable terms for the oil workers' union than they were willing to provide. "It is of the public domain," read the decree, "that the oil companies that operate in the country and that were compelled to establish new working conditions by the Group Number 7 of the Federal Board of Conciliation and Arbitration, have expressed their refusal to accept the resolution, despite the fact that the Supreme Court of Justice has recognized its constitutionality." Due to the dispute, the government argued that the suspension of labor activities in the industry was imminent, and given the importance of petroleum for the national economy, it was compelled to take control of the assets to ensure their continued operation. Thus, decades of large-scale foreign investment in the Mexican oil industry came to an end.

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<sup>85</sup> See *Decreto que expropia a favor del patrimonio de la nación, los bienes muebles e inmuebles pertenecientes a las compañías petroleras que se negaron a acatar el laudo de 18 de diciembre de 1937, del grupo número 7 de la Junta Federal de Conciliación y Arbitraje*, 18 March 1938.



Almost three months later, on June 7, 1938, *Petróleos Mexicanos* (Pemex) was created as a public enterprise in charge of exploiting and administering the expropriated oil resources in the country on behalf of the Mexican state. It would be governed by a nine-member Board of Directors consisting in six representatives appointed by the president of Mexico and three by the oil workers' union. The company's income and expenditures would be sanctioned by the Ministry of Finance.<sup>86</sup>

The precedent for Pemex can be found in the company *Petróleos de México, S.A.* (Petromex), which had been created as a mixed public-private company in 1933 to increase the participation of the state and domestic capital in the national oil industry (Álvarez de la Borda 2006). It had regulatory tasks and was vertically integrated, but it failed to attract private investment—by 1936, only 6.29% of the shares of the company were in private hands, far below the target of 50% (Álvarez de la Borda 2006). In 1937, the government dissolved Petromex and transferred its assets to the newly formed General Administration of National Petroleum (*Administración General del Petróleo Nacional*). This entity would control the expropriated companies between March 18, 1938 and the date of the creation of Pemex in early June of that year.

In its first years, Pemex did not have full control over all petroleum resources in the country. At the same time when Pemex was founded, President Cárdenas issued a decree creating a second state-owned enterprise charged with domestic and international marketing, *Distribuidora de Petróleos Mexicanos*. Additionally, Pemex only managed those assets that were expropriated. While these constituted a majority, the General Administration of National Petroleum still controlled those assets—approximately 3% of

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<sup>86</sup> See *Decreto que crea Petróleos Mexicanos*, 7 June 1938.

national production—that the Mexican state already owned before 1938 (Meyer and Morales 1990; Macmahon and Dittmar 1942).

In 1940, the General Administration and *Distribuidora* were merged with Pemex. *Distribuidora's* standing was jeopardized when a dispute with the labor union led to the resignation of its director. Additionally, coordination problems arose in the corporate governance of Pemex and the General Administration. In response, President Cárdenas decided to vertically integrate all activities and consolidate all assets under a centralized management.

## 2.2 *The Oil Industry Prior to the Expropriation*

In the first two decades of the 20<sup>th</sup> century, Mexico became one of the most important oil producing countries in the world. In 1921, only the United States produced more petroleum than Mexico (Haber, Maurer, and Razo 2003). A liberal natural resources ownership regime adopted by the government of Porfirio Díaz in the late 19<sup>th</sup> century had encouraged foreign investment in the Mexican oil sector and had led to significant discoveries along the Gulf coast (Meyer and Morales 1990).<sup>87</sup> Similarly, a small refining industry emerged clustered in the Tampico-Madero area in northeastern Mexico (Brown 1992). During the turbulent years of the Mexican Revolution—from 1910 to the early 1920s—the promise of high returns continued to attract foreign investment.

The defining element of the two decades prior to the expropriation of 1938 was the enactment of a new constitution in 1917 and, more specifically, of its article 27. The

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<sup>87</sup> The introduction of the liberal regime of ownership of natural resources occurred with the enactment of the Mining Code of 1884. While Manuel González was president of Mexico at the time, the regime has been associated with Porfirio Díaz, who supported and expanded the change (Meyer 1968).

new legal regime reversed the liberal reforms of the Diaz era that granted perpetual ownership of subsoil resources to the owner of the land and re-established the doctrine that the subsoil wealth belongs to the nation (Rippy 1972). The original text of article 27 stated the following:

In the Nation is vested the direct ownership of all minerals or substances, which in veins, ledges, masses or ore pockets, form deposits of a nature distinct from the components of the earth itself, such as the minerals from which industrial metals and metalloids are extracted; deposits of precious stones, rock-salt and the deposits of salt formed by sea water; products derived from the decomposition of rocks, when subterranean works are required for their extraction; phosphates susceptible of utilization as fertilizers; solid mineral fuels; petroleum and all solid, liquid, and gaseous hydrocarbons.<sup>88</sup>

The foreign oil companies that already operated in the country argued that their assets were protected from the new restriction, since article 14 of the same constitution clearly stipulated a no retroactivity condition for any law in the country. Negotiations between the companies and the early post-revolutionary governments ensued, unable to settle the oil question once and for all. To complicate matters further, it would not be until 1925 that the Mexican legislature issued an Enabling Law for Article 27 that clarified the scope of the constitutional text. While the Mexican government sought to

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<sup>88</sup> Translation based on the text provided in <http://www.ilstu.edu/class/hist263/docs/1917const.html#TitleIChapterI>, accessed on 21 June 2010.

reach a middle ground, the oil companies believed that acquiescing to a partial loss of any property rights would set a precedent of their acceptance that article 27 could apply retroactively (Meyer 1968). Moreover, they likely believed that a hard-line position against the Mexican government would preempt other countries from enacting similar laws (Maurer 2010).

When Lázaro Cárdenas took office as president of Mexico in 1934, the context of the oil industry was as follows. First, investment in the industry had decreased considerably and production had fallen drastically from the peak in 1921. This was the result of the exhaustion of the existing fields in Mexico (Haber et al. 2003) and the rise of Venezuela as a more promising oil area from a geological and a regulatory perspective (Meyer and Morales 1990). Second, the legal framework was based on the Petroleum Law of 1925, as amended in 1928. This was the Enabling Law of Article 27, and with the reform of 1928 it granted perpetual rights to those landowners who had acquired their assets prior to 1917 and who had made “positive acts” to explore and produce oil prior to that year.<sup>89</sup> Third, Mexican petroleum workers had gathered strength as a collective force, managing to combine the nearly 18,000 oil workers from different organizations into a single national union (Meyer 1968).

In that setting, the facilitating condition for the nationalization of the industry was not an appeal to Article 27—since the retroactivity question was still unsettled—but the dispute with the Mexican Oil Workers’ Union. As explained above, the workers demanded better terms of employment and pleaded their case with the Federal Board of

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<sup>89</sup> The Petroleum Law of 1925 had limited the rights of landowners making positive acts prior to 1917 only to 50 years. In the reform of 1928, a distinction was made between “landowners” and “lessees,” with the former re-acquiring perpetual rights over the subsoil of their lands (Meyer and Morales 1990). The definition of a “positive act” generated controversy. In the Petroleum Law of 1925, a positive act was defined stringently. In 1928, the definition was relaxed.

Conciliation and Arbitration. The latter sided with the union, but the oil companies refused to abide by the resolution.

### *2.3 The Aftermath of Expropriation*

The structure of the Mexican oil industry was in flux in the years immediately following the expropriation. At first Pemex was only charged with the administration of the assets of the expropriated companies, and it was only in 1940 that it acquired those that belonged to the General Administration of National Petroleum. Furthermore, it would not be until 1951 that Pemex acquired those oil fields belonging to private companies that had not been expropriated in the Decree of 1938. Most notoriously, the Mexican Gulf Oil Company had not joined its peers in the refusal to accept different labor conditions for the oil workers and therefore its assets were not expropriated by the government. In the 1940s, Gulf produced small amounts of oil and sold them to Pemex. By 1951, however, the company agreed to sell its assets to the Mexican government, which was eager to finally place all oil resources under state control (Bermúdez 1963).

Two additional problems complicated the performance of Pemex in those early years, one domestic and one international. On the home front, the government had to deal with a highly militant and organized oil workers' union that had been further empowered by their successful mobilization of 1938. The number of workers increased drastically, from 15,895 in April of 1938 to 23,073 in October of 1939 (Meyer and Morales 1990). The government pushed back, but the union responded with several work stoppages that continued into the early 1940s and peaked in December of 1946 with a workers' strike in Poza Rica and in the Azcapotzalco refinery in Mexico City. The newly inaugurated

government of President Miguel Alemán deployed the army to break the strike, and the Pemex director, Antonio J. Bermúdez, orchestrated the dismissal from the company of dozens of union leaders. The new leadership of the workers then reached a labor agreement with the Pemex management in June of 1947 that provided stability to the industrial relations in the company (Alemán 1977).

The second problem faced by Pemex was the international boycott organized by the oil companies and the support that these received from the Department of State of the United States, eager to set an example to prevent other countries from following the Mexican experience and affect U.S. business interests (Meyer 1968; Maurer 2010). The immediate effects of this boycott were the refusal to purchase oil from Pemex or to provide physical and human capital to the infant Mexican oil industry. Additionally, the U.S. Department of State maneuvered to block financing from the United States for Pemex, which was in a dire financial condition and desperately needed a loan to jumpstart its exploration and development programs (Alemán 1977).

The boycott from the companies was lifted in the early 1940s, when the Mexican government began to reach agreements with them regarding the compensation for the expropriation (Alemán 1977). By that time, the United States was purchasing crude from Pemex directly to assist in the war effort, which was a more pressing concern for the Roosevelt administration than “punishing” Mexico for the nationalization. The financing question lingered until 1947, when the U.S. government agreed to provide economic assistance to develop the nationalized Mexican oil sector (Alemán 1977; Bermúdez 1963).

### 3. Continuity and Change in the History of Pemex

Throughout its history, Pemex has undergone several important transformations. In this section, the trajectory of the company is discussed based on four criteria relevant for a state-owned enterprise. These four variables are: (i) the corporate structure, (ii) the relationship with the private sector, (iii) the production profile, and (iv) the relationship with labor. A fifth element, the policy value of the company for the state, is analyzed in the next section of this chapter.

#### 3.1 Corporate Structure

A central element of the corporate structure of the company since its founding has been the principle of shared governance between the federal executive and the oil workers' union. Accordingly, the Board of Directors, the top governing body of the company, has included labor representatives since 1938. This arrangement responded to the favorable view of industrial relations during the Cárdenas administration and to the rising strength of the oil workers' union at the time, which played a decisive role in the expropriation itself (Meyer and Morales 1990).

Initially, the Board of Pemex had nine members, of which six were designated directly by the president of Mexico and three by the union leadership. In 1940, the balance changed to five government representatives and four union ones. This structure remained in place until the reform of 2008, when a new *Ley de Petróleos Mexicanos* was issued, expanding the Board to include four “professional Board members” chosen by the president and subject to Senate confirmation.<sup>90</sup>

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<sup>90</sup> See *Decreto por el que se expide la Ley de Petróleos Mexicanos; se adicionan el artículo 3o. de la Ley Federal de las Entidades Paraestatales; el artículo 1 de la Ley de Obras Públicas y Servicios Relacionados*

The second element that describes the corporate structure of Pemex concerns the organizational scheme of the company. Prior to the late 1980s, Pemex operated as a single legal entity. Once the *Distribuidora* was merged with Pemex, the company became vertically integrated from the well to the pump at the gas station. The different tasks in the chain of production (exploration and production, refining, petrochemicals, gas processing, and marketing) were commissioned to *subdirecciones*. In 1989, the foreign trade activities were spun into a separate subsidiary, PMI, which was majority owned by Pemex (see Chapter 4). The more comprehensive change, however, occurred in 1992, when the company divided all other functions into four legally independent subsidiaries that operated at arm's length from each other. These subsidiaries were still subordinated to a holding company, Pemex Corporate, but each had its own Board of Directors with increased managerial autonomy.<sup>91</sup>

The four subsidiaries were Pemex-Exploration and Production, Pemex-Refining, Pemex-Gas, and Pemex-Petrochemicals. The separation followed standard practice in the international oil industry and, in the words of its supporters, it was essential to introduce accountability into a company of more than 100,000 workers scattered throughout the country. Francisco Rojas, who was CEO of Pemex at the time, explains:

Pemex was a fully vertical enterprise and this led to management inefficiencies. It was a company structured by functions: so sales would be in charge of one person, construction someone else, and thus no one was

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*con las Mismas y un párrafo tercero al artículo 1 de la Ley de Adquisiciones, Arrendamientos y Servicios del Sector Público*, 28 November 2008. The other Board members are selected by the President and are not subject to Senate confirmation.

<sup>91</sup> For example, the subsidiary boards of directors do not have any representatives from the union.



responsible of anything. When you asked them: ‘Why didn’t you finish this on time?’ they would say: “Because that department didn’t issue the public bidding on time.’ ‘And why didn’t you do the public bidding on time?’ ‘Because the sales people didn’t do their part on time.’ In short, no one was in charge of anything. We changed the structure into something that was not a Mexican invention: it was similar to that of an integrated oil company.<sup>92</sup>

Adrián Lajous, who was the chief planning officer of Pemex in 1992 and who is credited with the conception and implementation of the reform, is more blunt:

When Pemex wasn’t divided into subsidiaries, its accounting standards were those of a corner convenience store. There was no way to see the performance of smaller units. It was like a family corner store, where brother Pedro was in charge of sales, and cousin Joaquín was in charge of purchases, and uncle Juan kept the books. That’s how Pemex kept its data.<sup>93</sup>

Yet, the structure of Pemex into separate subsidiaries was one of the most contentious issues in the company by the time of Calderón’s reform initiative in 2008. Critics argued that duplicity of functions throughout each subsidiary was widespread, leading to unnecessary expenditures in administrative services (Shields 2003).

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<sup>92</sup> Author’s interview with Francisco Rojas, Mexico City, 30 July 2008. Francisco Rojas was CEO of Pemex from 1987 to 1994.

<sup>93</sup> Author’s interview with Adrián Lajous, Mexico City, 7 July 2008.

Additionally, they complained that the subsidiaries had amassed too much independence without a strong centralized authority. In 2008, *Pemex-Corporativo*, the central headquarters charged with coordination, was called by company staffers as “*Pemex-Decorativo*” to emphasize its lack of real power.<sup>94</sup>

Throughout the years, Pemex has owned several subsidiaries that are not directly part of the company’s formal structure. In 2010, for example, Pemex was majority owner of *Compañía Mexicana de Exploraciones, S.A.* (Mexican Company of Explorations, Comesa) and of *Instalaciones Inmobiliarias para Industrias, S.A. de C.V.* (Real Estate Facilities for Industries). Previously, it also owned gas local distribution companies.

An important change in the corporate structure concerns the ownership of the gasoline service stations of the company. Originally, Pemex directly operated most of its service stations through the subsidiary *Compañía Mexicana de Estaciones de Servicio* (Mexican Company of Service Stations, CODESSA). In the 1980s and early 1990s, more stations became franchises in the hands of private entities. Eventually, in December of 1992, CODESSA was dissolved and its remaining assets sold via public bidding. In 2010, service stations in Mexico, while restricted to selling Pemex gasoline, were privately owned.

A final aspect of the history of the corporate structure of Pemex concerns the short life of Mexpetrol, a company that focused on international activities. Mexpetrol was founded in 1989 with the objective of participating in all segments of the value chain, from project design to the construction of “turn-key” facilities (Gil Valdivia 1997). The

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<sup>94</sup> Leftist politicians in Mexico have pushed for re-integrating the company into a single legal entity (see, for example, *Intervención del Lic. Manuel Camacho Solís en el Foro de Debate de la Reforma Energética*, 8 July 2008). Rojas and Lajous dismiss these criticisms. Lajous, for example, argues that the duplicity of tasks already existed prior to the company restructuring, and that the way to eliminate it is by decreasing the number of workers rather than by changing the organizational structure.

company combined Mexican private engineering firms with several state-owned entities.<sup>95</sup> While the majority of the shares were in private hands, Pemex was the single largest owner. The most important assets were located in Argentina and smaller ones in Bolivia. In 1996, the Pemex Board of Directors authorized the sale of the company's shares in Mexpetrol—leading to the dissolution of the company.<sup>96</sup>

Disagreements exist regarding the virtues of Mexpetrol. Strictly speaking, the subsidiary was a losing enterprise with rates of return to investment much lower than the ones Pemex could obtain in Mexico. Francisco Rojas, Pemex CEO when Mexpetrol was founded, believes that it was a worthwhile opportunity for capacity-building:

The logic was to internationalize Pemex and other Mexican enterprises. Having the strength of a company of the size of Pemex, it made sense to internationalize both Pemex and Mexican engineering enterprises. That's what we wanted to do with Mexpetrol, and we could have created a super-enterprise. Just so you know: we had the chance to end up with Peru's gas, we had the chance of ending up with [Argentina's formerly state-owned oil company] YPF, that Repsol later bought, we even had the chance of ending up with Repsol when it was privatized. At the time, we were the second large shareholder of Repsol. If we had doubled the size of our investment, we would have ended up with control of Repsol.<sup>97</sup>

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<sup>95</sup> The constitutional restriction against associations with the private sector for the exploration and production of oil only applies to assets in Mexico, not internationally.

<sup>96</sup> See the minute of the Board of Directors meeting of Petróleos Mexicanos of 4 September 1996.

<sup>97</sup> Author's interview with Francisco Rojas, Mexico City, 30 July 2008.

Adrián Lajous, the Pemex CEO who decided to sell the company's shares in Mexpetrol, takes a more pragmatic approach. He points out that, in practice, the private partners in Mexpetrol had conflicting goals and coordination problems. Additionally, Pemex did not have expertise to market its services abroad. More importantly, "it would be very hard for Pemex to have access to fields as promising as the ones in Mexico, and Pemex did not have the resources to support an international expansion."

José Ángel Gómez Cabrera, one of the Pemex petroleum engineers who travelled to Bolivia and Argentina to participate in Mexpetrol's projects, shared Lajous's pessimism regarding the opportunities for internationalization:

I think that Mexpetrol ended because it wasn't feasible for the people in Mexico to be travelling to Argentina or Venezuela to find oil fields. Over there they would give us the worst fields. You would get old fields. In Bolivia they gave us a field called Camiri, which was in complete decline.<sup>98</sup>

### *3.2 Public-private relations*

A second criterion to analyze the history of Pemex concerns its changing relationship vis-à-vis the private sector. In the first decade of the twenty-first century, Pemex was 100% owned by the Mexican state and had a complete monopoly over petroleum exploration, production, refining, and gas processing activities in Mexico. Other state-owned oil companies, notably Brazil's Petrobras, Italy's Eni, and Norway's Statoil, were partially privatized in the 1990s and liberalized their domestic markets—

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<sup>98</sup> Author's interview with José Ángel Gómez Cabrera, Mexico City, 16 April 2008.

even though the state remained a significant player in the industry. In the case of Mexico, no such liberalization took place.

The relationships of production in the oil industry, however, transcend such a simplistic public-private dichotomy. Even in a “closed” industry such as Mexico’s, the private sector plays a significant role as a contractor for many of Pemex’s activities. This is a symbiosis that exists in every country in the world, regardless of how closed its oil sector may be. In fact, in 2009, Pemex was the main client worldwide of the private international oil services company Schlumberger.<sup>99</sup> In 2009, when Pemex began large scale operations in the Chicontepec oil field, the U.S.-based private companies Halliburton and Baker Hughes also drew a large share of their profits from operations in Mexico. The specialized journal *Petroleum Intelligence Weekly* describes the Mexican context as follows:

Mexico enjoys a reputation as one of the last true bastions of state oil and gas ownership, with fervent nationalism still dominating the debate over the country's oil industry some 70 years after foreign operators were expelled. That sense of national pride does not extend to the oil-field services sector, however, with state Pemex highly dependent on foreign oil-field services firms such as Halliburton, Schlumberger and Noble to keep the oil flowing. According to an independent study, one-third

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<sup>99</sup> Author’s interview with Lawrence Schwartz, Manager of Worldwide University Relations at Schlumberger, Cambridge, MA, 19 June 2009.

of Pemex's 2007 budget of 224 million pesos (\$16.8 billion) went on oil-field services.<sup>100</sup>

Moreover, this was not a new trend. In the late 1970s, Pemex hired the service company Brown & Root to develop the Cantarell field discovered in the Gulf of Mexico (Pratt, Priest, and Castaneda 1997). In short, the notion that the private sector is shunned from the Mexican oil industry is incorrect. Instead, it is necessary to determine which activities have been closed at different points in time. With regards to oil service companies operating as contractors for Pemex, the Mexican oil industry has always been open to private and foreign capital.<sup>101</sup>

The question of ownership and management of petroleum resources in the country—as opposed to fee-for-service contracts—has been more complicated. In this regard, two stages in the history of Pemex can be discerned. The first one, from 1938 until 1960, was ambiguous regarding the possibility of private participation and suggested, to some, that the legislation purposefully left open the possibility of re-allowing private ownership in case it were needed to develop the industry. The second stage, which began in 1960, closed all legal loopholes that allowed any petroleum resources to be controlled by entities other than Pemex.

According to Lorenzo Meyer—a historian of the Mexican oil expropriation—two different political groups emerged in the early 1940s with regards to this question. One of them, linked to then former President Cárdenas, pushed for the complete nationalization

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<sup>100</sup> See “Foreign Legion Underpins Mexico’s Oil Nationalism,” *Petroleum Intelligence Weekly*, 5 January 2009.

<sup>101</sup> Service contracts raised little controversy because the private companies never claimed control of the petroleum reserves nor made decisions of when or how much to produce or refine—not to mention, as well, that Pemex desperately needed the technical expertise that these companies could provide.

of the industry. The other one, however, wanted to keep the option of private participation open (Meyer and Morales 1990). The ambiguity of the legislation in the subsequent years reflected this tension within the government. The amendment to Article 27 of the Constitution of 9 November 1940, for example, banned the emission of concessions in the oil industry. Yet, the Petroleum Law of 1941—which served as Article 27's Enabling Law—allowed for the creation of mixed public-private companies with domestic capital for oil production in the country. Additionally, the Petroleum Law of 1941 did not explicitly exclude foreign capital from investing in exploration and drilling (Meyer and Morales 1990).

In this first stage of “incomplete nationalization,” several instances of private participation occurred. For example, as noted above, the Gulf Oil Company was allowed to continue producing until 1951, since it had not been expropriated in 1938. Additionally, in 1946 the Federal Government awarded an exploration and production contract to a Mexican citizen in the state of Sinaloa (Bermúdez 1963).<sup>102</sup> The most significant instance of controversial private investment, however, resulted from the risk-agreements made between the government and several foreign companies between 1949 and 1951. The government allowed these companies to select drilling locations and carry out the development of the wells. If the fields were unproductive, the companies would pay for the losses. If they were productive, then they would be reimbursed for the

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<sup>102</sup> The contract stipulated that the Federal Government would be paid 12.5% of the production obtained. The outcome would not be positive: in 1955, with the first well still being drilled, the government rescinded the contract (Bermúdez 1963).

expenditures incurred and would receive between 15% and 18% of the production during a twenty-five year period (Bermúdez 1963).<sup>103</sup>

The loopholes for private participation were closed by 1960, when Article 27 of the Constitution was amended to explicitly state that, with regards to petroleum and other hydrocarbons, “no contracts will be issued and those already in existence will no longer be valid.” Two years earlier, in 1958, a new Enabling Law of Article 27 had been issued stating that only the nation could exploit oil resources. In the words of Antonio J. Bermúdez (1963), the Pemex director-general between 1946 and 1958, at that time “the road to nationalization” was complete.

While no major liberalization would take place in petroleum *per se*, the domestic gas industry was partially liberalized in the 1990s. In 1995, the government of Ernesto Zedillo orchestrated a reform to the Petroleum Law to allow private entities to participate in the domestic market for transportation, storage, and distribution of natural gas.<sup>104</sup> The exploration, production, and processing of gas, however, remained under exclusive control of Pemex.

### *3.3 Production profile*

A third way to classify the history of Pemex follows from the level of crude oil production of the company. In this regard, several major stages can be distinguished as well. First, between 1938 and the early 1970s, Mexico did not have large potential reserves. Production was low and scarce resources were channeled to developing a domestic refining and distribution network that could satisfy the growing energy needs of

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<sup>103</sup> In 1952, the Attorney General’s office issued an opinion stating that the contracted did not violate constitutional restrictions (Bermúdez 1963).

<sup>104</sup> See the Amendment of 11 May 1995 to the Enabling Law of Article 27 with regards to Petroleum.



the country. This stage became unsustainable in the early 1970s due to two main factors. First, the growth rate of the domestic demand for fuels surpassed the company's capacity to replenish reserves (see Chapter 6). Second, the world price of oil increased drastically.

The second stage, from 1976 to 1981, corresponded to a period of rapidly rising production. Fields discovered in the late 1960s and early 1970s proved to be among the largest in the world. A new management, led by Jorge Díaz Serrano (Pemex CEO from 1976 to 1981), changed the old managerial policy that focused on self-sufficiency (Bermúdez 1976). This led to a significant clash with the Pemex "old guard," who believed that producing for export would jeopardize the long-term energy security of the nation (Díaz Serrano 1989; Székely 1983; Morales, Escalante, and Vargas 1988). In the end, the promise of massive rents accruing to the public treasury was too strong of a temptation for Pemex and the government. The company became a major exporter in the international market while it pursued heavy investments to fulfill its growth potential.

The third stage, from the early 1980s through the mid-2000s, consisted in sustained high levels of production coming from one primary reservoir, a massive field Cantarell in the Gulf of Mexico. During this time, the Mexican government settled on a goal to export an average of 1.5 million barrels per day—which was determined to be the limit of the "absorptive capacity" of the Mexican economy.<sup>105</sup> This level of exports was maintained in spite of growing domestic demand, and it would increase in the early 2000s upon the completion of a major project to increase production in Cantarell.

The fourth stage, which started in the middle of the 2000s, seeks to manage the decline of production in the country. After the peak of 2004, Pemex oil production has dropped at alarming rates. This process has prompted the government and the

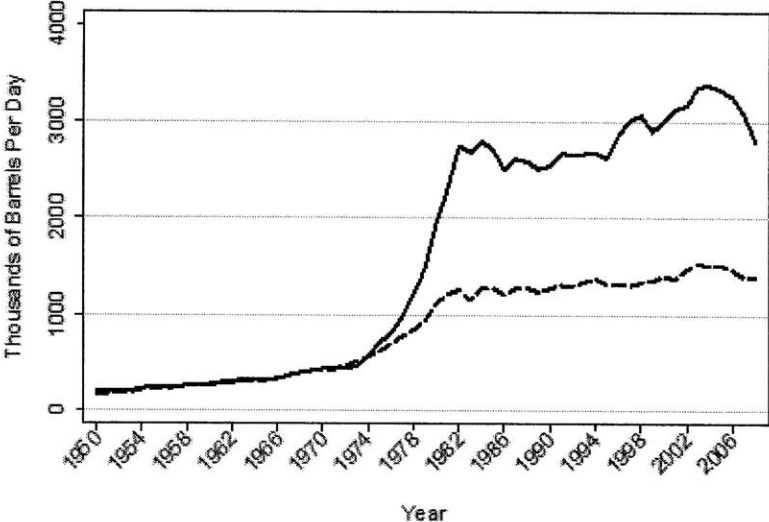
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<sup>105</sup> Author's telephone interview with Pedro Aspe, former Minister of Finance (1988-1994), 13 May 2009.

management to focus on exploration and production in areas of difficult access and to prepare for an eventual transition to becoming a net importer of oil. Figure 3.1 shows the evolution of domestic oil production (top line) and consumption (bottom line) between 1950 and 2008. Figure 3.2 presents the production levels of the Cantarell field, the most important in the history of Pemex.

[FIGURE 3.1 HERE]

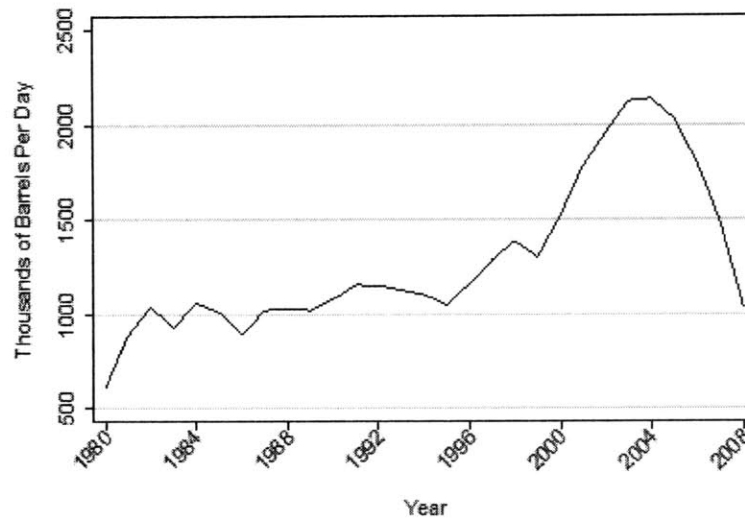
**Figure 3.1 Domestic Production and Consumption of Oil (1950-2008)**



Source: Pemex, Statistical Yearbooks

[FIGURE 3.2 HERE]

**Figure 3.2 Crude Oil Production in Cantarell Field (1980-2008)**



Source: Pemex, Statistical Yearbooks

### 3.4 Relationship with Labor

Industrial relations in Pemex have been difficult from the onset. After all, the expropriation of 1938 followed a period of rising strength and militancy of the oil workers' union. Through the years, the union has persevered to increase its prerogatives, which include high salaries compared to other workers in Mexico and, more importantly, stringent restrictions on the management's ability to hire, dismiss, or even relocate workers.<sup>106</sup> The consequence of the labor relationship is a very high number of workers in comparison to international oil companies (see Table 1.1).

For years, the power amassed by the union was represented by the strength of the leader, Joaquín Hernández Galicia—better known as “La Quina” (Alonso and Roberto López 1986). He rose in prominence as a union leader in the 1950s, and for decades he

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<sup>106</sup> The union's prerogatives are crystallized in the Collective Labor Agreement, a long document that is revised periodically and which has institutionalized a very favorable regime for the union. The most important section, Chapter 2, identifies two types of jobs in the company, “*de confianza*” and unionized. Any job that is not *de confianza* must be filled by recommendation of the union leadership.

focused on two goals. First, since the strength of the union relied on the number of affiliates, he continuously negotiated to increase the number of jobs in the company that were considered “unionized” positions and thus, per the Collective Labor Agreement, could only be filled by someone recommended by the union leadership. Second, he positioned the union so that it would receive a share from procurement contracts—thus safeguarding its financial position. In return, La Quina helped to keep the oil workers under the corporatist control of the ruling PRI and, by extension, of the government.<sup>107</sup>

The principle of co-governance of the company proved unrealistic in practice, as the labor representatives veiled exclusively for the interests of the union. This was the case even in circumstances where enhancing workers’ prerogatives would likely damage the long-term viability of the company. In fact, the presence of labor representatives pushed the management to discuss important issues outside of the Board meetings. Adrián Lajous, for example, recounts that as head of Pemex in the 1990s he “tried to use the Pemex Board meetings for ritualistic issues, but the Board meetings of the subsidiaries [which do not have union representation] for the real management.”<sup>108</sup>

A content analysis of a random sample of Board of Directors meeting minutes conducted for this study shows that, generally, union members only spoke during sessions if workers’ issues were at stake. The methodology of the content analysis is as follows. A simple random sample of 10% of all the Board of Directors’ meetings held between the beginning of the López Portillo administration (1 December 1976) to the end

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<sup>107</sup> Grayson (1988) documents the controversy regarding alleged high levels of corruption in the union with regards to the allocation of procurement contracts.

<sup>108</sup> Author’s interview with Adrián Lajous, Mexico City, 7 July 2008. In the late 1970s, Board meetings were even less important for the management of the company. Ricardo García Sáinz, who was a designated Board member in the late 1970s as Minister of Planning and Budget under López Portillo, states: “We wouldn’t even meet. We would meet only to fulfill some legal requirement, when there was a need to do sign a paper that required the Board’s approval.” (Author’s interview with Ricardo García Sainz, Mexico City, 17 July 2008.)

of the Fox administration (1 December 2006) was selected using a random number generator in a computer program.<sup>109</sup> This represented 18 out of 181 meetings. These meeting minutes were then read and coded based on several criteria. One of these was whether or not a union representative spoke in a meeting and what he or she said. Labor representatives participated in 50% of the sample (9 out of 18), but rarely to comment on the long-term health of company. Instead, their comments focused mostly on issues pertaining to the union.

One example, from the Board of Directors meeting of 10 December 2003, is illustrative of the participation of the union. The actual entry in the minute of the meeting is below:

Pablo Pavón [a union representative], right before the end of the meeting, requested to speak “because he had been given the task, by the Secretary-General of the union, to comment in the midst of the Board of Directors” an important issue. The previous day to the Board meeting, “a national newspaper published an imprecise article that discusses some topics that compromise the union’s reputation.” The title of the publication was “Oil Workers’ Union Encloses Petróleos Mexicanos.” He said that “this is worrisome, since it is clear that the article seeks to criticize the union, which has shown its solidarity with Petróleos Mexicanos and with the Nation by accepting revisions to the Collective Labor Agreement that have led to salary increases well below the rise of inflation and the needs and

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<sup>109</sup>Stata 10 was used.

purchasing capacity of the workers.” He asked for the solidarity of Petróleos Mexicanos so that a clarifying statement could be issued.

Twice, the government has pushed back to restore a more flexible labor structure for the company. The first, referenced above, occurred in 1947 under the Pemex administration of Antonio J. Bermúdez (Alonso and Roberto López 1986). The second one took place in 1989, early in the presidential administration of Carlos Salinas, and led to the removal of La Quina from the union.<sup>110</sup>

Ironically, in spite of the popular conception of the strength of the union, labor leaders were rapidly dismissed in both occasions and union prerogatives curtailed. Francisco Rojas cautions against blaming the union for all the problems in the company and points out to the low strength of the union during his administration as proof that it is possible to dismiss workers who do not increase productivity. “We’re the ones who have created the myth of the union,” he explains. “Why were we able to cut back the size of the workforce in half? Why were we able to re-write the collective labor agreement? Why can’t they do these things now?” Additionally, he emphasizes that the payroll has historically been very small with relation to the company’s revenues—approximately 4%.<sup>111</sup>

The relative weakness of the union lasted until the year 2000. In that year, negotiations with the leaders that replaced La Quina led to an increase in the type of jobs

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<sup>110</sup> This event became known in the Mexican political lore as “El Quinazo,” and the word would later become a common term to refer to a major action by a president to assert his authority early in the administration. La Quina was imprisoned after a controversial legal process (Hernández Galicia 2000).

<sup>111</sup> Author’s interview with Francisco Rojas, Mexico City, 30 July 2008. Adrián Lajous commented that “everyone was always very afraid of the power of La Quina, but when he was finally removed by the government, nothing happened” (author’s interview, 7 July 2008).

under control of the union. Three years later, in 2003, the union threatened to go on strike, but the impasse was resolved. By 2010, the number of workers and the union prerogatives were similar to those in place in 1989.

#### **4. The Policy Value of Pemex for the State**

##### *4.1 Fiscal Policy*

Arguably, the policy value of Pemex has been highest in the fiscal realm. The development of Cantarell in the 1970s coincided with the rise in the international price of oil and, almost overnight, brought vast sums of foreign exchange to the Mexican government. Since the presidential administration of José López Portillo (1976-1982), all Mexican governments have heavily relied on the proceeds of oil exports to finance their activities.

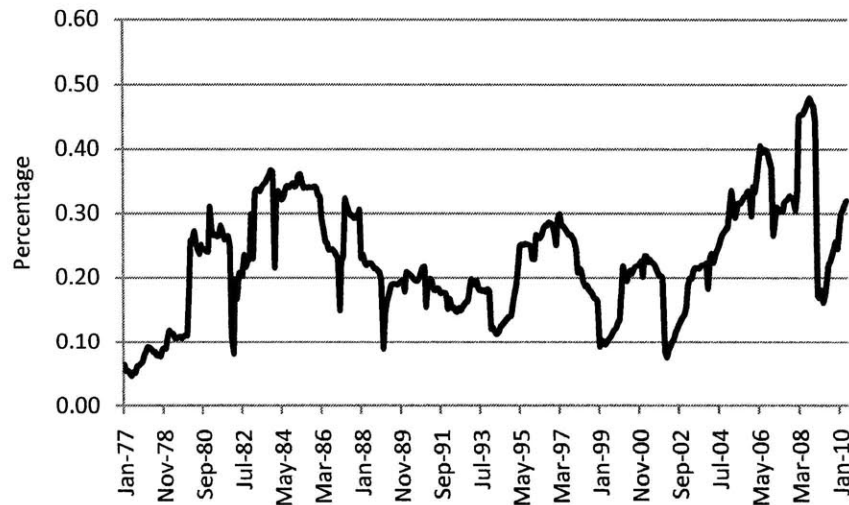
[FIGURE 3.3 HERE]

Figure 3.3 shows the percentage of government revenues coming from duties levied on Pemex (excluding taxes on gasoline consumption). A dramatic rise takes place in 1980, when as much as one-third of the federal budget is financed by the oil sector. Swings in the price of oil and the volume of exports made the percentage fluctuate in the 1980s and 1990s between 10% and 30%, before reaching a staggering 48% in September of 2008.

Fiscal extraction from Pemex rose continuously in the 1980s and 1990s. The Ministry of Finance (known in Spanish as *Hacienda*), in control of government revenues,

also acquired control over the finances of Pemex. Adrián Lajous explains that “Pemex’s budgetary decisions were made based on macroeconomic objectives... It wasn’t that Hacienda wanted to bureaucratize Pemex. It was that we were in such a difficult financial situation that questions of short-term financial equilibrium were central.”<sup>112</sup> As taxation from other sectors of the economy decreased, the Ministry searched deeper into Pemex to compensate for lost income. It would not be until the late 2000s when *Hacienda’s* power to levy taxes and duties on Pemex would be somewhat curtailed—a point which is discussed in greater detail in Chapter 5.

**Figure 3.3 Percentage of Government Revenues from Hydrocarbon Duties (1977-2010)**



Source: Banco de México

Figure 3.4 shows the percentage of total sales revenue that Pemex has paid in taxes and duties to the government from 1950 to 2008. Until the mid-1970s, Pemex was

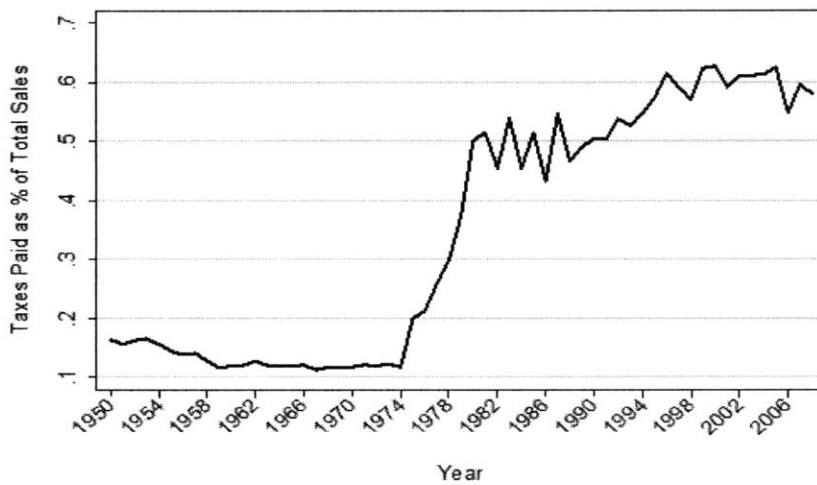
<sup>112</sup> Author’s interview with Adrián Lajous, Mexico City, 7 July 2008.



not taxed very heavily. A spike occurs in the late 1970s, as the Ministry of Finance begins to collect more money. The highest levels occurred during the administrations of Ernesto Zedillo and Vicente Fox, in the late 1990s and early 2000s, respectively.

[FIGURE 3.4 HERE]

**Figure 3.4 Taxes Paid by Pemex as a Percentage of Total Sales (1950-2008)**



Source: Pemex, Statistical Yearbooks

The financial subordination of Pemex to the Ministry of Finance raised many complaints among the company’s managers, who felt that entrepreneurial decision-making was hindered by the lack of investment resources. Francisco Rojas complained that “we reached the extreme where *Hacienda* would tell a productive enterprise like Pemex that it had to spend 35% of its budget in the first quarter of a year and 40% in the last quarter. It is truly insane for *Hacienda* to set rules on how a productive enterprise

should allocate its budget throughout the year.”<sup>113</sup> Adrián Lajous agrees with Rojas and emphasizes that the Ministry of Finance exercised a line-by-line control over the company’s budget.

#### *4.2 Industrial Policy*

Industrial policy in Pemex was pursued actively until the early 1980s. Domestically, the price of fuel was heavily subsidized for the benefit of industrial and household customers (Bermúdez 1976; Meyer and Morales 1990). Additionally, national engineering firms were often preferred when awarding procurement contracts. With regards to international marketing, Pemex offered supply contracts to several country—primarily Japan and France—in exchange for pledges to pursue foreign direct investment and participate in technological exchange programs (Wionczek, Shinohara, and Serrato 1982; Snoeck 1988).

The economic policy program in Mexico at the time, import-substitution industrialization (ISI), viewed industrial policy favorably. Import-substitution was a fundamentally statist paradigm, marked, as Baer (1972) points out, by

[P]rotective tariffs and/or exchange controls; special preferences for domestic and foreign firms importing capital goods for new industries; preferential import exchange rates for industrial raw materials, fuels and intermediate goods; cheap loans by government development banks for favored industries; the construction by governments of infrastructure especially designed to complement industries; and the direct participation

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<sup>113</sup> Author’s interview with Francisco Rojas, Mexico City, 30 July 2008.

of government in certain industries, especially the heavier ones, such as steel, where neither domestic nor foreign capital was willing or able to invest. (p. 98)

The Mexican government implemented ISI vigorously between the presidential administrations of Adolfo Ruiz Cortines (1952-1958) and Jose López Portillo (1976-1982). All of these governments were generally associated with a left-of-center ideology, which at the time was dominant in the ruling PRI. However, in the 1980s, a generational change would bring new leaders that espoused a different set of economic views.

Scholars of Mexican economic policy argue that the transition in the balance in the ruling coalition's support from import-substitution industrialization to neoliberalism—which advocated the retrenchment of the government from industrial promotion—occurred in 1986, when Gustavo Petricioli was appointed to lead the Ministry of Finance replacing Jesús Silva Herzog (Babb 2001). Petricioli had studied economics in the *Instituto Tecnológico Autónomo de México* (Autonomous Technological Institute of Mexico, known as ITAM), a private university that had been the bastion of neoliberal economic thinking for some time. Silva Herzog, on the other hand, had been trained in the National University and represented the “old guard,” looking more favorably at the role of the state in the economy (Babb 2001; Camp 2002).

From that point forward, Ministers of Finance have come from the ranks of ITAM, and several of them have received doctorates from the Department of Economics of the University of Chicago—perhaps the best known neoliberal training institution in the world. This was the case of Francisco Gil Díaz, minister between 2000 and 2006, and

his immediate successor, Agustín Carstens. While industrial policy did not fully disappear, the government entity in charge of approving Pemex's budget had an ideological aversion towards it.

#### *4.3 Political Patronage Objectives*

An analysis of the policy value of Pemex cannot neglect the negative aspects of the company's policy utilization. Pemex has a long history of corruption that has tarnished the reputation of the company considerably. Moreover, since it operates in most parts of the country, Pemex is wide open to pressures for political favor from both local- and national-level politicians.

One of the most infamous scandals involving Pemex and the pursuit of political or electoral gain occurred in the year 2000, in the midst of that year's presidential election. In what would later become known as the "Pemex-gate," the administration of Vicente Fox accused high-level officials in the Zedillo administration, in particular the CEO of Pemex at the time—Rogelio Montemayor—and the top leaders of the oil workers' union, of embezzling millions of pesos and illegally transferring them to the war chest of the PRI's presidential candidate.<sup>114</sup> In all likelihood, that incident was just the most visible one of many that occur away from the attention of the media and that hurt both the company's business efficiency and *Hacienda's* revenues.

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<sup>114</sup> See "Mexico's Attorney-General is investigating allegations of money laundering," *Petroleum Intelligence Weekly*, 28 January 2002.

## 5. Conclusion

This chapter has provided an overview of Pemex, including the history of its founding, its symbolism for the Mexican public and the political elite, and its value as an instrument of policy. The objectives have been two-fold. First, this chapter has sought to explain the common features to all the subsidiaries of the firm, so that an analysis of the differences among these different companies can focus on the differences. Second, it has attempted to underscore the importance of the petroleum industry to the Mexican state and the people.

Since its creation in 1938, Pemex has changed in significant ways. In terms of its corporate structure, it was split from a fully vertical enterprise into a group of relatively autonomous subsidiaries coordinated by a corporate office. The participation of the private sector in company activities also changed, once risk agreements were disallowed in the 1950s. With regards to production, Pemex discovered massive fields in the 1960s and 1970s that turned Mexico from a slight importer to one of the most important oil regions in the world. As a result, Pemex in the 2000s was much larger and more influential in the international oil industry than it had been in the 1940s, 1950s, and 1960s.

At the same time, by 2010, seven decades after its founding, much remained constant in the company. As the demonstrations led by the *Adelitas* showed, petroleum affairs in Mexico remained highly symbolic for the population at-large and could easily triggered popular mobilizations. Additionally, the company's relationship with the union continued to be tense. Throughout the history of the company, labor representatives sat in the company's board of directors; yet, their role as a co-governing party was curtailed by

their understandable incentive to advocate for greater union prerogatives first and foremost.

Finally, in its role as one of the most important state-owned enterprises in the country, the Mexican state continued to utilize Pemex as an instrument of policy. The type and extent of policy utilization, however, varied over time. Starting in the late 1970s, but especially in the 1990s and 2000s, Pemex became the preeminent fiscal policy tool of the Ministry of Finance. Previously, it had played an explicit industrial development role that was attenuated after the mid-1980s. Furthermore, governments used Pemex as a vehicle to increase their clout over political clienteles throughout the country and to channel resources away from productive activities in order to influence elections.

The next three chapters present detailed accounts of the subsidiaries of the company, following the sub-organizational analytical method that was described in Chapter 1. In the following chapter, Pemex's international marketing branch, PMI, is examined. Subsequent chapters discuss the history of the exploration and production subsidiary and the two downstream branches: Pemex-Gas and Pemex-Refining.

## **CHAPTER 4**

### **HOW PMI BECAME A SUCCESSFUL COMMERCIAL ENTERPRISE**

#### **1. The Argument in Brief**

The history of *PMI Comercio Internacional* (PMI, for short), the international marketing and trading of Pemex, illustrates a wide range of outcomes of the theoretical argument advanced in chapter 2 and provides an opportunity to observe the mechanisms that led a state-owned enterprise to attain high levels of business efficiency. The path towards becoming a successful commercial enterprise, however, was not without hurdles. In fact, the history of PMI reveals how a combination of exogenous shocks and endogenous political development transformed a government entity over the course of thirty years.

This chapter makes the following arguments. First, PMI evolved from a disorganized branch into a highly specialized, productive, and innovative commercialization organization. Second, market competition and managerial specialization—at different points in time and to different degrees—contributed to improve the firm's efficiency and decrease the government willingness and ability to introduce political intervention that was not aligned with the business interests of the company. Third, starting in the mid-1980s, PMI has not been utilized as an instrument of industrial policy. In the late 1970s and early 1980s, the government sought to exchange supply contracts for foreign direct investment (thus promoting domestic industrialization), but soon after the rise to the presidency of the conservative government of Miguel de la Madrid in 1982, the company's goal centered strictly on maximizing government revenues.

The case of PMI shows the effects of changes in the level of market competition on the behavior of a state-owned enterprise. Over time, the international oil market has moved from periods when demand for oil outpaces supply to others when a supply glut pushes prices down. The latter are instances of high competition, as firms must excel in their practices to displace rivals in global supply chains. Interestingly, in the period under study, PMI implemented three novel and successful marketing strategies and they all coincided with periods when market competition became more severe. This occurred at three different points in time and under three different directors-general. A close examination into the process leading to those successful innovations opens a window into the incentives for business efficiency brought by market competition and illustrates how a state-owned enterprise from a developing country can achieve world-class levels of performance.

## **2. An Overview of the Business of PMI**

PMI was created in 1989 as a subsidiary company of Pemex out of the General Division of Foreign Trade. For the purposes of this chapter, the Division of Foreign Trade and PMI proper are considered the same organization, since the new subsidiary comprised the same staff and offices as its predecessor. The legal tie to the parent company, however, changed in ways that are more fully described later in the chapter. Previously, commercialization activities were a division of Pemex; starting in 1989, they were conducted by a company controlled by Pemex as its majority owner.

PMI is charged with all foreign trade activities of Pemex, which can be divided into three main categories. First, it sells (i.e., “markets”) Mexican crude in international



markets. Historically, this has been the most important activity of the company. Second, it undertakes “trading” of refined products such as gasoline, diesel, and petrochemicals—but not of crude oil.<sup>115</sup> Compared to marketing, trading constitutes a small part of the business. Third, it looks after Pemex-owned foreign assets, such as refineries, that are operated by partner companies. Regarding marketing, PMI can be compared to other companies that engage in first-hand oil sales—that is, only to companies with oil exploration and production activities. Trading and asset management, on the other hand, are conducted by many different kinds of companies, both standalone trading firms and subsidiaries of oil companies.

PMI, like any marketing branch, faces challenges largely determined by the fact that the international oil market consists in many slightly differentiated streams of crude oil and that customers—the refineries—are customized to process particular types. Some of these crudes are sufficiently similar that the commodity is, in practice, relatively fungible. Other times, crude streams vary considerably and refineries can only process them profitably if they undertake costly and lengthy capital investments. For example, those companies that produce more viscous crude (called “heavy,” as opposed to “light”) and with higher sulfur content (known as “sour,” as opposed to “sweet”) pay a penalty since typical refineries using them are unable to yield high percentages of gasoline, diesel, and jet fuel—the refined products that command the highest market value.<sup>116</sup>

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<sup>115</sup> “PMI does not make trades with speculative purposes, only for hedging purposes,” explained a trader in PMI. Author’s interview, Mexico City, 17 April 2008.

<sup>116</sup> These are measured in terms of the viscosity of the oil (measured in degrees API, after the classification of the American Petroleum Institute, where higher degrees indicate “lighter,” less viscous, oil) and the content of metals, particularly sulfur, which are generally corrosive to refineries and thus decrease the value of each barrel. Heavy, sour crudes are considered “specialty”—as opposed to general purpose—crudes. They are different because they carry “a very high value in specialized plants and a considerably lower value in general purpose refineries” (Boué 2002, p. 11).

Marketing success relies on commercial strategies for both spot sales and the development of long-term supply contracts. Competitiveness is not only achieved via the price and quality of the product, but also with the quality of the service. In the international oil market, reliability of the supplier carries value—since it diminishes supply risk for the refinery (Boué 2002). Customers that feel unfairly treated at times of excess demand may be more willing to make investments to switch to other crudes or may make negotiations more difficult during cyclical periods of oversupply.

Thus, the tools to develop commercial strategies are varied. The fact that refineries are customized to process certain types of crude oil allows marketing companies to engage in spatial arbitrage. Arbitrage consists in exploiting short-term differences in the price for the same product. In the case of heavy oil, a company like PMI may choose to raise its price for a geographic region—say, the Gulf Coast of the United States—where demand is temporarily higher while keeping it lower for Europe or Asia. In these instances, additional costs and delays due to transportation ensure that the price discrepancy does not close instantly.

In theory, PMI could also engage in time arbitrage, increasing its inventory of crude oil when its price relative to that of a competitor's price is low and selling the inventory when it is high. However, the high costs of carry discourage this practice. Bernardo de la Garza, chief of crude oil marketing at PMI from 2001 to 2010, explains as follows:

The basic problem that I face is that I have the obligation to sell all of the company's production each month. If I do not sell all the crude oil that I

am supposed to and thus lead to a situation of high inventories, the cost is higher than if I underpriced slightly and sold the extra oil. The issue is how to play with the price so that you meet the objectives of clearing the market and maximizing value. In this tradeoff, there are cents at stake; but when you are placing 1.7 million barrels of crude in the market every day, cents make a big difference.<sup>117</sup>

The quality of the products is generally fixed, pre-determined by the geological conditions of the reservoirs. Still, a marketing company may blend different crude streams and put to market a product with higher captive demand. Other times, marketing companies will pursue upgrading projects in conjunction with their E&P counterparts and pre-process the crude into a lighter blend before shipping it to the customers.

In short, there are several paths to improve a company's competitiveness as it seeks to meet the dual goals of price and volume maximization. Innovations in commercial strategies result when a company develops a new mechanism to create and exploit price arbitrage opportunities or to improve the quality of its service. As the rest of this chapter makes clear, the innovations of PMI have occurred precisely in the moments when market competition has increased.

Since the early 1980s, most of Mexican oil production has consisted of a heavy, sour crude stream labeled "Maya," originating in the supergiant Cantarell field off the Bay of Campeche, which has API gravity of 21.8 and 3.33% sulfur. For comparison, the

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<sup>117</sup> Author's interview with Bernardo de la Garza, Mexico City, 7 April 2008. If production decisions are made in conjunction with marketing strategies, then production could be curtailed at the wellhead based on the outlook of the market. However, this is generally not the case, given the time lag involved in making such production decision, which would likely eliminate the arbitrage window.

benchmark crude West Texas Intermediate (WTI)—a light, sweet crude—has an API gravity of 39.6 and 0.24% sulfur. Production of Maya rose steadily in the early 1980s, stabilized later in the decade, and rose again considerably in the late 1990s and early 2000s. In the 1990s and 2000s, Maya was one of the most important crude streams in the world. In the year 2006, for example, only two other streams of crude oil were produced in greater volumes than Maya: Russia's Urals and Saudi Arabia's Arabian Light.<sup>118</sup> Mexico also commercializes the lighter crude streams Olmeca and Isthmus, although in smaller volumes, and often these are blended with heavier crudes to produce a Maya-like crude.

Figure 4.1 shows the long-term trend in exports of Maya from 1980 to 2010. From an average slightly below one million barrels per day throughout the 1980s and 1990s, the level of exports grew rapidly in the early 2000s, peaking in 2003 and then declining. Production from the Cantarell field has declined even more rapidly (Adrián Lajous 2009), but Pemex has chosen to blend heavier crudes from different fields with light crudes to produce a Maya-like mixture. This commercial strategy has maintained a higher level of exports.

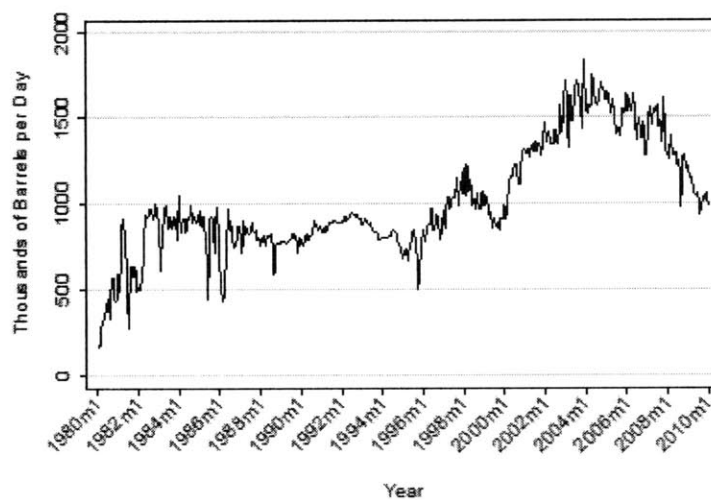
[FIGURE 4.1 HERE]

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<sup>118</sup> Source: Energy Intelligence, 2007, *The Crude Oils and their Key Characteristics*, available online at [http://www.energyintel.com/DocumentDetail.asp?document\\_id=200017](http://www.energyintel.com/DocumentDetail.asp?document_id=200017) (accessed on 7 April 2010).

Figure 4.2 displays the nominal monthly F.O.B. price of Maya from 1983 to 2010.<sup>119</sup> Figure 4.3 shows the difference in the average monthly prices of WTI (spot price at Cushing, Oklahoma) and Maya (F.O.B.). Throughout the entire time period, Maya has sold at a discount with regards to Maya due to its inferior characteristics. Yet, the gap has widened or narrowed at different points due to oil market “fundamentals” of supply and demand, as well as commercial strategies adopted by PMI.

**Figure 4.1 Total Exports of Maya Crude (1980 – 2010)**

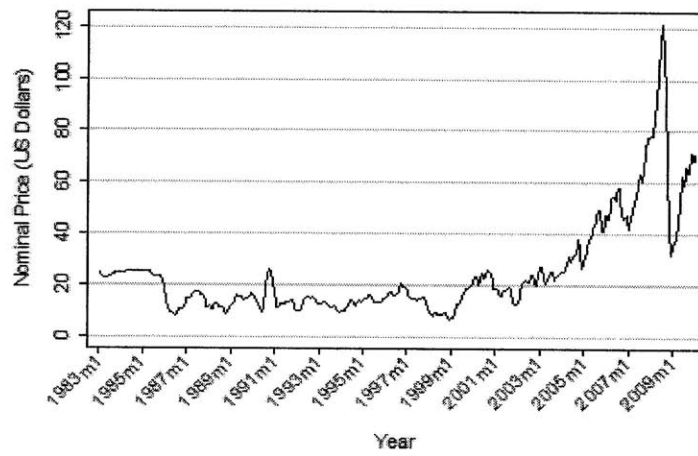


Source: Pemex

[FIGURE 4.2 HERE]

<sup>119</sup> The term FOB means “free-on-board” and denotes the price of a cargo at the port of shipment, exclusive of transportation costs. When the latter are included in the price, this is generally referred to as “landed.” Often times, although not always, transportation costs are paid for by the customer.

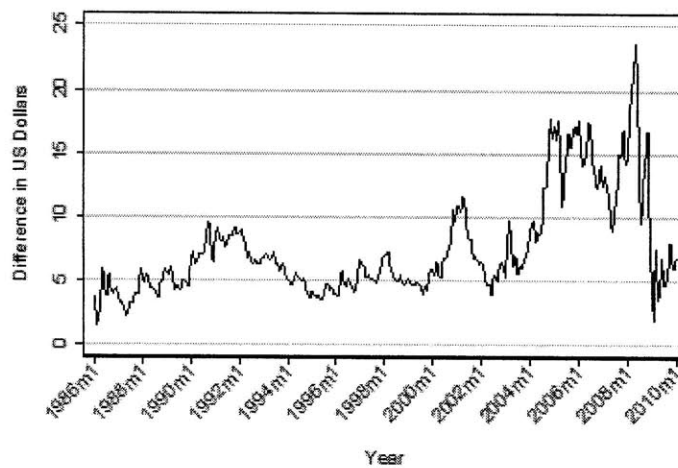
**Figure 4.2 F.O.B. Price of Maya Crude (1983-2010)  
(Monthly Averages)**



Source: Energy Information Administration, U.S. Department of Energy

[FIGURE 4.3 HERE]

**Figure 4.3 Difference in Prices between WTI Spot and Maya F.O.B. (1986-2010)  
(Monthly Averages)**



Source: Energy Information Administration, U.S. Department of Energy

### 3. Measurement of Variables

How to measure the relevant dependent and explanatory variables? As mentioned in chapter 2, some variables are intrinsically different depending on the segment of the value chain under study. That is, market competition in exploration entails different activities than in refining and so on. Additionally, in other instances, there is an explicit choice not to quantify variables that are inherently qualitative or for which data is not available and expert opinion provides as good a metric as possible. Nevertheless, an attempt is made to be clear regarding the methodology employed in all cases.

#### 3.1 *Business Efficiency*

The efficiency of PMI's marketing and trading activities is done qualitatively, based on the opinion of Mexican and international experts. Additionally, productivity and innovation in marketing are gauged quantitatively by comparing the price of the main Mexican export, Maya, to a relevant counterfactual—in this case, the benchmark crude known as Alaska North Slope (ANS). If PMI's behavior were assessed based only on the price of Mexican oil, it would not be possible to disentangle changes due to fluctuations in the global oil market from those due to the implementation of commercial strategies. The causes of these changes are identified thanks to the econometric analysis of a time series of monthly price and volume data for Maya and international crudes from 1983 through 2009. Some of the findings are included in the text throughout the chapter, and the full methodological discussion is provided in Appendix A.<sup>120</sup>

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<sup>120</sup> The econometric technique used is a combination of vector-autoregression and intervention analysis (here labeled VARIA). The essence of vector-autoregression analysis consists in estimating the relationship among variables that are jointly endogenous, such as supply, demand, and prices. Intervention analysis simply tests for whether the implementation of a policy changes the mean of a (detrended) series.

These results are also compared to those previously published by Boué (2002), measuring the success of PMI relative to that of its main competitor in the market for heavy, sour crude: Venezuela's *Petróleos de Venezuela (PDVSA)*. Quantitative analysis of trading practices is not possible due to the confidentiality of the transactions. In any event, as explained above, trading has not traditionally been as significant for PMI's business volume as marketing.

### *3.2 Non-Commercial Policy Outcomes*

Policy outcomes in the case of the commercialization subsidiary can take several forms. An industrialist orientation seeks to use oil pricing and the allocation of contracts towards the promotion of domestic industry. A lower price, for example, can be negotiated in exchange for the commitment to make a direct investment in the country or to enter into a technological supply agreement. In the absence of industrial policy, no extra-commercial supply agreements are made.

Data on supply contracts are generally not publicly available, thus complicating a systematic quantitative assessment of policy outcomes. Hence, participant accounts and secondary sources are used to determine whether or not extra-commercial *quid pro quo* clauses were included.

### *3.3 Market competition*

The case of PMI is unique among those included in this study, from a methodological standpoint, for two reasons. First, the presence of a competitive market environment does not depend on decisions made by the Mexican government or by



Pemex that could be regarded as endogenous to the subsidiary's performance. PMI's mission has been to commercialize crude oil and to trade oil products in the international market, and the degree of market competition has thus been outside its control. Second, the degree of market competition in the international milieu has changed several times—sometimes drastically—thus permitting a systematic analysis of the effects of different levels of competition on the performance of the company and on the capacity of the government to intervene in its internal operations.

Market competition in the international oil market is measured as follows. Qualitatively, industry specialists have identified the times when market competition is high or low based on the ease with which they can sell crude in the market. Adrián Lajous, who was chief of the Division of Foreign Trade between 1982 and 1988 and who would later become director-general of Pemex, speaks in terms of “inflection points” where the market shifts from a “sellers’ market” to a “buyers’ market” and viceversa.<sup>121</sup> A consensus on these points exists in the secondary literature, as follows:

- 1973: Change of regime (Parra 2005; Yergin 1991)
- 1979: Decrease of competition (Parra 2005)
- 1981: Increase of competition (Parra 2005)
- 1985-86: Increase of competition (Lajous 2006; Mabro 1987)
- 1998: Increase of competition (Mabro 1998)
- 2002-03: Decrease of competition (Fattouh 2010)

The use of a quantitative measure generally confirms the cutoff points above. A measure of competition must capture the swings in the difficulty of oil companies to sell

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<sup>121</sup> Adrian Lajous, personal interview, Mexico City, 7 July 2008.

barrels at the margin.<sup>122</sup> An intuitive method to estimate increases in international competition would be to analyze the balance of global petroleum supply and demand. In periods of global economic expansion, the demand for oil increases and, all else held constant, competition decreases. By contrast, during global downturns, competition increases as the demand for oil shrinks.

Unfortunately, monthly data for this indicator is unavailable for most of the period under study and a proxy must be used instead. Under the reasonable assumption that oil supply is fixed in the short run, changes in global aggregate economic activity provide a good approximation.<sup>123</sup> When economic activity rises, so does the demand for crude oil. Following Kilian (2009), global aggregate industrial activity is measured by taking the natural logarithm of average shipping freights around the world.<sup>124</sup>

Letting periods of high demand (i.e., low competition) be those for which the values are one standard deviation above the mean, and focusing only on the 1980s (i.e., to avoid potential issues with the volatility of the 1970s), the threshold is crossed in October of 2003. After that month, most monthly time periods are above one standard deviation

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<sup>122</sup> The standard indices used in the industrial organization literature to measure competition—such as the concentration ratio of the four largest companies or the Herfindahl-Hirschman Index—are not as helpful for our purposes given that those are intended to gauge the presence of oligopolistic competition. Few, if any, dispute that the oil market is not perfectly competitive.

<sup>123</sup> Changes in supply help determine the competitiveness in the market as well, although in the oil industry they have historically been less helpful. As Kilian (2009) explain, oil supply decisions usually respond slowly to changing market environments. In fact, Kilian argues that, in the short-run, the oil supply curve is perfectly inelastic. The implication is that increases in global demand are only slowly met by increasing production. Kilian's interesting finding is that supply shocks have a very temporary effect on prices. However, there have been moments where an exceptionally high increase of crude appears to enter a particular submarket, such as when Mexican oil exports rose sharply beginning in 1999-2000.

<sup>124</sup> Shipping freights rise when global economic activity increases and decline during times of global recessions. Kilian (2009) argues that "it is widely accepted that world economic activity is by far the most important determinant of the demand for transport services" (p. 1055). See Appendix A in this dissertation for a more detailed explanation.

until September of 2008.<sup>125</sup> Conversely, the critical months for low demand (i.e., high competition) are considered to be those that are one standard deviation below the mean. These are between July of 1985 and February of 1987, between February of 1998 and July of 1999, between August of 2001 and August of 2002, and after November of 2008. While these figures come from one particular proxy for global demand for oil, it is reassuring that they roughly match the assessments of industry analysts.

Pemex entered the international market as a seller in 1975. Between 1972 and 1974, Mexico was a net importer of oil, and previously its production barely met domestic consumption needs. The timing was advantageous if the objective was to maximize rents: oil prices were high and market competition was low. Afterwards, the global level of competition changed four times: in 1981, 1985, 1998, and 2003. The first three times competition increased; the fourth, it decreased.

### *3.4 Managerial Cohesion*

Unlike market competition, specialization cannot be introduced by a rapid exogenous shock. Instead, by definition, it results from a long and gradual process. Accordingly, the presence or absence of high managerial cohesion is more complex, and the identification of the effects on the behavior of the company are more controversial—albeit not less important. In fact, identifying the presence of cohesion is very different from market competition in the sense that the exact moment of the change is unclear. Nevertheless, it is possible to identify moments of high and of low cohesion, even if there are gray areas in between.

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<sup>125</sup> This cutoff roughly corresponds to the beginning of the global financial crisis. The investment bank Lehman Brothers filed for bankruptcy precisely on that month.

As explained in Chapter 2, several questions are useful to assess the degree of cohesion of the managers of the company. Have most of the managers worked together for a long period of time? Do they share a common technical language, as members of the same profession usually do? Do they share experiences of high risk that developed bonds among themselves? Are the managers a small group that belongs to the same social circle or is their life outside of work independent of each other?

The assessment of the level of managerial cohesion in this chapter is made qualitatively. Managerial cohesion in the late 1970s and early 1980s is low. In the early to mid-1980s, a process of professionalization of the staff is undertaken. Managers and staffers acquire technical knowhow, and the younger, better trained generation begins to replace the older one. By the early to mid-1990s, PMI has achieved a high level of specialization. A small group of staffers has moved up through the ranks of the company and has learned advanced techniques on trading, refining economics, and crude oil markets. By 2010, this high level of cohesion remained high.

Cohesion, however, has likely been lower than in Pemex-Exploration and Production. There is no dominant profession in PMI. In 2008, the director-general was a chemical engineer, and the deputy directors included a lawyer, an economist, a specialist in business administration, and another chemical engineer. Yet, specialization in the analysis of the oil market is high and promotions are almost always made from within. Working in a small environment, managers of PMI develop a strong professional bond from the moment they join the company. For many of them, PMI has been their only employer, 15 or 20 years after graduating from college.

### *3.5 Auxiliary Variables*

In the history of the relationship between the Mexican state and PMI, fiscal jeopardy played an important role to diminish the willingness of the politicians to introduce non-aligned government intervention in the operations of the firm. The high need for fiscal revenues increased the stakes of errors in marketing decisions, and politicians were less willing to upend the recommendations of the technical staff. For theoretical purposes, this variable enhances the effect of market competition in diminishing the willingness of the politicians to get involved in technical decisions.

Moments of fiscal jeopardy can be measured qualitatively based on participant accounts. In their memoirs, Presidents De la Madrid and Salinas both emphasize the moments when they thought that a moratorium on debt payments was an imminent possibility. These accounts, however, can be complemented with a simple quantitative analysis. Figure 4.4 presents the monthly averages from 1980 to 2010 of the net debt of the Mexican public sector, shown in 2002 constant prices (adjusted using the Mexican Consumer Price Index). It is not until early the 1990s that the deficit declines considerably, after a sustained high level beginning in 1982 and a peak in early 1987.

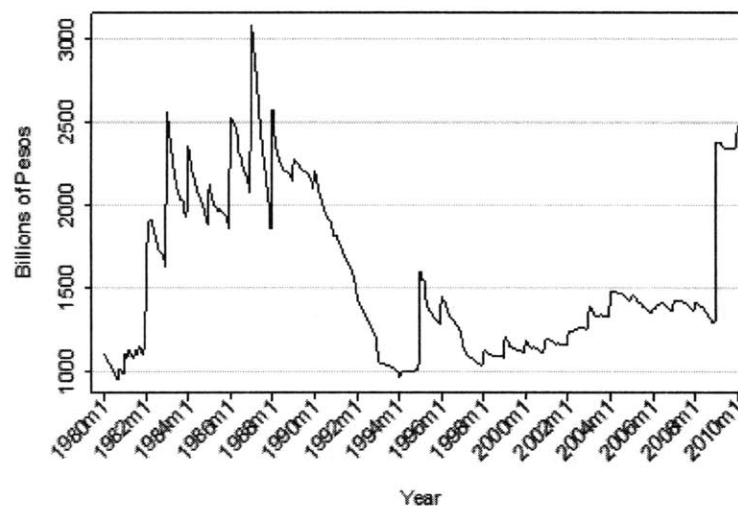
[FIGURE 4.4 HERE]

## **4. Summary of the Evolution of PMI Across Time**

PMI evolved over time as it became an efficient state-owned enterprise. This section describes the variation in the main explanatory variables—market competition, managerial cohesion, and political ideology—and shows how these changes led to

different outcomes in terms of economic efficiency and policy orientation. As the reader may recall from chapter 2, market competition and managerial cohesion jointly help to determine both the capacity of the firm to perform efficiently and the ability of the government to intervene in the internal operations of the SOE. Likewise, political ideology and the government's willingness and ability to intervene in the firm determine its policy orientation.

**Figure 4.4 Deficit of the Mexican Public Sector (1980-2010)  
(2002 Constant Prices)**



Source: Banco de México

Table 4.1 describes the qualitative changes in market competition and managerial cohesion over time. The high-high quadrant leads to a firm that behaves like a commercial enterprise, the low-low quadrant leads to a firm that behaves like a government agency, and the high-low and low-high quadrants lead to intermediate outcomes. In these latter instances, the capacity of the government to intervene in the company is moderate, and the performance of the firm is lacking in at least one regard.

[TABLE 4.1 HERE]

**Table 4.1 Evolution of Market Competition and Managerial Cohesion**

		Market Competition	
		Low	High
Managerial Cohesion	Low	1976-1981	1981-1985
	High	2003-2010	1985-2003

**Table 4.2 The Policy Utilization**

		Industrial Policy Mandate	
		Low	High
Non-Aligned Gov't. Intervention	Low	1986-2003	1985-1986
	Moderate	2003-2010	1981-1985
	High	1976-1981	

Table 4.2 describes the changes in the political ideology of the government and how these interrelate with the government's intervention in its internal operations. The

ideological placement is determined by the ruling coalition of the country. It is worth pointing out that the case of PMI does not allow examining one type, a rightist ideology with a high level of non-aligned interference. Similarly, the instance of an industrial policy mandate with a low level of intervention covers only one year and thus does not provide as rich an account as the other cases in the table.

[TABLE 4.2 HERE]

## **5. A Political and Economic History of PMI**

### *The price cut that cost a presidency*

On June 1, 1981, Jorge Díaz Serrano, the director-general of Pemex, made a decision that would cost him his job, an eventual run for the presidency, and ultimately, his liberty. As head of Pemex, he brought down the price of Mexican crude sold in international markets by 11.5%. The decision, he argued, was of vital importance to keep Mexican crude competitive.

The move offered rivals in the highest political circles the opportunity to try to topple him. José Andrés de Oteyza, the Secretary of Patrimony and Industrial Promotion, strongly criticized the Pemex director with President López Portillo (Díaz Serrano 1989). Lowering prices, Oteyza argued, showed that Díaz Serrano was pandering to U.S. interests, undermined Mexico's commitment of solidarity towards the Organization of



Petroleum Exporting Countries (OPEC), and, more importantly, would hurt the government's revenue base at a time of rising financial instability (Buendía 1985).<sup>126</sup>

López Portillo, aware that the economy was slipping into the worst economic crisis in decades, was already concerned about Díaz Serrano's power. Pemex, as some observers argued, had become "a state within the state."<sup>127</sup> Yet, Díaz Serrano was the president's childhood friend, and during the last few years had turned Pemex from a small company into a global oil giant. He was the leader of the petro-boom: a sort of Mexican Midas.

According to the unwritten rules of the Mexican political system, the outgoing president had the prerogative to handpick the candidate of the ruling Institutional Revolutionary Party (PRI).<sup>128</sup> The PRI's candidate was virtually assured to win the presidency, as the party customarily used all legal and extra-legal means to win elections (Gómez Tagle 1994; Craig and Cornelius 1995). Oteyza and other prominent members of the cabinet feared that Díaz Serrano was López Portillo's favorite to win the nomination; with elections a year away, time was running out for the detractors of the Pemex chief executive.

Tragedy soon beset Díaz Serrano. On June 6, 1981 he was forced to present his resignation to the Board of Directors of Pemex. The president's friend was removed from

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<sup>126</sup> Oteyza testified on June 16, 1981 in the Mexican Congress and spoke extensively against what he considered to be Díaz Serrano's poor business judgment. Miguel de la Madrid recalled in particular the claim that Díaz Serrano's decision was weakening OPEC's market position (Castañeda 1999).

<sup>127</sup> Riding, Alan, "The Political Background of Resignation at Pemex," *The New York Times*, 8 June 1981, p. D1.

<sup>128</sup> Jorge Carpizo (2002), who served as attorney-general and secretary of the interior during the Salinas presidency (1988-1994), wrote in reference to the twentieth-century Mexican political system: "The actual head of the PRI is the president of the country, and no one denies or doubts this... The fact of being the actual head of the PRI gives the president a series of prerogatives that go beyond those outlined in the constitutional framework, which are, as we have mentioned before, the designation of his successor, the appointment of governors, senators, of the majority of the deputies, of the principal municipal presidents..." (p. 191).

the political scene in Mexico City and appointed Ambassador to the Soviet Union. On September 22, Secretary of Planning and Budget Miguel de la Madrid, an ally of Oteyza, was selected as the candidate of PRI, and soon after taking office in 1982 prosecuted Díaz Serrano for alleged corruption charges. On July 30, 1983, then Senator Díaz Serrano was impeached by Congress and put behind bars. He would remain in jail until the end of De la Madrid's administration.<sup>129</sup>

The fate of Díaz Serrano would resonate strongly among the Mexican political elite. José Antonio Ugarte, López Portillo's chief of staff, later would say: "If oil prices hadn't fallen, I have no doubt that [the candidate] would have been Díaz Serrano" (quoted in Castañeda 1999, p. 393). How could everything unfold so rapidly? How could a price cut of 11.5% wreak havoc in the architecture of the Mexican petroleum industry and bring down the top contender for the presidency?

#### *The international petroleum market, 1976-1981*

The commercial policies of Díaz Serrano ought to be understood in the context of the international oil market of the time. It was a time of political conflict in oil-rich regions, apparent scarcity, and rising prices. Díaz Serrano became the chief of Pemex in December of 1976 and never faced difficult conditions in the international market until the crisis that led to his demise.

The peak of the oil crisis ensued after the Iranian Revolution of 1979, which pushed prices to levels never seen before. The high volatility was due to events in the

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<sup>129</sup> Díaz Serrano was accused of embezzlement in the purchase of two oil tankers. The case against Díaz Serrano was highly controversial, and many argued that it was nothing but a political vendetta by De la Madrid. Even though Díaz Serrano's two top lieutenants, Jorge Chavarría and Ignacio de León, fled the country when their massive corruption was exposed, the evidence against the Pemex director-general was weaker.

Middle East in early 1979 that fell upon an industry psychologically predisposed for the worst. As Francisco Parra, former secretary-general of OPEC documents, by 1977 there was a widespread belief among international experts that the world was running out of oil. “The community of energy analysts,” he writes, “was obsessed with the notion that an oil crisis was around the corner, and that it would take the shape of (most likely) physically or (perhaps) politically constrained supplies of oil” (2005, p. 218). In March of 1977, the chairman of the International Energy Agency disclosed the results of an “alarming” internal study that predicted a serious global shortage of petroleum by 1985.<sup>130</sup> Similarly, in an interview published in *The New York Times* a full year before the fall of the Shah, the chairman of the Royal Dutch/Shell committee of managing directors remarked: “It becomes more difficult year by year to meet the potential demand. The crisis is with us now.”<sup>131</sup> Producers worried about early depletion, occurring years in advance of their development timetables; consumers feared spiking prices and armed conflict over scarce resources.<sup>132</sup>

At the time, no reliable international spot market existed to reveal the market clearing price.<sup>133</sup> Instead, the vast majority of oil sales were made by long-term contract and oil producers set prices by decree. It would be years before the New York Mercantile Exchange (NYMEX) and the International Petroleum Exchange of London introduced paper transactions and provided the liquidity necessary to turn the marker crude markets West Texas Intermediate (WTI) and Brent into credible indicators of supply and demand

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<sup>130</sup> “Agency Study Warns of 1985 Oil Shortage,” *The New York Times*, 17 March 1977, p. 96.

<sup>131</sup> “The Crisis No One Believes,” *The New York Times*, 5 February 1978, p. IES6.

<sup>132</sup> There were certainly skeptics regarding the fear of a severe oil shortage. The *Oil and Gas Journal*, for example, published an article in mid-1978 with the title “Global Oil Deficit Seen Unlikely before Late 1980s.”

<sup>133</sup> In fact, OPEC countries had a policy of not selling at all in the spot market, limiting spot transactions to a negligible fringe.

conditions (Yergin 1991). Moreover, the existence of many different varieties of crude—each with its own specific viscosity and content of metals—meant that the relative worth of one particular grade against others was often ambiguous. Countries responded to political considerations and business hunches in order to set prices, hoping not to be undercut by a rival seeking a larger share of the market. To the extent that rigorous technical analysis took place, it was constrained by the lack of reliable statistical indicators.

The Organization of Petroleum Exporting Countries served as a forum where states—many of which had only recently nationalized their industries—could discuss prices and try to cooperate (Ghanem 1986). OPEC had been formed in 1960 as an attempt to form a common front against companies that were perceived to play one country against another in their search for better concessions (Skeet 1988). Once nationalizations occurred, however, oil exporters resorted to OPEC to agree on prices and, subsequently, allocate production quotas among themselves, although with questionable levels of success (Adelman 1980; Parra 2005).<sup>134</sup>

This tradition of “administering” prices came from the time when the so called “Seven Sisters” dominated the international oil market.<sup>135</sup> As vertically integrated companies that controlled most of the production, refining, and distribution facilities, the Seven Sisters determined prices through more or less open production negotiations (Parra 2005). Companies with low crude stocks relative to their refining capacity would call for supply increases, while those with high relative crude stocks would ask for the contrary.

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<sup>134</sup> In 1985, OPEC adopted a market share system to replace its posted price system (Parra 2005).

<sup>135</sup> The “Seven Sisters” was the informal name given to the largest oil companies in the world. These companies were Exxon, Mobil, Chevron, Texaco, Gulf, British Petroleum, and Royal Dutch/Shell. The classic reference on their role in world energy markets is Sampson (1976).

For the most part, the iteration of the exchange across time ensured that petroleum production remained fairly stable and competition was largely relegated to the final product markets. At other times, the Seven Sisters modified crude prices as they sought to transfer earnings to fiscal homes with less onerous tax burdens (Skeet 1988).

When national governments took over their petroleum industries in the early 1970s, they simply adopted the existing pricing system, despite not having the global refining perspective of the private companies to dictate market conditions. After all, their goal was to obtain control of the production decisions, and they were not quite ready to relinquish any of the prerogatives, including setting prices. Perhaps more importantly, they did not know of any alternative price setting mechanism in the oil industry. Parra (2005) writes about these years:

OPEC member countries believed it was their function and prerogative to administer prices. In their experience, oil prices had always been administered... After 1973, it never occurred to them to do otherwise, that is, to leave the settlement of oil prices to the market. There was not even a whisper of discussion of such a possibility from any quarter of the industry. But even if it had occurred to them, it is not at all clear how they would have gone about it. There was no independent free market in crude, such as later developed for North Sea oil, that could provide market-oriented benchmark crude prices or a reference point on which to base term contract prices. (p. 216)

The result of these two factors, fear of early depletion and lack of a reliable market-based price system, was a fragile price-setting regime that began to crumble in January of 1979 with the fall of the Shah. Skeet (1988, p. 151) argues that, in hindsight, the system of administered prices survived in the 1974-1978 period given the capacity of the largest producer—Saudi Arabia—to dictate production goals and the absence of incentives for other members to violate agreements. In December of 1978, OPEC met in Abu Dhabi to agree on a price schedule for all of the following year and announced that the designated marker crude, Arabian Light, would rise from its price of US\$12.77 by an average of 10% every month of 1979.<sup>136</sup> Yet, the price structure changed rapidly the following month.

Throughout 1979, OPEC unsuccessfully tried to keep up with changing market conditions. Iranian production dropped drastically, increasing the fears of scarcity among consumers, and official posted prices kept rising without the apparent coordination of previous years. The speed with which economic and political events unfolded far outpaced the capacity of the cartel to set up meetings to discuss price adjustments. A gap emerged between the official posted prices of OPEC member countries and the prices of the small spot market.<sup>137</sup>

Incentives to violate agreements within the cartel increased and resulted in the establishment of a premium on top of the official prices that customers had to pay in order to secure a shipment. Kuwait was the first country to do this, adding a US\$1.20 surcharge per barrel in late February (Skeet 1988). With the exception of Saudi Arabia,

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<sup>136</sup> Parra (2005, p. 219) notes that in the press release of the OPEC conference the price increase is justified not by changing market conditions, “but by member countries’ need to compensate for the decline of the dollar against other currencies and the high rate of international inflation prevailing at the time.”

<sup>137</sup> During February and March, this gap was approximately US\$10 (Skeet 1988).

all other members followed suit, and it soon became evident that OPEC had lost its ability to set the pace of price changes under the existing circumstances. An extraordinary meeting of OPEC took place in late March that increased the official price for April 1979. As a signal that discipline had broken down, the final communiqué acknowledged that member countries had the sovereign right to add surcharges to their official prices (Skeet 1988). Another OPEC conference took place in June, again seeking to catch up with a market situation of increasing supply concerns and rising prices.

Prices continued to increase throughout 1979, and the Iran-Iraq war of 1980 fueled concerns about the availability of oil supplies. The F.O.B. nominal price of Saudi crude (Arabian Light) rose from US\$12.77 in December of 1978 to US\$23.12 in December of 1979 and US\$31.99 in December of 1980. Prices rose continuously until June of 1981, dropping slightly from July through September before rising again. By contrast, in the relative stability between December of 1974 and December of 1978, roughly the period between the two oil shocks, prices only increased by US\$2.26.

#### *Mexico's commercial policy under Díaz Serrano*

The goal of oil commercial policy under Diaz Serrano was industrialist, seeking to promote the development of other domestic industries. Pemex often negotiated directly with foreign governments and actively pursued technological exchange programs and foreign direct investment.<sup>138</sup> The governments of France and Japan were among those

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<sup>138</sup> Adrian Lajous, author's interview, Mexico City, 12 January 2009.

that acquiesced in order to secure contracts of Mexican crude (Snoeck 1988 pp. 76, 77).<sup>139</sup>

At the same time, the execution of the policy was disorganized, lacking both a professionalized staff and established decision-making institutions. The absence of market competition meant that few signals of performance could reveal these underlying problems. Pedro Haas, director-general of PMI from 1989 to 1994, commented on the practices of the company's marketing staff as follows:

Their method was to sit down, casually, with several companies, and try to guess what they wanted, complain a little bit, and end up setting a price very similar to the one that the companies wanted initially. It could or could not be a reasonable price.<sup>140</sup>

Díaz Serrano managed the company without much oversight, but the events of June of 1981 showed that with regards to commercial policy the government reserved the right to meddle in the firm's operational decisions. During the five years he was in charge, he had increased prices without having to seek consensus in the cabinet or the company's Board of Directors (Meyer and Morales 1990). However, his first decision to lower prices would also be his last. "But this is the way that prices have always been determined!" pleaded Díaz Serrano at a cabinet meeting convened to reprimand him for

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<sup>139</sup> Foreign policy considerations were also at stake, manifested in a decision made in 1979 that no single country would receive more than 50% of Mexican exports. In Mexico and in the United States—by far the primary customer—this decision was understood as decidedly anti-American.

<sup>140</sup> Author's interview with Pedro Haas, telephone communication, 14 January 2009.



cutting prices. López Portillo assented. “It’s true,” the president said. The next morning, López Portillo appointed a new director-general (Díaz Serrano 1989).<sup>141</sup>

The absence of an institutionalized commercial strategy in Pemex can be explained by three characteristics of Mexico’s shift from being a slight importer to a major exporter. First, the change took place in the midst of a strong sellers’ market. As one observer recalls about those years, “the demand for Mexican crude was such that there were even people who would camp outside the offices of Pemex trying to make a purchase. We didn’t even have to seek out clients. The clients would literally beg for barrels of oil.”<sup>142</sup> Inefficiencies in the commercialization process were easily concealed by the vast rents accruing to the government.

Second, it occurred very rapidly. In 1974, two years before Díaz Serrano’s appointment, Mexico was a net importer of 380 barrels in the entire year. By 1981, Mexico was exporting almost 1,100 barrels per day. This increase took place simultaneously as the giant oil field Cantarell was being brought into production, two refineries were planned and constructed, and a major gas pipeline from southern Mexico to the U.S. border was laid out. The staff of Pemex was spread thin, as the company was growing in several different directions at once.<sup>143</sup>

Third, it happened at a moment when Mexico was trying to play an active foreign policy role around the world (Herrera and Ojeda 1983; Ojeda 1976). President Luis

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<sup>141</sup> Other actors recount the story differently from Díaz Serrano’s autobiography. Adrian Lajous, for example, worked directly under Oteyza at the time and emphasizes that López Portillo had warned Díaz Serrano to seek the consent of the economic cabinet before cutting prices. (Adrian Lajous, personal interview, 12 January 2009.)

<sup>142</sup> Author’s interview with Adrián Lajous, Mexico City, 7 July 2008. In the early 1980s, Lajous was an official in the Ministry of Patrimony and Industrial Promotion.

<sup>143</sup> Lajous recounted his surprise to learn when he arrived to Pemex that the Foreign Trade Division had “designed the first contracts to export crude simply by taking the same contracts that they had used to buy crude and changing the names of the buyer and the seller.” (Adrián Lajous, personal interview, Cambridge, Massachusetts, 12 January 2009.)

Echeverría (1970-1976) sought to become a leader of the Third World, chairing the Group of 77 in 1974-1975 and adopting a strong nationalistic rhetoric. By and large, López Portillo followed the same foreign policy doctrine. At the same time, Mexico's proximity to the United States meant that much of the rhetoric could not turn into policy. While Mexico was cognizant of the limitations imposed by its much stronger neighbor, it pursued an independent geopolitical strategy whereby it was important to appear as an honest broker with OPEC nations.<sup>144</sup>

Díaz Serrano issued quarterly price statements that consistently put Mexican crude (medium-light Isthmus at first and, starting in September of 1979, also the heavy Maya) higher than comparable OPEC oil, under the argument that, being outside of OPEC, Pemex was more reliable as a supplier and thus its long-term contracts carried less risk. In July of 1980, for example, Mexican Isthmus, with viscosity of 33.4° API and sulfur content of 1.25 %, sold at US\$34.50, while Arab Light, of 32.8° API and sulfur content of 1.97 %, was fixed at US\$28. In that same month, Mexican Maya, an especially hard to refine heavy crude of 21.8° API and 3.33 % sulfur, was given a price of US\$29 (Snoeck 1988). Unfortunately, given that OPEC countries were selling crude at a premium above the official prices, it was not possible to make direct comparisons to gauge the success of the Mexican pricing policy.

In short, Díaz Serrano lacked a specialized staff to study the international market and sell Mexican crude, as there had been no time to develop one. Moreover, he probably did not feel the need for one, since he had never had difficulty selling a barrel of oil. When things turned sour and competition suddenly appeared, the weaknesses inherent in the system became apparent.

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<sup>144</sup> López Portillo expressed that view in public statements (Buendía 1985).

*Exogenous shock: The oil market inflection of 1981*

The consensus view about an impending global oil shortage was misguided. A global economic slowdown meant that demand for oil was receding, production from new investments was coming onstream, and inventories were larger than ever (Parra 2005). What seemed unthinkable occurred in early 1981: oil prices shifted downward. From the peak of US\$39 in February of 1981, oil sold at US\$36.58 in July, and it would not stop there. By July 1982, it was at US\$33.44; in July 1983, it stood at US\$28.73. The oil crisis for the industrialized world had come to an end, but for oil exporting countries it was just beginning.

*Mexico's response: commercial and political disarray*

Mexico was ill prepared for the transition from a sellers' market to a buyers' market. The losses to the public treasury would be massive. Pemex responded slowly to changing market conditions and received a wake-up call in April of 1981, when the Ashland Oil Company announced that it would suspend the purchase of 90,000 barrels per day. According to Ashland, Mexican crude was no longer economical for its operations (Snoeck 1988). Other customers were vocal about the poor relative quality of Maya, and urged Mexico to cut the price by US\$6 per barrel (Morales et al. 1988). Pemex lowered the price of Maya by US\$2.50, but kept the price of Isthmus steady. This appeared risky at the moment, since by then the official spread between Isthmus and Arabian Light was US\$6.50 per barrel. Throughout April and May, Pemex failed to sell

an estimated 100,000 barrels per day (Morales et al. 1988), presumably because of this overprice.

The stage for the fall of Díaz Serrano was set by an OPEC summit held on May 25-26, 1981 where member countries agreed to hold prices steady and only cut production slightly (Skeet 1988). The downward pressures in the price were too strong for this action to have substantive effects. Rumors surfaced that some OPEC nations—Libya in particular—were offering customers discounts of US\$4 per barrel below the official prices.<sup>145</sup>

Pressures on Pemex from customers mounted rapidly, eventually forcing Díaz Serrano to make a rash decision (Diaz Serrano 1989). He opted to keep Isthmus at US\$38.50, but to cut a blend of 40% Isthmus/60% Maya from US\$34.60 to US\$30.60. Mexico, officially at least, became the first major exporting country to lower its posted prices.<sup>146</sup> This is how Díaz Serrano (1989) recounted the events of the last days of May of 1981, when he decided to lower prices:

One day, Mr. De León came to see me very alarmed to show me telex messages from several clients that had received offers from Arab sellers discounting the marker crude by four dollars. They asked for similar treatment and gave a deadline for our decision. I summoned the experts to a working meeting that would extend through the weekend in my house. All options were analyzed and the conclusion was that there was nothing better than to lower prices, or else we would lose a clientele that we had worked very hard to get. On the next day,

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<sup>145</sup> Martin, Douglas, "Cheaper Oil from Libya Is Reported," *The New York Times*, 4 June 1981, p. D1.

<sup>146</sup> Martin, Douglas, "Cheaper Oil from Libya Is Reported," *The New York Times*, 4 June 1981, p. D1

Monday, June 1<sup>st</sup>, we would go to Veracruz to celebrate the Day of the Navy. Moreover, the deadline to respond to the customers was coming up. If we did not cut prices, they would go over to the OPEC sellers. We had no time to spare. De León was already waiting for my orders at the Veracruz airport. I told the president that I urgently needed to speak with him before we landed. I explained our problem and told him that we had to act immediately, as the situation was very delicate.

“All right,” he said, “but work things out with the economic cabinet.” To me, that was a clear signal to move forward and, upon getting off the plane, De León was waiting for me, looking anxious.

“Send the telex immediately,” I told him. He did not hesitate and went away. (Díaz Serrano 1988, p. 106).

Díaz Serrano’s decision to lower prices before reaching an agreement with the economic cabinet opened the door for sharp criticism in a cabinet meeting on June 4<sup>th</sup>. The rest of the cabinet, fierce political rivals of Díaz Serrano, saw a weakness in the latter’s standing with the president and criticized him harshly.<sup>147</sup> López Portillo, already concerned about Díaz Serrano’s lack of accountability, asked him to resign on June 6 and named Julio Rodolfo Moctezuma Cid in his place.

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<sup>147</sup> According to Lajous, who participated in these events as a high ranking official in Oteyza’s ministry, the economic cabinet had bonded due to their frustration with the lack of understanding of basic economic concepts among Diaz Serrano and his top commercial advisers (Author’s interview with Adrián Lajous, Cambridge, MA, 12 January 2009.)

The importance of the absence of market competition and the lack of a specialized staff cannot be underestimated. The attacks on Díaz Serrano were primarily motivated by the politics of the presidential succession, and they would have certainly continued if the Pemex chief had not been faced with a downturn in the international oil market. Nevertheless, the vulnerability that ultimately brought him down was the lack of an institutionalized decision-making framework to deal with competitive markets.<sup>148</sup> In this instance, the personalistic approach meant not only that decisions lacked technical backing, but also that the political liability for mistakes was high and directly attributable to Díaz Serrano.

Commercial policy throughout the rest of 1982 displayed even greater disarray. After all, Díaz Serrano had acquired some expertise that other members of the cabinet lacked. In the aftermath of the resignation, Oteyza took control of the pricing policy, but he was inexperienced in oil market issues and his decisions proved to be disastrous. On June 16, Oteyza announced a US\$2 increase effective on July 1st. Unaware that the bargaining power had now shifted to the buyers, he threatened customers unwilling to lift Mexican oil at that price that “a barrel of Mexican oil foregone at this moment will be a barrel of oil foregone forever” (qtd. in Morales, Escalante, and Vargas 1988, p. 161). Exxon Corporation, the largest purchaser of Mexican crude, suspended lifting 175,000 barrels a day, which amounted to 12% of total Mexican exports. Shell Oil Company, Mexico’s second-largest customer, warned that the price increase was unjustified given market conditions.<sup>149</sup> France’s state-owned *Compagnie Française des Pétroles* halted

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<sup>148</sup> The decision to lower prices, according to several actors, was correct. However, the extent of the price cut and the process reflected a lack of expertise among Diaz Serrano and the commercialization managers (Author’s interview with Adrián Lajous, Cambridge, MA, 12 January 2009).

<sup>149</sup> Friedman, Thomas L., “Libya Lowers Oil Price a Slim \$1.10,” *The New York Times*, 1 July 1981, p. D1.

imports from Pemex, prompting Mexico to threaten the cancellation of French contracts in the country in other industries.<sup>150</sup> A high-level envoy was sent by Lopez Portillo to negotiate directly with the Mitterrand government but failed to secure the resumption of purchases.<sup>151</sup> In the month of July alone, lost exports amounted to one billion dollars of missed government revenues (Morales et al. 1988).

By August, Oteyza finally accepted the new reality and agreed to cut prices, essentially to the level Díaz Serrano had decreed for June.<sup>152</sup> Customers resumed purchases of Mexican crude, and government revenues increased accordingly. For the rest of the López Portillo administration, Pemex treaded carefully, decreasing its production and making sure not to overcharge buyers.<sup>153</sup>

#### *Pemex in transition: 1982 – 1985*

On December 1, 1982, Miguel de la Madrid replaced López Portillo as president of Mexico and appointed Mario Ramón Beteta as director-general of Pemex. In the Mexican government of those years, no civil service protections existed and a new presidential administration inevitably triggered the reshuffling of the top and middle levels of the bureaucracy. Pemex was not an exception, and Beteta arrived with hundreds

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<sup>150</sup> “Mexicans’ Rift Grows with Paris,” *The New York Times*, 6 July 1981, p. D1.

<sup>151</sup> Author’s interview with Ricardo García Sainz, Mexico City, 17 July 2008. García Sainz had been Secretary of Budget and Planning earlier in the López Portillo administration.

<sup>152</sup> Friedman, Thomas L., “Mexico Lowers Its Oil Prices,” *The New York Times*, 5 August 1981, p. D2. It should not be concluded from this that Díaz Serrano’s price cut in early June had been of the right amount. It is possible that while a drop of that magnitude was justified given August market conditions, in July it was not correct. The answer to this question, however, is virtually impossible to determine given the lack of reliable market data and the high proportion of the transactions that were made in kind between governments and which are very difficult to quantify.

<sup>153</sup> During the De la Madrid presidency, Oteyza did not have an influential position in the government. Between 1982 and 1986, he was appointed Ambassador to Canada.

of new staff members.<sup>154</sup> He often referred to the need to create a “New Pemex,” and the change in cadres was a step in that direction.

With regards to oil marketing, Beteta’s arrival had two immediate consequences—one with regards to the creation of a professional staff and another concerning the decision-making framework for pricing policy. First, almost by accident, he appointed Adrián Lajous—a young economist who had risen to a high position in Oteyza’s Ministry of Patrimony—as Oil Trade Coordinator, where he would supervise the activities of the Foreign Trade Division of the company.<sup>155</sup> Lajous was not very experienced in oil trade matters, but Beteta esteemed that he knew more than alternative candidates. “I was not very qualified at all,” Lajous himself admits. “I was an amateur.”<sup>156</sup>

As it turned out, Lajous’s tenure would become one of the most transformative periods in the history of the Mexican oil industry, as oil marketing became institutionalized. He sought to work at first with several of Díaz Serrano’s old collaborators in foreign trade matters, but gradually brought in fresh faces. Among other things, he created a subdivision of market analysis so that Pemex could make informed decisions about the changing market conditions.<sup>157</sup>

In the words of Pedro Haas, one of Lajous’s closest advisors at the time, the latter had two main accomplishments during his tenure (1982-1988). First, he changed the composition of the staff by adding young professionals versed in microeconomics.

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<sup>154</sup> This group was nicknamed *pitufos* (“smurfs”) by the oil people that had traditionally filled the ranks of the company. The origin of the term is unclear, but some argue that it was because the new employees were many and no one knew exactly where they came from (Grayson 1988).

<sup>155</sup> Lajous relates that he was paying a “courtesy visit” to Beteta when the director’s staffers were discussing issues relating to the fiscal standing of Pemex. Lajous helped them resol

<sup>156</sup> Adrián Lajous, personal interview, Cambridge, Massachusetts, 12 January 2009.

<sup>157</sup> Pedro Haas, personal interview, 14 January 2009.



“Getting the old guard to understand that market prices are established on the basis of marginal microeconomics was quite hard,” explains Haas. “Lajous got rid of all those old *petroleros*, who supposedly knew but didn’t really know and who were actually quite shady.”<sup>158</sup>

According to Lajous, the very nature of marketing activities demanded a different kind of employee. “The work also required very different skills,” he explained, “such as marketing skills that the rest of the company lacked and languages. People needed to operate in a language other than Spanish, and very few people in Pemex could do that.”<sup>159</sup> Long-time Pemex employees often voluntarily transferred to other areas of the company upon realizing that their qualifications did not match the requirements of commercialization jobs.

Second, Lajous “set up the legal and regulatory scaffolding” to operate efficiently.<sup>160</sup> One of the central aspects of this transformation was the drafting of international standard contracts, which grounded decisions on contractual obligations rather than circumstantial factors. A second key feature was the creation of an institutionalized decision-making structure for the presidential cabinet to approve changes to the price of Mexican crude. The Foreign Oil Trade Committee (*Comité de Comercio Exterior del Petróleo* or COCEP), an inter-ministerial committee, was established to meet periodically to approve changes to the official market price of Mexican crude.<sup>161</sup>

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<sup>158</sup> Author’s interview with Pedro Haas, telephone communication, 14 January 2009.

<sup>159</sup> Author’s interview with Adrián Lajous, Mexico City, 7 July 2009.

<sup>160</sup> Author’s interview with Pedro Haas, telephone communication, 14 January 2009.

<sup>161</sup> Author’s interview with Bernardo de la Garza, Mexico City, 30 October 2008.

Beteta, aware of the reasons that led to the downfall of Díaz Serrano, feared that oil pricing policy carried high political risk and agreed to set up the committee. Accountability would be diffused, so political costs of price cuts could not be blamed on a single person (Grayson 1986); moreover, given the importance of oil revenues for the government balance sheet, the relevant ministers—in particular the Secretary of Finance and the Secretary of Planning and Budget—would be directly engaged in pricing decisions (Morales, Escalante, and Vargas 1988).

According to COCEP's official minutes, the first meeting took place on December 22, 1982—in other words, only three weeks after the new administration took office. It was attended by Beteta, Lajous, and under-secretaries from the ministries of Foreign Relations, Finance, Planning and Budget, Commerce, and the newly created Ministry of Energy, Mines, and State Enterprises (which replaced Patrimony and Industrial Promotion). The committee voted to set official prices on a monthly basis—as opposed to the quarterly basis that was in place before—due to the rise in volatility in the market and to keep prices unchanged from the month before.<sup>162</sup>

The minutes of the COCEP meetings reveal both the workings of the system of “administered prices” and the new framework of shared political responsibility for determining prices. “The attendants agree unanimously,” reads the minute from the first meeting, “to make a public announcement tonight whereby the prices for January of 1983 will remain at the levels of the previous ten months, with a blend of 54% Isthmus and 46% Maya at US\$32.50 and US\$25.00 per barrel, respectively, which gives a weighted

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<sup>162</sup> See *Acta del Comité de Comercio Exterior de Petróleo (COCEP), llevada a cabo en la Ciudad de México el día 22 de diciembre de 1982 a las 17:00 hrs*, pp. 1, 2.

average of US\$28.45.” In order to set prices, discussions focused on the behavior of OPEC. For instance, the minute from the meeting on March 8, 1983 states that:

Jorge Eduardo Navarrete [under-secretary of Foreign Relations] is in London and has been in continuous communication with OPEC ministers. He noted the internal division within OPEC, especially regarding the Iranian position, which refuses to cut its production from 3 million barrels per day and which, in spite of selling at the price of US\$28 per barrel, refuses to agree on a decrease in the price of the marker crude. Similarly, he mentioned that Nigeria refuses to raise its price by US\$1.50 per barrel, which may entail that Saudi Arabia will cut its price to US\$29.00. (p. 3.)

How was Lajous able to implement these changes in the subsidiary? Part of the freedom to maneuver emanated from the risk that errors at foreign trade entailed. According to him, “everyone respected and feared the work with this potentially dangerous task,” which provided autonomy both from the political superiors and prevented interference from the powerful oil workers’ union.<sup>163</sup> Yet, the process whereby politicians learned about the danger of meddling in the operations of a company facing market competition would be slow. It would not be until the middle of 1985 when the political elite realized that neglecting the advice of the technical experts carried a heavy price.

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<sup>163</sup> Adrián Lajous, personal interview, 7 July 2008.

*Exogenous shock: The decline in demand of mid-1985*

By mid-1982, Mexican oil exports had stabilized around 1.5 million barrels per day. This was the government's explicit goal, determined as the limit of the economy's "absorptive capacity" in the National Energy Plan published in 1979.<sup>164</sup> The government aimed to decrease its dependence on oil revenues, and keeping export volumes fixed in the context of a growing economy would achieve exactly that. Between May of 1982 and May of 1985, the volume goal was met as exports averaged 1.581 million barrels per day.

In June of 1985, however, exports dramatically plunged by half, to 783,000 barrels per day. The cause was a misjudgment by the members of COCEP regarding market conditions, which led them to price Mexican crude above its proper value in a context where global supply was outpacing demand. The immediate consequence was a massive loss of revenue, estimated in 528 million dollars in that month alone.<sup>165</sup> The long-term consequence was a further realization by politicians that oil pricing decisions carried great risk and that it was politically and economically safer to yield them to the technical staff.

What led to the mishap by COCEP? In the first half of 1985, falling demand in the international oil market created downward pressures on prices but OPEC refused to lower official prices. Negotiations with non-OPEC countries failed to reach agreements as well. In his memoirs, President Miguel de la Madrid laments that his Energy Secretary, Francisco Labastida, was treated dismissively by Saudi officials during a trip set up to discuss the possibility of cutting prices (Madrid Hurtado 2004). While Saudi Arabia,

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<sup>164</sup> Pedro Aspe, personal interview, 13 May 2009; Adrian Lajous, personal interview, 12 January 2009.

<sup>165</sup> This estimate is obtained by subtracting the actual exports (783 mbd) from the desired exports (1.5 mmbd) and multiplying by the realized price of Mexican crude from July (US\$24.55). The July price was lower than the June price by US\$0.64 and, arguably, would have prevented a large percentage of the customers from cancelling their purchases from Mexico.

Mexico, and a few other countries sold crude at official prices, many OPEC nations were violating quota restrictions and offering discounting shipments below posted prices (Skeet 1988).<sup>166</sup>

In early June of 1985, a dispute arose between the technical staff at the Foreign Trade Division of Pemex and Energy Secretary Labastida in the midst of COCEP.<sup>167</sup> The members of the committee and President De la Madrid supported Labastida's proposal, which called to keep prices constant for another month (Grayson 1988). During the previous two years, Mexico had shown solidarity to OPEC's lead in pricing decisions,<sup>168</sup> and a price decrease would be perceived as an attempt to undercut the cartel. The analysts at the Foreign Trade Division, however, believed that a price drop was critical in order to keep the export goals. In fact, it was publicly reported that customers had been threatening to suspend lifting shipments of Mexican crude unless prices were lowered.<sup>169</sup>

The distribution of influence within COCEP changed in favor of the technical staff. The drastic loss of revenue resounded throughout the federal bureaucracy, and the Secretary of Energy's credibility in COCEP was tarnished. Thanks to the institutionalized price-setting process, final responsibility for the decision was shared among all the members of the committee and no single member suffered a fate similar to Diaz Serrano's four years earlier. Nevertheless, the collapse of exports painfully reminded the politicians who attended the meetings that pricing policy was treacherous. As the loss of revenues became more severe in June, the Secretary of Energy told Pemex: "Do whatever

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<sup>166</sup> Ibrahim, Youssef M., "OPEC Meets on Weakening of Cartel Unity," *The Wall Street Journal*, 3 June 1985, p. 2.

<sup>167</sup> Pedro Haas, personal interview, 14 January 2009.

<sup>168</sup> Ibrahim, Youssef M. and Richard B. Schmitt, "Mexico Lowers Prices of Heavy and Light Crude Oil, Signaling End of Two-Year Solidarity with OPEC," *The Wall Street Journal*, 12 July 1985, p. 3.

<sup>169</sup> Ibrahim, Youssef M., "OPEC Meets on Weakening of Cartel Unity," *The Wall Street Journal*, 3 June 1985, p. 2.

you have to do, but raise exports.”<sup>170</sup> Prices were finally adjusted on June 17, 1985 with an announcement that Maya exports would be US\$1.50 cheaper.<sup>171</sup> Another price cut followed two weeks later. By July, PMI had raised the export volume back to the target of 1.5 million barrels per day.

*The exogenous shock is aggravated: Saudi Arabia “declares war” in October of 1985*

The years of 1985 and 1986 would be momentous for the international oil industry, as the downturn in prices was even more sudden and severe than in 1981. In November of 1985, oil prices were at US\$27.12, but by February of 1986 they had dropped to US\$18.11, and in July of that same year they plunged to US\$10.91. It was a reduction of 60% in slightly more than six months. Oil producing countries, already hurting from the contraction in demand and high cost of lending of the early 1980s, now had to face a reality of record-low oil prices. Mexico, producing a heavier variety of crude, suffered more: in June of 1986, the price of Maya dropped to US\$7.63 a barrel (Adrián Lajous 2006).

The collapse of oil prices began with the downturn in global demand of mid-1985 and was aggravated by two decisions made by Saudi Arabia: to increase production and to introduce a novel commercial strategy known as “netback pricing” (Mabro 1987). In essence, netback pricing consists of guaranteeing the client—the refiner—a specific profit margin on the sales of its product, charging for the oil the remainder after subtracting profits and operational costs from the sales price. It was highly attractive for customers, since earnings would be protected in the competitive refining industry.

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<sup>170</sup> Author’s interview with Pedro Haas, telephone communication, 14 January 2009.

<sup>171</sup> Ibrahim, Youseff M., “Mexico Cuts Heavy Crude Price to \$24, Raising Pressure on OPEC for Reduction,” *The Wall Street Journal*, 18 June 1985, p. 3.

Saudi Arabia's turn to netback resulted from a frustration with OPEC's behavior that had been accumulating for several years. After the inflection of the market in 1981, the world had seen an oversupply of petroleum. Not only did OPEC have excess capacity, but non-OPEC countries such as Norway, Great Britain, and the Soviet Union were increasing production and gaining market share at OPEC's expense. OPEC called emergency meetings in 1982, first in Qatar and later in Vienna, in order to restrain production and defend prices. However, indiscipline was rampant, with Iran, Libya, and Venezuela significantly violating their volumetric commitments (Parra 2005).

OPEC countries met again in March of 1983 in London to renegotiate on volume restrictions. They agreed to set Arabian Light as the marker crude at US\$29, with other grades adjusted based on quality, and they decreased their overall production quota to 17.5 million barrels per day (Skeet 1988). However, unfavorable market conditions meant that OPEC's quota exceeded demand requirements. Cheating was widespread, via discounts off the official prices, attractive credit terms for customers, and paying for transportation costs. Moreover, the system of negotiated price differentials proved unrealistic in practice. As Parra (2005) explains:

The value of crude oils relative to each other depends largely on their product yields, lighter crudes yielding more of the higher value gasolines and distillates than heavier ones. But the prices of the various refined products vary over time, depending on seasonal and other factors, so crude price differentials that may be realistic in one situation rapidly go askew in another. OPEC could not possibly keep up with the shifting market, and

even if it could, frequent renegotiation of the differentials would have been politically impossible. (Parra 2005, p. 281.)

Throughout this time, the only OPEC country that consistently fulfilled its obligations was the one with the largest reserves and production capacity: Saudi Arabia. Yet, good behavior came at a cost, primarily in the form of diminished market share. Saudi Arabia knew that others were cheating, but its oil minister, Yamani, supported an OPEC fixed-price policy and had turned the country into the *de facto* swing producer of the cartel, trying to stabilize prices by decreasing or increasing production as needed. Production dropped to dangerously low levels, from 43 % of total OPEC production in 1981 to 20% in 1985. This took place while total OPEC supply dropped from 22.8 million barrels per day to 16 million.<sup>172</sup> The Saudi quota approved by OPEC was 4.3 million barrels per day, but in May of 1985 the Kingdom was producing only 2.4 million barrels (Skeet 1988).

By mid-1985, Saudi Arabia made final warnings to other OPEC members to meet their obligations, to no avail. In May of that year, King Fahd convened a meeting of oil producers and stated that Saudi Arabia would feel free to act to secure its own interests unless cheating was brought to an end. In July, at OPEC's ministerial meeting in Vienna, Yamani repeated that they were ready to abandon the role of swing producer and would push to gain back their allocated quota of 4.35 million barrels per day for 1985 (Parra 2005). Then, in September, at the meeting of the Oxford Energy Seminar, Yamani confirmed the news: Saudi Arabia was officially abandoning its policy aimed at

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<sup>172</sup> Source: Energy Information Administration, <http://www.eia.doe.gov/emeu/international/oilproduction.html>, accessed on 2 November 2008.



protecting prices in favor of one aimed at increasing its market share (Adrián Lajous 2006).

Saudi Arabia adopted netback because it worried that, in the oversupplied market of the mid-1980s, additional barrels produced would not find customers so easily. Moreover, much of the refining capacity was tied by long-term contract to other OPEC nations. Thus, Saudi Arabia had to offer very attractive terms to clients to encourage them to lift greater quantities of its crude. While it succeeded in gaining clients back, the combination of their increased production with the netback pricing policy had catastrophic consequences for prices.

Netback pricing distorted the crude oil and products markets in at least three ways, slashing the price of oil in the process. First, by guaranteeing a profit margin, it eliminated incentives for the refiner to minimize costs. Operational inefficiencies could be passed on to the seller of crude rather than be absorbed by the refiner in order to keep the price of the products competitive. Second, netback pricing was blamed for encouraging refiners to overproduce. Thanks to netback, lower sales prices caused by excess supply could also be passed on to the seller. Finally, netback pricing introduced transaction costs where previously few existed. The determination of “fair” profit margins and “accurate” operational costs had to be done through constant re-negotiation between producer and consumer, in a context where asymmetric information tended to benefit the refiner.

The rest of OPEC soon followed Saudi Arabia’s strategy, and in an OPEC summit in December of 1985, oil ministers changed their long-standing doctrine of price

administration for one of increasing market share.<sup>173</sup> Netback pricing was the natural alternative for these countries, which finally abandoned their hope of setting prices by decree. As Parra (2005) recognizes, there were then two netback wars being fought simultaneously: one by Saudi Arabia against the rest of OPEC, and one by OPEC against the oil exporters outside of the cartel, as reluctant as ever to curtail their production.

*Mexico's response: world-class innovation*

In response to the declaration of a price war by Saudi Arabia and its subsequent increase in oil exports via netbacks, the Foreign Trade Division at Pemex responded with formula pricing, an innovative commercial strategy that would transform the landscape of the international market and help Pemex win customers back (Boué 2002). Two years later, in an implicit recognition of the drawbacks of its commercial policy, Saudi Arabia abandoned netback pricing and adopted formulas similar to those pioneered by Pemex (Parra 2005). Algeria and Libya introduced formula pricing by September of 1989, Nigeria and Egypt followed in December of 1990 and October of 1991, respectively. To this day, formula pricing is the preferred method of setting prices among companies that do not sell crude in spot markets (Horsnell and Mabro 1993; Adrián Lajous 2006; Fattouh 2006).

Formula pricing consists in constructing an equation that approximates the yield that a refinery obtains from running a crude not sold in spot markets with a combination of crudes that are—such as Brent, West Texas Intermediate, or Alaska North Slope—and refined products such as fuel oil. The different marker crudes are given specific weights,

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<sup>173</sup> Skeet (1991) points out that by then the system of administering prices existed only on paper, given that the discounts offered surreptitiously by many oil exporters had already created a shadow market-based pricing system.

which then determine the new price, with an added adjustment factor to account for errors in measurement and for small variations necessary to decrease high inventories or to exploit short-term market conditions.<sup>174</sup>

In hindsight, the concept was extremely simple, but at the time it was very difficult to devise and implement for at least three reasons. First, and contrary to what it could seem at first, reliance on spot market prices did not necessarily mean that the actual market clearing prices were being used. The vast majority of the oil was sold by long-term contracts, meaning that spot transactions only reflected a small share of the existing supply and demand. Relying on spot markets for pricing crude oil had the risk of following potentially misleading information. Second, it entailed relinquishing the ability to set oil prices by decree, which had been a fundamental prerogative of the Mexican government for years. Third, every other oil exporting nation was rapidly adopting netback pricing, in a panic not to be displaced by Saudi oil.

The process that led to the development of formula pricing began in Oxford in September of 1985. Five top Pemex executives, including Lajous, were present when Yamani confirmed that Saudi Arabia was introducing netback to regain its market share. They decided that a new strategy had to be designed to counter the Yamani's "implicit declaration of a price war" (Lajous 2006, p. 18).<sup>175</sup> Lajous hired the services of the

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<sup>174</sup> The introduction of formula pricing meant that the market would be divided into regions in order to take advantage of price differentials across markets. The first formula introduced for the North American market was:

$$\text{Price of Maya} = 0.21(\text{WTI} + \text{WTS} + \text{ANS}) + 0.37(\text{F.O. \#6 3\%}) - 0.28(\text{F.O. \#6 1\%} - \text{F.O. \#6 3\%}) + K,$$

for West Texas Intermediate (WTI), West Texas Sour (WTS), Alaska North Slope (ANS), High Sulfur Fuel Oil (F.O. #6 3%), and Low Sulfur Fuel Oil (F.O. #6 1%), plus the constant of discretionality. The formula would be changed in 1989, 1990, and 1996 (Boué 2002).

<sup>175</sup> This, of course, was the view from the Mexican side. The Saudi perspective was that they were simply claiming the market share that was rightfully theirs according to OPEC officials quotas (Skeet 1991).

consulting firm McKinsey & Company to help in designing an alternative mechanism. McKinsey's advice, to his disappointment, was to adopt netbacks. Lajous and his advisors resisted, and only after further work was formula pricing agreed upon.

Lajous settled with formula pricing for several reasons. Juan Carlos Boué (2002) emphasizes the interest of managers in the Foreign Trade Division to give up discretionality in order to avoid being susceptible to lawsuits brought against them under the Federal Law of Responsibilities for Public Servants. Lajous agrees that this factor played a role, but he affirms that the main reason was the need to economize on analytical and managerial resources, which were scarce in the small Foreign Trade Division, and which would be allowed to focus on other matters once the "transparent, semi-automatic pricing mechanism" was introduced (Lajous 2006).<sup>176</sup>

An overview of the context in late 1985 and early 1986 reveals the constraints on human capital faced by the Foreign Trade Division and which Lajous had to face. In the end, his task was to accomplish the most he could with the resources he had (Boué 2002). They could not resort to selling Mexican crude in the spot markets because "it [was] doubtful that Pemex [had] personnel sufficiently experienced to wheel and deal as deftly as required of successful spot market traders" (Grayson 1986, p. 55). Moreover, these markets carried higher volatility than long-term contracts, and this entailed an unacceptable level of risk for fiscal authorities.

Adopting netbacks was also discarded, since it would have stretched the staff thin negotiating with refiners the terms of the contracts. Customers knew their operational costs better than Pemex staffers, and they could credibly threaten to switch over to OPEC oil in the event of discord. Pedro Haas adds:

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<sup>176</sup> Author's interview with Adrián Lajous, Mexico City, 7 July 2008.

We had reached the analytical conclusion that netbacks were completely destructive for the market, since they didn't permit arbitrage between crude oil and products. I mean, refineries won't run crude if profit margins are negative. But if you sell crude via netbacks, profit margins are guaranteed, so volume is always increasing and nothing can stop that. You have a downward spiral. Thus, opposing what every other country was doing in the market was a huge struggle, and in Mexico there was a big debate about it. Adrián had the courage to stand firm and argue what he believed, and the Ministry of Finance ended up supporting him.<sup>177</sup>

Finally, doing nothing and continuing to administer prices was not an option. By February of 1986, Pemex had already lost sizable sales to netback-priced deals, and it was both impractical and unrealistic for staffers to spend their time trying to understand a market that was changing at a very fast rate. As an observer noted at the time: "In the fast-moving world market where supply suddenly was vastly outstripping demand, Mexico continually had found to its cost that the earlier pricing concessions seemed always to be a case of too little, too late" (Niering 1986, p. 294). In short, in spite of the risks posed by introducing formulas, Lajous believed that the Foreign Trade Division of Pemex and his own footing were at greater peril with either price administration or with netbacks.

Mexico's geopolitical strength had shifted from the Díaz Serrano days, and commercial policy stopped responding to foreign policy objectives. Maximizing

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<sup>177</sup> Pedro Haas, personal interview, 14 January 2009.

government revenues became the only goal, as the fiscal subsistence of the state was on the line. Mired in debt, the government's bargaining position vis-à-vis creditor nations—the United States in particular—was much deteriorated. It was pointless to continue with the defiant rhetoric of the Echeverria and Lopez Portillo administrations.<sup>178</sup> Moreover, President De la Madrid became disaffected from OPEC after what appeared to be disloyal behavior regarding the effects of their actions in the oil market (Madrid Hurtado 2004). When Saudi Arabia introduced netbacks, Mexico was, to a large extent, fully relieved of its commitments to OPEC, and it was free to pursue its own commercial strategy.

In a special meeting held on February 14, 1986, COCEP voted to allow formula pricing. Lajous obtained authorization for the use of formula pricing in spite of the reluctance of some members of the cabinet—in particular Labastida and Jesús Silva-Herzog, the Finance Minister. The meeting was unusual in that it was attended by the heads of the different ministries, rather than by under-secretaries as it had become customary. After all, it was a session of very high importance: the Mexican politicians were formally surrendering control over oil pricing policy to technical bureaucrats' ability to successfully model the market value of Mexican oil. After the exports debacle of the previous June, however, most of the members of COCEP had understood that their ability to administer prices effectively was dubious and that technical expertise was needed to ensure the flow of government oil revenues.

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<sup>178</sup> President De la Madrid would write in his memoirs: "I have no doubt that the drastic fall of our primary source of income hurts the relationship between Mexico and the United States greatly. It weakens us to the extreme; it places us in a situation where we have to wait for and tolerate the negotiations that they propose." (2004, p. 536).

Pemex presented formula pricing to clients at the annual International Petroleum Week in London in late February, and initial response to formula pricing was negative (Lajous 2006). Lajous recounts that an oil magnate pulled him aside to chastise him. “Why are you intent in ruining your country with this crazy plan!” the man said.<sup>179</sup> A well known oil industry consultant, Philip Verleger, argued soon after that netback pricing was going to be the dominant pricing mechanism for the foreseeable future (Petroleum Economist 1986). Furthermore, between January and April of 1986, Mexican oil exports lagged behind the official target by 400,000 barrels per day, presumably because customers were still finding netback preferable (Niering 1986). However, soon after, Mexico began regaining market share, and the skeptics at home and abroad began to appreciate the merits of the new system.

Changes to the “K” were still subject to COCEP approval each month. They represented only a small percentage of the price, which—once the “K” was set—was allowed to fluctuate based on the changes in market prices of the different components of the formula. An excerpt of the minute of the April 7, 1986 meeting serves to illustrate this process:

Mr. Lajous indicated that just as the formulas for Isthmus have allowed Pemex to place the available supply of this crude in the market, and even to have demand in excess of the supply capacity, the formulas for Maya require an adjustment in the constant. The adjustment was already foreseen in the design of the formula. COCEP discussed the issue at length, highlighting the strong competition from Venezuela to place its

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<sup>179</sup> Author’s interview with Adrián Lajous, Cambridge, MA, 24 November 2009.

heavy crude, posting prices below the Mexican price. The difficulty to place Maya given the sales practices that Venezuela uses were noted. It is expected that lowering the constant in the formula for Maya will facilitate the sale of the excess volumes of this crude.

The Committee RESOLVES: COCEP approves lowering the constant for Maya formulas by US\$0.75 per barrel, beginning on April 1<sup>st</sup>, and it authorizes Pemex to lower this constant up to US\$1.25 per barrel with the objective of placing the largest possible volume of heavy crude in the market. (pp. 2, 3.)

Time series econometric analysis confirms the success of formula pricing and quantifies its effect. The vector-autoregression-intervention-analysis (VARIA) methodology (see Appendix A) shows that the introduction of formulas, holding constant global supply, global demand, and exports of Maya, had a strong and statistically significant sustained impact on the price of Maya relative to a counterfactual (Alaska North Slope). The left panel of Figure 4.5 displays the effect of formula pricing on the price differential of these two crudes. The gray area and the dashed line represent the 67% and 95% confidence intervals, respectively. The immediate impact of formula pricing was an increase of two dollars on the differential; the cumulative impact stabilized around 7 dollars.

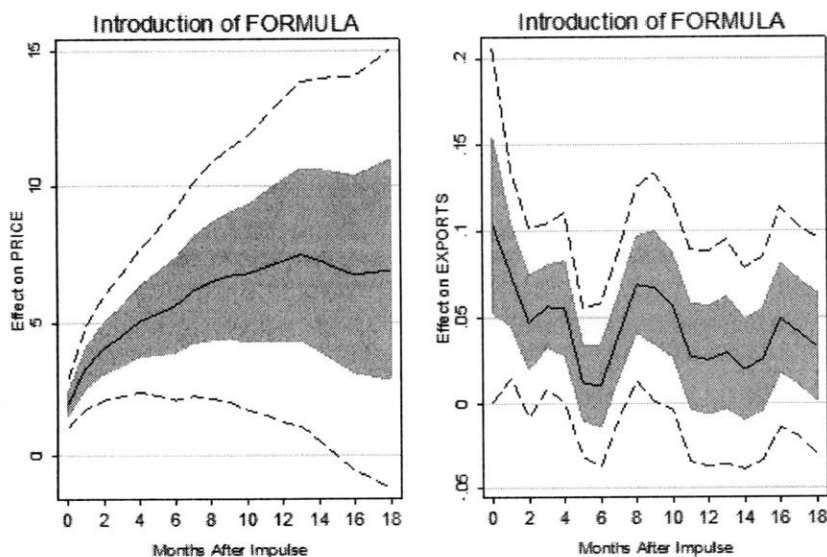
The right panel of Figure 4.5 shows the cumulative impact of the introduction of formula pricing on the exports (represented in the statistical analysis as the monthly



percentage change in exports of Maya). The 95% confidence intervals are wide, but the findings strongly suggest that formula pricing had an immediate impact of raising exports by 10%, and eight months afterwards the cumulative effect had been a sustained and statistically significant increase of 5% per month. In short, this results support the thesis that formula pricing helped Lajous and his staff meet the dual goals of price and export maximization.

[FIGURE 4.5 HERE]

**Figure 4.5. Effect of Formula Pricing on the Price and Export Volume of Maya (VAR-Intervention Analysis – Cumulative Dynamic Multiplier Results)**



An alternative statistical analysis, also confirming the benefits of formula pricing, is provided by Juan Carlos Boué (2002). Rather than comparing the price of Maya to a spot market benchmark like Alaska North Slope, Boué's reference point is the price of Venezuelan crude—which has historically been the main competitor of Maya in the

market of the United States Gulf of Mexico. Venezuela's state-owned oil company, *Petróleos de Venezuela* (PDVSA), provided a different counterfactual by continuously refusing to implement formulas and opting instead to maintain discretionality—adhering to the policy of administered prices.<sup>180</sup>

The essence of Boué's approach is threefold. First, he takes a marker crude as reference (in this case, West Texas Sour). Second, using information on the price of several heavy and medium crudes with high sulfur content imported to the United States, he calculates the market premium for each additional degree API and the penalty for each additional percentage point of sulfur content. Third, he estimates the market price of a crude of similar characteristics to the average of Mexican and Venezuelan export baskets and compares that price to the realized prices published by the Department of Energy of the United States.<sup>181</sup>

Boué's results are reproduced in Table 4.3. His data only covers yearly averages from 1992 – 2000, so the immediate impact of formula pricing against the Venezuelan counterfactual cannot be assessed. Nevertheless, the pattern of Boué's analysis is consistent with the VAR estimates of Figure 6. Pemex repeatedly sold its crude at or slightly above the estimated market price, while PDVSA failed to meet the expected price year after year by more than one dollar per barrel on average (with the exception of the year 2000).

Formula pricing succeeded for two reasons. First, Pemex adequately recognized that spot markets had finally become reliable indicators of market conditions. According

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<sup>180</sup> Juan Szabo, who served as head of the Exploration and Production division of PDVSA in the late 1990s, commented that, in his view, formulas ultimately proved to be a better commercial strategy (personal interview, 12 August 2009).

<sup>181</sup> This step is necessary because the U.S. Department of Energy, for many months, has not published the price of individual Venezuelan crudes, only for the average export basket.

to Bernardo de la Garza, who served as head of crude oil commercialization in PMI in the 2000s, crucial to this was the introduction of oil futures in the New York Mercantile Exchange, which gave volume and liquidity to the paper trade of marker crudes.<sup>182</sup>

[TABLE 4.3 HERE]

<b>Table 4.3 Observed and Estimated Prices for Mexican and Venezuelan Crude Exported to the United States (1992-2000)</b>		
Year	Estimated Price - Observed Price (US\$/B)	
	Pemex	PDVSA
1992	0.44	1.79
1993	0.09	1.55
1994	0.06	1.78
1995	-0.06	1.58
1996	-0.04	1.38
1997	-0.03	1.30
1998	-0.05	1.14
1999	0.03	0.84
2000	-0.07	-0.4
Average	0.04	1.22

**Source: Table T6.1 in Boué (2002)**

Second, customers greatly appreciated the transparency and simplicity that formulas brought into the market (Boué 2002). The savings in transaction costs and in political risk turned out to be preferred over the uncertainty of netback negotiations. Rosendo Zambrano, who served as director-general of PMI in the late 2000s, agrees with that statement and notes that proof of the benefits of formula pricing is the fact that

<sup>182</sup> Bernardo de la Garza, personal interview, 30 October 2008.

refineries running Mexican crude have historically received better financing terms from banks than those running Venezuelan crude. This, he argues, is due to the perceived benefits of a transparent commercial relationship between producer and consumer.<sup>183</sup> This served as an incentive to lift Mexican oil. When Saudi Arabia adopted formulas in late 1987, the benefits of formula pricing were vindicated.

*Fiscal Jeopardy Exacerbates the Effect of Market Competition*

Chapter 2 explains that market competition decreases the government's willingness to meddle in a state-owned enterprise's operational decisions due to the potential high cost to the public treasury. This mechanism is exacerbated in a setting of fiscal jeopardy such as Mexico's throughout the 1980s (see Figure 4.4). Mexico was mired in a deep financial crisis, and oil revenues were the lifeline of the government. In this context, the government withdrew further from meddling with technical decisions.

One clear instance of fiscal jeopardy occurred in 1982, when Mexico effectively suspended servicing its payments and unleashed the Latin American debt crisis (Schmidt 1985). However, this would not be the only critical moment. For example, an imminent threat of a moratorium occurred in early 1986. As oil prices kept dropping, rumors surfaced that President De la Madrid would resign (Madrid Hurtado 2004, p. 543). By February of that year, Mexico was on the verge of declaring a moratorium on its debt payments (Krauze 1999). De la Madrid wrote then in his memoirs:

I know that if in the current juncture I suspended payments on the foreign debt, the people would applaud me. But I also know that the excitement

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<sup>183</sup> Author's interview with Rosendo Zambrano, Mexico City, 12 June 2008.

would last a mere 15 days, and after that they would turn against me, as they began to feel the effects of such a drastic measure. The reason why a unilateral moratorium is not convenient is because we could be subject to sanctions (2004, p. 538).

And later, in May:

Perhaps it will be inevitable for me to take more aggressive measures regarding the payment of the debt, that is, allow the crisis to hit. And it will certainly be a crisis, because if I suspend more payments it is almost inevitable that the creditor countries will impose sanctions, which would affect our foreign trade, our import capacity, and would certainly wreak havoc in the foreign exchange market. The problem is that I do not see them giving me any other alternative (2004, p. 568).

Problems continued through the end of the De la Madrid administration. Pedro Aspe, who was undersecretary of Finance in the De la Madrid administration and would later become Minister of Finance, focused on early 1987 as “perhaps the worst moment of the Mexican fiscal crises.” Aspe had traveled to Washington, DC with Finance secretary Gustavo Petricoli seeking to renegotiate the terms of Mexico’s debt payments. “We went to the office of [IMF Managing Director] Jacques de la Rosière. Since they made us wait, Gustavo turned to me and said: ‘Call Lajous and ask him what the price of a barrel of Mexican oil is right now.’ I called him and he said: ‘5.50.’ A shipment had

just left at that price. I'll never forget that moment. So the Minister of Finance says: 'So what's the price?' 'Low, but he doesn't have the exact number,' I replied. Afterwards, I said to Gustavo: 'I told you a white lie. The price of Mexican oil today is 5.50.' 'Oh my God!,' he replied in disbelief."<sup>184</sup>

Similarly, the fiscal crisis of the government in early 1989, once Carlos Salinas had taken office, cannot be underestimated. Mexico had already reached agreements to renegotiate its debt with the International Monetary Fund and the World Bank, but commercial banks were determined not to yield to the Mexican request to forgive a fraction of the principal. In his memoirs (2000), Salinas wrote the following:

On May 19<sup>th</sup> [1989], we had an economic cabinet meeting... The proposal to suspend payments was lingering. I reiterated that that was not the adequate measure to put pressure; it was a possible action that should only be employed as a last resort...

In my personal notes from May 23<sup>rd</sup>, I wrote: "The [commercial] banks are not in a hurry and they are in a very tough position. I am on the way to a moratorium, against my will, not because of what it represents, but because of the fearful who are here." The next day, I wrote: "The exchange market is restless. People can perceive the threat of the moratorium. The worst would be unleashing speculation."

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<sup>184</sup> Pedro Aspe, personal interview, 13 May 2009.

*Removing regulatory constraints and the creation of PMI*

The effect of market competition and fiscal jeopardy was manifested in the government's willingness to establish institutional limits on its ability to interfere in oil commercialization activities. These efforts began in the mid-1980s, when the Division of Foreign Trade was relieved from cumbersome regulations applicable to all state-owned enterprises in Mexico and that had the objective of maintaining the government's capacity to oversee the companies' activities. Subsequently, the government's willingness to establish "veto points" in its relationship with the Division of Foreign Trade peaked on May 24, 1989, barely six months into the administration of President Carlos Salinas, when the Division formally became a subsidiary company of Pemex.

The new entity was named "PMI *Comercio Internacional*." It would be headquartered in Mexico City, and it had its own subsidiaries abroad to undertake its commercialization activities. Companies such as "PMI Holdings North America" and "Pemex Internacional España" had emerged, the first chartered in Delaware, in the United States, and the second one established in Madrid, Spain. These subsidiaries were not classified as state-owned enterprises by the Ministry of Finance and thus were not subject to the regulatory constraints of the Mexican public sector in terms of procurement and the hiring of personnel. The creation of PMI crystallized a series of objectives that Lajous had been pushing for in the previous years, and it was facilitated—as it will be explained below—by the need of the Mexican government to protect petroleum revenues at a time of extreme fiscal jeopardy.

Functionally, PMI would differ from the Foreign Trade Division in two regards. It continued to handle crude oil marketing activities, but it also took control of managing

Pemex assets abroad. Perhaps more importantly, the first director of PMI, Pedro Haas, introduced a trading division within PMI to make transactions—and reap a profit—on oil products. Haas explains that

When I arrived to lead Foreign Trade, my job was to follow up on what Lajous had been doing. Our main disagreement at the time was that he thought that the area of Foreign Trade had to be limited to international marketing of crude, that is, the contractual sales to final customers. But I was coming back from working in London, having observed closely the trading activities that Shell and BP were doing in the market for Brent. I was excited about that and wanted to implement it in Pemex. In the end, we were both right. In crude, Pemex has never done trading: it has always sold to final customers; but trading was introduced in products, and it was necessary, and it brought high profits, and it mitigated a lot of problems.<sup>185</sup>

Second, and more importantly, the requests for greater regulatory flexibility by the Foreign Trade Division occurred at a time when fiscal jeopardy in the country made it highly advisable for the federal government to establish a separate subsidiary in charge of crude oil commercialization. Mexico's foreign debt problems remained high in 1989, and the creation of a separate corporate entity in charge of foreign trade offered some

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<sup>185</sup> Pedro Haas, personal interview 14 January 2009. When asked why he was persuaded that Pemex should not do trading of crude oil, Haas replied: "Because crude oil revenues are so important for the nation. The idea that you could sell a shipment at 14.10 and the next at 14.15 and the next at 13.95 would entail that you could get into a lot of trouble. You needed rules."



“corporate veil” protection in the event that the Mexican government defaulted on its payments.

Pemex, formally a unit within the Ministry of Energy, could be considered an extension of the federal government by a foreign court of law if creditor banks sought to seize Mexican assets after a moratorium was announced. Under international law, accounts receivables are domiciled in the country of the company making the payment—rather than in the country of the company receiving the payment. Accordingly, oil revenues were highly vulnerable unless a structure could be constructed to build degrees of separation between the federal government and the proceeds from oil sales abroad.

A sensible solution was to create a subsidiary in charge of oil commercialization, with majority—but not exclusive—ownership by Pemex and with the capacity to open subsidiaries abroad that would not be, legally, state-owned enterprises. Hence, PMI was founded with three different shareholders, all state-owned: Pemex (85 % ownership), the National Foreign Trade Bank (Bancomext) (7.5 %), and *Nacional Financiera*, a development bank (7.5%). Pemex would first sell its crude oil, at arm’s length, to PMI, which would then commercialize it abroad. The “corporate veil” protection was not absolute, since all shareholders were state-owned, but the government’s legal team believed that it offered a reasonable degree of security, especially if foreign subsidiaries were incorporated in jurisdictions—such as the state of Delaware in the United States—with statutes where “corporate veil” protections were stronger.<sup>186</sup>

Moreover, this “corporate veil” logic explains the fairly convoluted ownership scheme of the PMI subsidiaries. In the mid-1980s, Lajous and the Juan Manuel Romero,

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<sup>186</sup> In the United States, courts deciding on lawsuits to “pierce” the corporate veil must use the laws of the state of incorporation, even if the corporation conducted business in other states. Laws in Delaware are less liberal in allowing the corporate veil to be pierced than elsewhere.

Finance Director of the Foreign Trade Division, designed a system of foreign subsidiaries for Pemex and created “PMIs” abroad—even before the main PMI was chartered in Mexico City.<sup>187</sup> Before, Pemex activities abroad were conducted in the Mexican embassies by so called “energy attachés,” a questionable practice that made Mexican oil revenues liable to tax collection by local authorities. The creation of subsidiaries was meant to protect the Mexican government against fiscalization, by chartering companies that only provided “assistance” to Pemex abroad. Thus, PMI Holdings North America, Inc., incorporated in Delaware, is owned in its entirety by PMI Norteamérica S.A. de C.V. The latter is incorporated in Mexico, but has 71.7% ownership by PMI Holdings BV and 28.3% ownership by PMI Holdings Petróleos España. However, PMI Holdings BV is incorporated in Amsterdam, the Netherlands, and has 100% ownership by Pemex, while PMI Holdings Petróleos España is incorporated in Curaçao, Netherlands Antilles, also with 100% Pemex ownership.<sup>188</sup> In 1989, when PMI was founded in Mexico, the network of PMIs abroad was already in place.<sup>189</sup>

As it turned out, Mexico met its international obligations and there was never a need to test the structure in international tribunals. The fiscal crisis peaked in July of 1989, when Salinas actually instructed his press secretary to arrange the recording of a speech announcing that his government had declared a moratorium (Salinas de Gortari 2000). Nevertheless, in the end the negotiation with the commercial banks succeeded and an agreement was reached before payments were suspended. From that moment forward,

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<sup>187</sup> Author’s interview with Juan Manuel Romero, Mexico City, 3 February 2010.

<sup>188</sup> Source: [http://www.pmi.com.mx/Contenido/docsPortal/Transparencia/Que\\_es\\_PMI\\_3.pdf](http://www.pmi.com.mx/Contenido/docsPortal/Transparencia/Que_es_PMI_3.pdf), accessed on 28 January 2010.

<sup>189</sup> Author’s interview with Juan Manuel Romero, Mexico City, 3 February 2010.

Mexico's fiscal jeopardy came to an end—but the effects in terms of state's relationship with its oil commercial activities had been already completed.

The question that remains is why subsequent administrations did not repeal the “extra-legal” regulatory arrangement of PMI, especially given that debt payments were not suspended and that the government did not face the risk of a moratorium again. Lajous recalls that “every time there was a new Comptroller-General, he would object to the structure of PMI, and we would have to go explain the reasons of the regulatory flexibility.”<sup>190</sup> Officials in the Bank of Mexico and the Finance Ministry, which always supported the independence of PMI, argued that the organizational arrangement provided an important safeguard for the oil revenues of the government, just in case another fiscal crisis took place. Moreover, changing back and forth the corporate governance of PMI could weaken the corporate veil argument before a court of law.

In fact, challenges to the legality of PMI lingered well into the 2000s, but its regulatory flexibility persisted. In April of 2006, the Superior Auditor of the Federation—the supreme oversight entity of the legislative branch—conducted an audit on Pemex and demanded that it provide documentation justifying its investments in all the subsidiaries of PMI. This issue was brought to a meeting of the Board of Directors of Pemex, which voted to ratify retroactively the purchase of the shares of PMI and the subsequent establishment of PMI's subsidiary companies.<sup>191</sup>

In 2008, one of the leading opposition senators, Graco Ramírez of the PRD, denounced the PMI structure of subsidiaries in a congressional hearing on Mexican oil sector. His participation demonstrated general lack of awareness of the history of PMI

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<sup>190</sup> Author's interview with Adrian Lajous, Mexico City, 7 July 2008.

<sup>191</sup> Minutes of the Pemex Board of Directors Meeting of 1 June 2006.

and the intricacies of international law. Nevertheless, it illustrates the concerns of a new generation of Mexican politicians, not tempered by the fiscal crises of the 1980s, regarding the regulatory exemptions of PMI:

You want a black hole? Pemex International... Pemex Financial [a subsidiary of PMI] does not have any employees and is administered by a bank located directly in the Cayman Islands. Think about what we do for tax evasion. And they have several companies, just so you know: one in Dublin, one in Houston, one in Amsterdam, in Aruba, and in several other places... This is beyond the transparency laws... Commercial decisions go through the Foreign Oil Trade Committee, which does not exist legally... If we want to reform Pemex, we must subpoena the director-general of PMI and eliminate this agency of international corruption.<sup>192</sup>

#### *Developing staff cohesion in PMI*

Over the years, PMI managers developed a high level of cohesion. A relatively small group of managers worked together and collectively developed specialization in the analysis of the crude oil and refining markets. As the technical nature of the work increased, the managers of PMI began to see themselves as different from Pemex—especially not marred by its reputation of inefficiency.

As mentioned above, Lajous's replacement in charge of PMI was Pedro Haas, who had been a close collaborator for years. Similarly, Haas would be followed in 1994

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<sup>192</sup> Participation of Senator Graco Ramírez in the forum on Transparency, Accountability, and the Fight Against Corruption in *Petróleos Mexicanos*, 17 July 2008.

by Eduardo Martínez del Río, who also had a long trajectory in the Division of Foreign Trade and PMI, having served as deputy director for market analysis and deputy director for crude oil marketing. When Martínez del Río retired in 2005, he was replaced by Rosendo Zambrano, who had forged his entire professional career in PMI and had risen from the lower echelons of the company.

The specialization of the staff at PMI had begun in 1983 when the subdivision for market analysis was created. The introduction of the pricing formulas, which demanded close analysis of both the global crude market and the local refining markets that bought Mexican oil, raised the need for further training. Attention focused on determining the adjustment factor present in the formula—the constant labeled as the “K”—in order to maximize revenues. It was an important task, yet manageable for the small and still relatively inexperienced commercial staff.

Guillermo Ruiz, then an analyst in the Foreign Trade Division, described the aftermath of the introduction of the formulas as follows:

The formulas were very beneficial in that they gave us the ability to follow the market, making sure we did two things at all times: not leave any money on the table and reduce volumetric risk. In the Foreign Trade Division there was a focus on how to follow the market and how to have ever more sophisticated tools to measure our competitiveness, how to simulate the value obtained at a refinery that used any of our crudes, Maya or Isthmus. The formula for Olmeca, which came into production later, was developed with those tools. We looked into what tools refiners used to

optimize their profit margins, like linear programming models, and we tried to develop simulation models for all our clients—I mean, they didn't have to be incredibly detailed, but the idea was to be able to derive the demand curve for our crudes.<sup>193</sup>

Training and learning-by-doing were emphasized, with rapid progress. In 1987, a group of three analysts of the Foreign Trade Division, led by Guillermo Ruiz, went to Houston to receive training by McKinsey & Company on refining economics—in particular regarding the linear programming techniques used by refiners to optimize their operations. Upon their return, the staffers organized workshops to transmit their knowledge to their peers.

Upon taking charge, Pedro Haas continued to build a competent staff. He visited top universities to recruit young college graduates. He valued raw intelligence over experience or knowledge of the oil industry, under the belief that new employees could be trained rapidly. An oil market observer familiar with PMI recalls that: “All the state companies wanted to be like PMI. [Brazil's] Petrobras, [Colombia's] Ecopetrol, everybody wanted to emulate the success of PMI, and whenever they would meet them they would say ‘Here come Pedro Haas and his *kinder*,’ since everyone was so young.”<sup>194</sup>

Specialization in trading developed under Haas. As a former gasoline trader of PMI explained, trading required considerable learning-by-doing, and over time the staff grew more comfortable with their new activity and began to reap considerable profits:

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<sup>193</sup> Author's interview with Guillermo Ruiz, Mexico City, 25 July 2008.

<sup>194</sup> Confidential interview with oil trader, Houston, TX, February 2009.

Knowing the market is not a quality but an activity. There are several sources of learning to know the market. First, there are publications related to gasoline markets (including news about refinery maintenance, political affairs that could affect the market, trends in regulation in important market). Second, you need to know about the activities that are carried out by the other traders. You do this in several ways, talking on the phone with the brokers, studying the futures market, the derivatives market—mainly swaps. And you also need to be talking with your counterparties, be they clients or suppliers. You do that in order to understand what they are doing and so that they understand what you are doing. Another activity is monitoring your own trades. Just like a stock market trader, a commodities trader has positions in the market—I am short here and long there. For gasoline in PMI, it is not just about buying or selling futures, but also about buying gasoline, lifting in a tanker, did the tanker arrive on time, does it have the correct quality.<sup>195</sup>

Interestingly, many “old guard” members of the Foreign Trade Division—who had worked for many years in Pemex and who were less in tune with the transformation orchestrated by Lajous and Haas—left voluntarily when PMI became an independent subsidiary. Since PMI was, legally, a separate company from Pemex, it was not immediately clear whether those employees in PMI would keep their Pemex labor benefits, in particular their seniority. In consequence, they sought to transfer to other branches of Pemex rather than continue with PMI. At first, says Haas, PMI had a small

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<sup>195</sup> Interview with former gasoline trader, Mexico City, 17 April 2008.

crisis given the shortage of personnel; however, it opened the door for hiring younger cadres who would be trained in the methods of market analysis that had been developed in the late 1980s.<sup>196</sup>

Additionally, PMI would have no unionized employees. Since the early 1980s, union members were reluctant to seek positions within the Foreign Trade Division given the nature of the work involved, which required language skills and which involved high legal and financial risks.<sup>197</sup> There remained, however, a few unionized support staff, and these workers left when PMI was created.<sup>198</sup>

*Effect of specialization: lower government intervention*

As the work in PMI became more technical in nature, politicians became more distant from their internal operations. Government officials lacked the capacity to understand the decisions made at PMI, and they yielded to the subsidiary to make promotions from within. Bernardo de la Garza, director of crude oil commercialization in 2008, remarked that:

The work of PMI is so technical and specialized that it is hard for outsiders to know what is going on... Now, the government does not want to appoint someone external to lead PMI because what if someone new cannot do the job—the revenue that PMI provides for the government is so important that they do not want to touch it so they don't break it.<sup>199</sup>

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<sup>196</sup> Author's interview with Pedro Haas, telephone communication, 14 January 2009.

<sup>197</sup> Author's interview with Adrián Lajous, Mexico City, 7 July 2008.

<sup>198</sup> Author's interview with Pedro Haas, telephone communication, 14 January 2009.

<sup>199</sup> Author's interview with Bernardo de la Garza, Mexico City, 7 April 2008.



*Effect of specialization: Development of successful commercial strategies*

The development of technical know-how allowed PMI to understand in-depth the special characteristics of the market for Maya. PMI's knowledge of the economics of Maya—developed as a result of the introduction of formula pricing—allowed it to adjust commercial policy accordingly. This section discusses the process and results of the two most significant marketing policies implemented in the 1990s in order to increase the price and export volume of Maya. These were the acquisition of 50% ownership in a refinery in the United States in 1993 and the signing of several long-term supply agreements with refineries in the United States beginning in late 1997.

Since the 1980s, PMI had developed expertise to analyze the oil market and had realized that the demand side is primarily determined by the refining markets. The essence of crude oil demand thus lies on two main elements. First, refineries seek to maximize the yield of some products over others. Second, lighter crudes can be transformed into higher value products much more easily and with considerably less expensive capital investments. PMI had the data and the modeling tools to realize that refineries customized to run heavy, sour crudes were price inelastic with regards to heavy oil, although they could substitute Mexican crude for other types of heavy crudes (primarily from Venezuela). However, refineries without deep conversion capacity were highly price elastic—a small increase in the price of heavy crudes or a decrease in light crudes would shift their demand for Maya considerably. The challenge, evidently, is that if the price of Maya decreases drastically at the margin, the price is lowered for the entire

supply and not just for the percentage of exports that is shipped to general purpose refineries.<sup>200</sup>

An effective response to counter this vulnerability of heavy crudes is to promote the expansion of capacity of refineries that are specifically customized to run heavy oil. Refineries that expand their “deep conversion capacity,” which primarily entails the very costly cracking and coking facilities, stand to reap sizable profits due to the lower price of heavy oil but also become captive to processing those types of crudes. While general purpose refineries cannot easily switch to processing heavy crudes because they cannot extract the same yield of gasoline, diesel, and jet fuel, deep conversion refineries cannot easily switch to lighter crudes because they rely on the lower price of heavy oil to compensate for their higher capital investment.

There have been two primary strategies to promote the expansion of deep conversion capacity and thus improve the structure of the demand curve for heavy oil. One of these, pioneered by *Petróleos de Venezuela* in the early 1980s, consists of purchasing refineries in foreign markets and building the coking facilities. This vertical integration downstream achieves in-house control over investments in physical capital, but it is costly to make the acquisition and it brings risk-and-return exposure in the downstream markets to the parent company. The second strategy was pioneered by PMI in the late 1990s and consists in enticing refineries to make the investments on their own in exchange for price guarantees. This approach does not require front-end capital disbursements by the seller of oil and does not bring risk-and-return exposure to downstream markets. The successful completion of either strategy, however, demands

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<sup>200</sup> The shift may not occur immediately, given that a large percentage of oil is sold via long-term contracts. However, these contracts typically must be renewed every three months.

highly specialized knowledge of trends and opportunities in the upstream and downstream oil markets.

In the early 1990s, PMI followed the first approach, which led to a 50-50% joint venture with Shell in a refinery in Deer Park, Texas.<sup>201</sup> In August of 1992, the two companies signed a memorandum of understanding whereby Pemex would purchase a 50% interest in the refinery and contribute to the construction of its coking and desulfurization facilities. In early 1993, the venture was made official in a new company—Deer Park Limited Partnership.<sup>202</sup> Upgrading began in the summer of 1993, and the coker was completed in April of 1995 after one billion dollars in expenditures.<sup>203</sup> As part of the 30-year agreement, Deer Park would process over 100,000 barrels of Maya per day and ship a sizable share of its gasoline production back to Mexico.<sup>204</sup>

The Deer Park agreement met several objectives for PMI. Perhaps the most important was diminishing the vulnerability of Maya crude in the market. Second, it gave Pemex copious profits in the 2000s from the profits in the refining market of the United States.<sup>205</sup> Third, it further developed PMI's expertise in contract negotiation and asset management, as it enabled PMI's staff to be present in Houston and exchange information with their counterparts from Shell regarding the state of the U.S. refining market.

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<sup>201</sup> At the same time, PMI was also in talks with Conoco to start a joint venture in the latter's Lake Charles, Louisiana refinery, but the project never materialized. See "Pemex in talks with Conoco," *Petroleum Economist*, 19 March 1993.

<sup>202</sup> "Shell, Pemex Team Up in Refining Venture," *The Oil and Gas Journal*, 8 March 1993, p. 25.

<sup>203</sup> Knott, David, "Looking for Ventures Down Mexico Way," *The Oil and Gas Journal*, 23 October 1995, p. 48. See also, Editorial, "The Shape of Shell to Come," *Petroleum Economist*, 30 November 1995, p. 2.

<sup>204</sup> "Pemex to Acquire Interest in Shell Texas Refinery," *The Oil and Gas Journal*, 31 August 1992, p. 28.

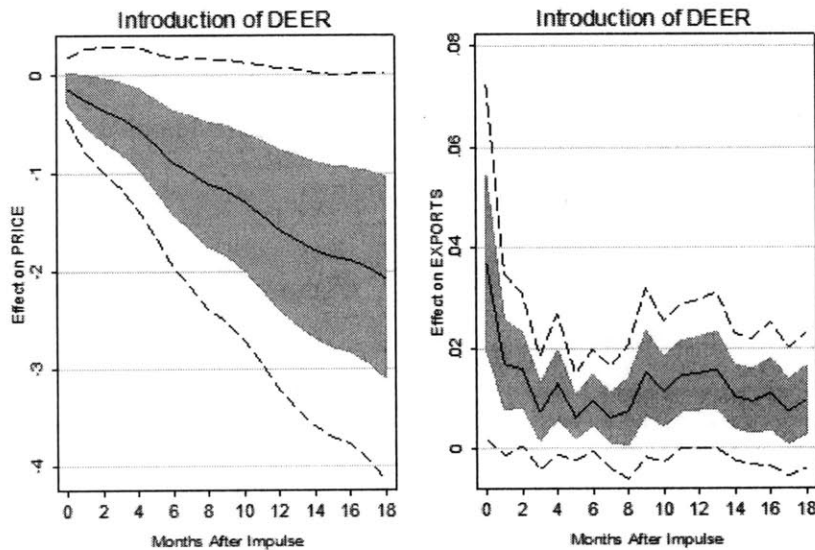
<sup>205</sup> In 2006, for example, PMI received total profits from the joint venture in Deer Park of US\$520 million. Source: PMI, Freedom of Information Law response UE-186000002108, 16 April 2008.

The evidence on the direct impact on prices and exports, however, is mixed.

Figure 4.6 presents the results of the VARIA analysis, testing the cumulative impact of the completion of the coker facility in Deer Park in the spring of 1995 on the price differential of Maya and Alaska North Slope and on the percentage change of exports. The effect on prices is small in the early months; subsequently, the effect grows but so do the confidence intervals. The rate of exports increased by nearly 4% in the first month and eventually stabilized at around 1% higher than the pre-intervention level (although without consistent statistical significance).

[FIGURE 4.6 HERE]

**Figure 4.6 Effect of Deer Park on the Price and Export Volume of Maya (VAR-Intervention Analysis – Cumulative Dynamic Multiplier Results)**



A few years later, PMI decided to try a different strategy which had an unambiguously positive impact on the price of Maya. Rather than acquiring an ownership stake in the refineries in the United States, PMI increased the overall refining capacity for

heavy crude by enticing several companies to construct coking facilities in exchange for long-term supply contracts of Maya that guaranteed a certain differential between Maya and a reference crude—such as WTI—or product—such as gasoline or fuel oil. Captive demand for heavy crude in the U.S. increased by approximately 700,000 barrels per day without Pemex having to disburse money up front and much faster than an equity purchase would have allowed.<sup>206</sup>

The first of these agreements was signed in late 1997 between PMI and Clark USA for the latter's Port Arthur refinery. Pemex would supply, for a minimum period of eight years starting on July 1, 2001, close to 175,000 barrels per day to be processed in deep conversion facilities that Clark would build on its own account and risk.<sup>207</sup> In exchange for making the massive capital investment, Clark was assured that the difference of the sum of half the price of regular unleaded gasoline and the price of diesel minus one and a half times the price of high sulfur fuel oil would not be less than 15 dollars per barrel.<sup>208</sup> If the average differential over the life of the contract was below 15 dollars, then PMI would pay Clark for the difference. Otherwise, no payments would be made in either direction.

Ernesto Estrada, a Chicago-trained Ph.D. in economics, was the director of PMI's Houston office at the time and the person in charge of developing these long-term supply agreements. He arrived in Houston in the summer of 1996 with confidential knowledge that Pemex would undertake a massive enhanced oil recovery project to nearly double the production of Maya in Cantarell in five years and with the mission of devising a

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<sup>206</sup> Author's interview with Ernesto Estrada, telephone communication, 12 January 2010.

<sup>207</sup> This agreement was approved in an extraordinary session of Pemex's Board of Directors, held on 2 March 1998.

<sup>208</sup> See Extraordinary Session of the Board of Directors of Pemex, 2 March 1998.

commercial strategy to place that additional crude in the market without putting a severe downward pressure on its price. Estrada explained his challenge as follows:

We already knew that the price differential [between light crude and Maya] would widen, but the market didn't know... The first thing we did was estimate the impact on the market of the additional production. We knew what was the capacity to process Maya and we saw that the opportunity cost of refineries fell dramatically. With only 100 or 200 thousand additional barrels, the extra refining capacity would already be exhausted and then the price would have to be cut considerably so that the refineries customized to process light crude started to lift heavy oil. Say that the differential was 10 dollars. We estimated that with the additional production the differential would go to something like 20 dollars. If PMI managed to close that differential by even 4 or 5 dollars, that was additional profit multiplied by hundreds of thousands of barrels per day over many years.<sup>209</sup>

The Deer Park agreement had been very expensive and time consuming, and a similar downstream investment would not resolve the underlying problem. The negotiation of a single joint venture would have exhausted much of PMI's time and energy, and it would have only increased captive demand for heavy crude by a fraction of what was needed. Instead, the strategy of the long-term contracts ensured that as many as

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<sup>209</sup> Ernesto Estrada, personal interview, 12 January 2010.

seven refineries committed to coking investments in a relatively short period of time, thus fully absorbing the additional 700,000 barrels per day that were forthcoming.<sup>210</sup>

Estrada and his team had to move quickly and discreetly. There was complete confidentiality in every step of the process. If the refineries found out the magnitude of the Cantarell project, they would realize that PMI's willingness to pay was high and demand a wider price differential as guarantee to build the cokers. That did not happen, and for each new agreement PMI would negotiate a differential close to their initial objective.<sup>211</sup> By the year 2000, before Maya exports increased drastically, a total of seven contracts had been signed.

The success of these contracts can be gauged through participant accounts. An oil industry executive who worked for one of the refining companies argued that the agreements were immensely beneficial for both Pemex and its customers.<sup>212</sup> Estrada agreed with that assessment, although he believes that PMI had a more favorable outcome given that it successfully exploited its confidential information:

Some of these refineries got upset afterwards. I mean, it was obviously beneficial to them, since the differential did widen, but they would argue that they had given the deep conversion to Pemex for free. I mean, these complaints were never made via official channels. At the corporate level, they never complained. But individual people would later make casual

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<sup>210</sup> Ernesto Estrada, personal interview, 12 January 2010.

<sup>211</sup> Estrada explained as follows: "The negotiation with Coastal for their Aruba refinery was very tough. They were very tough. But by then I had already signed three contracts, so I was in a stronger position. 'We already know that you're about to increase production by X,' they would say. They would throw numbers at you. But you could tell that they didn't know, that they were bluffing, because their numbers were far from the real figures, and in the end they agreed to a differential where Pemex never had to pay anything" (personal interview, 12 January 2010).

<sup>212</sup> Confidential interview, Houston, Texas, 8 February 2009.

comments that Pemex had gotten a great deal. And they couldn't complain too much because they knew that PMI had pushed them into making a deal that was also very advantageous for them. But they would say: "Yes, advantageous, but it could have been even more advantageous for us had we known the information that you had!"<sup>213</sup>

The econometric analysis confirms these assessments and quantifies the size of the gains for PMI. Figure 4.8 presents the VAR results of this particular policy intervention. The impulse that is measured is the date when the coker in Clark's Port Arthur refinery began operating. Other cokers would become operational in the coming years, but their effect is not directly measured by this analysis. The left panel shows a statistically significant cumulative gain of approximately two dollars per barrel—against the benchmark—by the eighth month. The cumulative impact on the rate of exports, however, was negligible.

[FIGURE 4.8 HERE]

*Exogenous shock: The price collapse of 1998*

In 1998, nominal prices of crude dropped below their 1986 levels.<sup>214</sup> A drop in global aggregate demand, arguably triggered by the Asian financial crisis, took prices to levels not seen in over a decade. In late 1996, Maya had averaged as much as US\$20.81 per barrel. In 1997, the price stabilized around US\$15, but then dropped to US\$11.49 in

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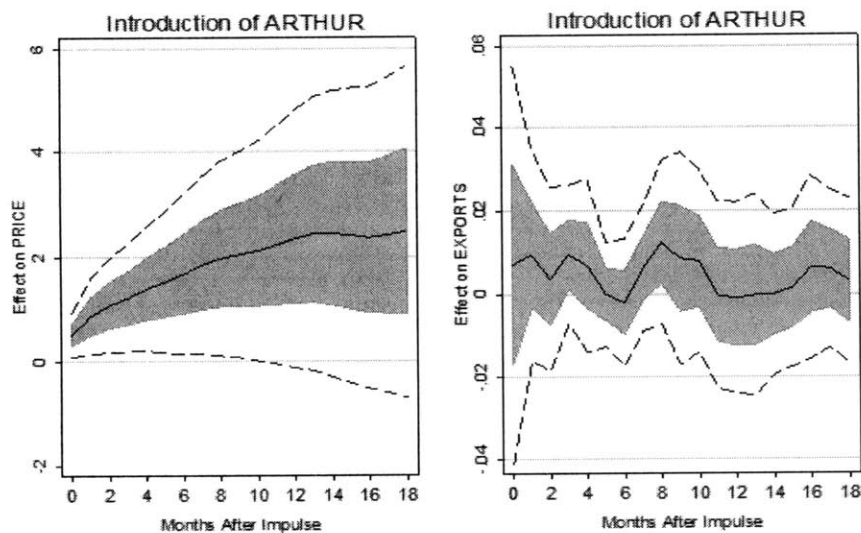
<sup>213</sup> Ernesto Estrada, personal interview, 12 January 2010.

<sup>214</sup> "Markets—The Crash of '86 Eclipsed," *Petroleum Economist*, 23 December 1998, p. 47.



December and to US\$9.70 in January of 1998. In December of 1998, the monthly average was down to an all-time low of US\$6.37.<sup>215</sup>

**Figure 4.8 Effect of the Port Arthur Agreement on the Price and Export Volume of Maya (VAR-Intervention Analysis – Cumulative Dynamic Multiplier Results)**



The price of Maya would slowly rise in 1999. In April of that year, it finally broke the US\$10 barrier for the first time since December of 1997, and in December of 1999 it was back above US\$20. All in all, the price crisis had lasted at least 18 months. What was PMI's response? Would there be similarities between 1998 and the previous sudden price drops of 1981 or 1986?

<sup>215</sup> A consensus had emerged in the industry regarding the "fair" price of oil the international market, whereby producer countries could find it profitable to continue to make investments and consumer countries would not see their economies negatively affected. In 1998, this price was US\$18, using Brent crude as the reference (Mabro 1998).

*Effect of specialization: PMI's response to the price collapse of 1998*

On January 9<sup>th</sup>, 1998, Lourdes Melgar, the director-general for international affairs at the Mexican Ministry of Energy, got an unexpected phone call from Luis Téllez, the secretary of energy.<sup>216</sup> “You said that there will be an energy conference in Caracas on January 15<sup>th</sup>, right?” “Yes,” she replied, surprised by the sudden interest of her boss in an international meeting of relatively low importance. “We are going to go,” said Téllez. “Adrián Lajous is coming with us. Schedule meetings with the Venezuelan Minister of Energy, the President of the Central Bank, and, if possible, the President of the Republic of Venezuela. The international oil market is about to collapse, and we must do something.”

For the analytical purposes of this chapter, the response of the marketing branch of Pemex to the price collapse is illustrative because it was handled professionally and never threatened the job security of the people in charge nor the price-setting framework in the country. In fact, commercial policy in Pemex had been institutionalized in such a way that the result was the mirror opposite of the disarray of 1981 that led to the fall of Diaz Serrano. Lajous—then chief executive of Pemex—remained stable in his position, and formula pricing—the backbone of Mexican oil commercialization strategy—was not put into question.

Téllez became promptly aware of the impending crisis thanks in large part to PMI's ability to follow closely the international market. “The Ministry of Energy is small and did not have a strong research department,” said Téllez. “However, Pemex had a very solid institution in PMI, which has very good traders and people who do very good analysis, and they realized that the price was about to decline and that a very serious

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<sup>216</sup> Lourdes Melgar, personal interview, 13 May 2009.

public finance crisis was imminent.”<sup>217</sup> Lourdes Melgar concurred: “Without a doubt, PMI played an important role... [And] the participation of Lajous was critical. He knew the oil market extremely well, and that enabled to craft a strategy very quickly.”<sup>218</sup>

A whirlwind of high level oil diplomacy ensued, as Mexico helped to bring together the Venezuelans and the Saudis—bitter rivals within OPEC—as well as the Norwegians in an effort to curtail global supply in light of the drastic reduction of global demand. A conflictive OPEC meeting in Jakarta in late 1997 had left the cartel in disarray and unlikely to meet the challenge of a sudden drop in demand. Téllez explained his reasoning as follows:

There was a need for someone to serve as a catalyst of OPEC’s ability to coordinate, and this idea arose within the Mexican government. We sought the assistance of another major producer that wasn’t in OPEC, which was Norway. The Norwegians agreed with us. I went to Oslo to meet with the oil minister and she agreed with us, so then it wouldn’t just be us alongside OPEC. And we made an effort for Venezuela and Saudi Arabia to resume cooperation.<sup>219</sup>

Events unfolded rapidly, leading to a wide OPEC and non-OPEC agreement to curtail supply. Mexicans and Venezuelans reached a preliminary agreement in the January meeting in Caracas. Téllez and Lajous then flew to Norway to explain the proposal. Norway, like Mexico, was a member of the OECD and its participation was

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<sup>217</sup> Luis Téllez, personal interview, 26 June 2009.

<sup>218</sup> Lourdes Melgar, personal interview, 13 May 2009.

<sup>219</sup> Luis Téllez, personal interview, 26 June 2009.

critical to avoid the semblance that Mexico was OPEC's "puppet."<sup>220</sup> From Oslo, the Mexican delegation travelled to Madrid to convene with the Venezuelans, notify them of the Norwegian position, and travel to Riyadh and explain the secret plan to the Saudi oil authorities. Participants understood that Saudi cooperation was crucial in any effort to cut global supply significantly (Grayson 1998).

The initial impact of the accord was positive, although short-lived. News of the Riyadh meeting broke out on March 22, 1998 and led to an immediate rise in the price of oil (Mabro 1998). In hindsight, however, the production cut was too small compared to the magnitude of the drop in demand, and prices continued to crawl downwards (Mabro 1998).

Diplomatic efforts continued throughout 1998 and 1999. Keeping oversupply at bay was a full time activity that extended over several months and was not always successful. Lourdes Melgar pointed out the difficulties in overseeing market players in a context of high uncertainty and deeply rooted suspicion among producers:

[I]t wasn't something where the initial agreement took place and then we just sat back and saw the fruits of our labor. No, we had to be working continuously to try to keep the agreement in place... I had to monitor CNN around the clock. The issue was that the debates between ministers did not take place in official meetings; they took place through the press. A conflict broke out between Venezuela and Iran and led to a point where the whole effort to keep production low was in jeopardy. Then, in February of 99, the oil market reached its lowest point. Mexico started to

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<sup>220</sup> Lourdes Melgar, personal interview, 13 May 2009.

attend OPEC meetings... Algeria was the chair of OPEC that year, and they called a meeting in The Hague, in the house of the Algerian ambassador, and it was attended by Venezuela, Iran, Saudi Arabia, Algeria, and Mexico... The debate was bitter, but the final resolution was that some form of agreement had to be reached regarding the compliance of Iran and Venezuela, and another production cut was agreed. After that meeting, things began to improve once and for all, albeit gradually... The other concern was that Chávez won the elections in the middle of the process and there was a huge concern about the future of Venezuelan oil policy. President Zedillo asked Luis Téllez to travel to Caracas to meet with the president-elect. We were very interested in this, because it was evident that Chávez already was in conflict with Luis Giusti, the president of PDVSA, but Venezuela did comply.<sup>221</sup>

*Exogenous shock: The rise in prices of the 2000s*

The 2000s witnessed a dramatic rise in the price of crude oil. Price levels peaked in the summer of 2008, but they had been rising continuously since 2002. By and large, the upward pressure on prices was driven by an increase in aggregate global activity, especially in China and other rapidly industrializing Asian economies. Maya production from the Cantarell field would peak in 2004, but PMI had little difficulty placing the additional barrels of oil. From a price of US\$13.15 in January of 2002, Maya rose to US\$27.65 in January of 2004—a level unimaginable a decade earlier. Prices would not stop there: in June of 2005, the nominal F.O.B. price of Maya broke the US\$40 barrier

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<sup>221</sup> Lourdes Melgar, personal interview, 13 May 2009.

for the first time in history. In April of 2006, it surpassed US\$50; in July of 2007, US\$60. The all-time high was reached in July of 2008 at a staggering US\$121.36 per barrel.

The decrease of market competition in the 2000s had two effects on PMI. First, concerns arose that the productive efficiency of PMI had begun to deteriorate. Second, the government's willingness to intervene in the operations of the company increased. This response was not generalized throughout the government, but it rose to levels not seen since the early 1980s. Luckily for PMI, the high level of technical specialization among its staff thwarted political attempts to challenge its decisions. At the same time, some concerns arose regarding the insularity of the managerial personnel.

#### *The Congressional Investigation of 2005*

In November of 2004, COCEP—now labeled GICEH—announced that the adjustment factor in the formula for Maya—the “K”—would be cut by 3 dollars. This represented almost 8% of the average price in the previous month. The decision and the events that followed illustrate the high level of institutionalization of pricing policy compared to 1981, but also the fact that in a context of lower market competition and no fiscal jeopardy, the government's willingness to intervene in the company increased.

On November 6, 2004, the Mexican newspaper *La Jornada* published a story that would trigger the most significant attempt of government intervention in oil commercialization in two decades. “Historic Cut to the Oil Price Sold to the United States,” read the headline.<sup>222</sup> The article then quoted an international oil market analyst who argued that the price adjustment was “excessive.” The article concluded by

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<sup>222</sup> Israel Rodríguez, “Histórica rebaja al precio del crudo para EU: Pemex Internacional,” *La Jornada*, 6 November 2004.

insinuating that PMI's Director of Crude Oil Commercialization, Bernardo de la Garza, had sought to send a gesture of goodwill to the recently re-elected President George W. Bush.

A congressional investigation was launched on March 16, 2005 to determine whether any wrongdoing by PMI had led to the price decrease.<sup>223</sup> Bernardo de la Garza explained the events leading to the price cut as follows:

Many things came up at once. It was one year before Katrina and Rita hit, and in that year we had about 4 hurricanes hit. One of those hit a refinery that buys a lot of crude from us, which is the Chevron refinery in Pascagoula [Mississippi], leading to its close for several months. Then, starting in August or September, the Arabs starting lowering their prices, and we did not bring down ours at that point. It was an honest mistake on our part, and when we reached the point where we had to make the adjustment, it had to be a big one. It led to the resignation of the director-general of PMI. He had a delicate health condition, and he decided to resign given all the pressure that he was facing.<sup>224</sup>

The congressional committee lacked the technical capacity to assess pricing policy correctly—both to appreciate the virtues of the institutional system and any potential errors in policy implementation. Knowledge of commercialization activities in

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<sup>223</sup> See Comisión de Investigación en Relación a las Políticas Implementadas para la Determinación de los Precios del Petróleo, "Informe de la Comisión," Cámara de Diputados del H. Congreso de la Unión, LIX Legislatura, 22 February 2006.

<sup>224</sup> Bernardo de la Garza, personal interview, Mexico City, 7 April 2008.

Mexico, by that point, was far removed from anyone who had not worked in PMI for years. Bernardo de la Garza, for example, had already worked in oil commercialization in PMI for 14 years, was a former head of PMI's Houston office, and was very well respected among industry experts, both domestic and international.<sup>225</sup>

The final report of the congressional investigation illustrates these points. Members of congress met with PMI managers and travelled to Mexican oil producing facilities, but did not summon independent experts that could provide an impartial opinion on the state of affairs. In fact, the general report prompted the deputies from the opposition PRD to include the following dissent:

We believe that the general tone of the document is excessively flattering for several reasons. First, it does not answer fully the question that motivated the creation of the commission: to investigate the unilateral decision to discount by 3 dollars the "K" factor of the formula that determines the price of crude...<sup>226</sup>

PMI emerged unscathed from the congressional report, but eventually a regulation was instituted in 2007 that curtailed PMI's price setting flexibility. In 2007, at the request of the PMI's comptroller, a new rule dictated that changes to the "K" in excess of 10% of the price of oil would have to be first approved by the company's Board of Directors.<sup>227</sup>

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<sup>225</sup> Confidential interview with international oil industry expert, February 2009.

<sup>226</sup> Dissent by Deputies Francisco J. Carrillo Soberón and Rosa María Avilés Nájera of the Party of the Democratic Revolution. See Comisión de Investigación en Relación a las Políticas Implementadas para la Determinación de los Precios del Petróleo, "Informe de la Comisión," Cámara de Diputados del H. Congreso de la Unión, LIX Legislatura, 22 February 2006, p. 37.

<sup>227</sup> Bernardo de la Garza, personal interview, 7 April 2008.



In practice, month-to-month fluctuations were expected to be much smaller than that and thus the new rule would have little impact.

*Is the Formula for Maya Keeping Up with Market Changes?*

Observers worried that a degree of complacency had prevented PMI from updating its formula to price Maya in international markets in spite of changing market conditions. Between 1986 and 1996, the formula was revised three times. However, since 1996 until 2010 no changes had been made. If formulas do not successfully estimate the market price of Maya, PMI risks failing to meet its objectives of price and export maximization.

Two major reasons suggest that formulas could be outdated. Most significantly, some industry experts argue that benchmark crude prices no longer represent the clearing price at the margin (Fattouh 2006). The production of benchmark crudes has been in decline, leading to fewer open transactions and a more difficult process of “price discovery.”<sup>228</sup> Second, the percentages in the formula may no longer represent accurately the distribution of price components. The importance of fuel oil in the energy matrix of the United States, for example, has declined, prompting some experts to question the validity of continuing to anchor Maya prices to fuel oil in the North American market to such high degree. However, in an environment with lower market competition, incentives to meddle with the formulas decrease. Risk aversion rises and the search for innovative commercial strategies suffers.

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<sup>228</sup> Fattouh explains this problem for the case of the Dubai benchmark, which is used to price oil in Asia. Oil production of Dubai dropped from 400,000 barrels per day in the early 1990s to slightly over 100,000 by the year 2004. This meant that every month there were only a handful of cargoes of Dubai crude. In fact, this prompted the use of Omani crude in combination with Dubai as the relevant benchmark. Brent and WTI, according to Fattouh (2006) have similar problems.

*PMI in 2008: Becoming a Technical Enclave?*

Concerns arose in the middle of the price spike of 2008 regarding whether the decrease of competition was transforming PMI into a “technical enclave,” successful due to its highly specialized staff but increasingly parochial. By then, all directors-general of PMI had been promoted from within, after building their entire professional life inside the company.<sup>229</sup> Pedro Haas had been followed by Eduardo Martínez del Río, who was replaced in 2005 by Rosendo Zambrano. Zambrano was a veteran of PMI, with over 15 years of experience in the company, and he had served as deputy director for refined products trading from 1995 to 2005. Zambrano’s replacement, Rocío Zambrano, also came from within the company. In fact, she had taken over Zambrano’s position of deputy director in 2005.

The sense among some observers was that if market competition did not expose inefficiencies in PMI, no one from outside would notice. In other words, managerial cohesion with decreased market competition was leading to a sluggish insularity not seen before. In the end, even if PMI did not have identifiable landmark successes in the 2000s—comparable to formula pricing in the 1980s and the contracts in exchange for cokers in the 1990s—performance remained high in the 2000s. “PMI traders are just as good as BP or Shell traders,” said an international oil industry expert based in Houston.<sup>230</sup> Other experts interviewed for this study concurred.

Moreover, in the long run, rising levels of competition are likely to keep PMI honest. After the price peak of the summer of 2008, competition increased rapidly as the world struggled with a global recession. In a more difficult market environment,

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<sup>229</sup> Interview with Mexican oil industry expert, April 2008.

<sup>230</sup> Interview with international oil industry expert, February 2009.

incentives for top performance in PMI should return. Combined with the high degree of managerial specialization, high competition can help keep non-aligned government interference at bay and promote entrepreneurial behavior within the organization.

## **6. Conclusion**

This chapter accomplishes three major objectives. First, it presents a detailed account of the history of PMI's crude oil marketing activities—whereby a state-owned enterprise evolved from a disorganized and inefficient unit into a highly productive and innovative firm. Analytically, it illustrates the role of the different explanatory variables in shaping the outcomes of business efficiency and policy utilization of the firm. Methodologically, the chapter blends meticulous process tracing—based on archival material and dozens of in-depth interviews—with time series econometric analysis in order to provide robust evidence.

In essence, the branch once associated with the downfall of Jorge Díaz Serrano and a haphazard price determination process changed into a modern company capable of responding to a dynamic international environment. In fact, PMI's innovations transformed that environment. Formula pricing became one of the major mechanisms for oil price discovery in the global market, and the projects to expand the deep conversion refining capacity in the United States changed the landscape of supply and demand conditions in the Gulf of Mexico. This process coincided with a retrenchment in the state's involvement in the company.

Chapter 2 conceptualizes the role of market competition as two-fold. First, it provides the company with “pressures” to change. The case of PMI illustrates this

process. In September of 1985, when several Pemex managers realized that Saudi Arabia was abandoning its policy of moderation in crude production and adopting netback pricing, they moved fast to protect their position in the market and avoid being undersold. Their analysis determined that the new Saudi commercial policy greatly threatened Mexican marketing activities, and they rushed to develop a counter-measure. Similarly, in 1996, PMI understood that the increase in production of Maya threatened to bring the price of Mexican crude down. As a result, the company developed a plan to increase captive demand for heavy oil in the Gulf of Mexico and executed it stealthily prior to the completion of the Cantarell Project.

By the same token, the decrease in the level of market competition removes these pressures to change. Without the need to undersell rivals, managers lose incentives to revise the status quo and improve the company's operations. As the chapter points out, PMI faced this challenge in the 2000s when demand for oil rose and the difficulty to sell additional barrels dropped. Several experts raised concerns regarding PMI's apparent lack of interest to update the pricing formulas and adjust to changing market circumstances. Moreover, questions arose regarding the implementation of the adjustment factor (known as the "K") in those formulas, in particular in late 2004.

Second, market competition plays an important role because it affords the company the necessary "means to change," decreasing the willingness of the government to participate in its internal operations. In this particular case, the company needed autonomy to make pricing decisions based on technical considerations as well as regulatory flexibility to participate in a fast-paced environment. Market competition was decisive because it raised the cost for the government to intervene in decision-making.

The severe loss of oil revenue in 1981 had already warned politicians of the pitfalls of meddling in pricing decisions and had prompted the creation of COCEP—an inter-ministerial committee that institutionalized decision-making. In that context, Adrián Lajous had also persuaded the government to relax the public bidding regulations for oil marketing activities. Otherwise, he told prominent cabinet members, Pemex would be too slow to respond to rivals' efforts to undersell.

The state retrenched further in the middle of 1985. After COCEP chose to ignore the recommendation of the technical staff to lower prices in May of that year, Mexican exports collapsed by 50% over the next month. To overcome the losses, politicians yielded further control of pricing to PMI bureaucrats, who gained influence over the coming months and eventually obtained approval for the use of formulas in February of 1986.

The “means to change” would be curtailed slightly in the 2000s, when market competition decreased. In response to the congressional investigation of 2004, government officials established limits on COCEP's ability to change the “K” in the formula from one month to the next. This policy had the advantage of institutionalizing decision-making for larger swings in the “K.” At the same time, it also decreased PMI's flexibility to respond to short-term market volatility.

The case of PMI also helps to illustrate the formation and effects of managerial cohesion. In the theoretical discussion of Chapter 2, there are two elements that lead to cohesion of the managers: specialization and socialization. The process of specialization in oil industry economics in PMI began with the creation of the subdivision of market analysis in the early 1980s and continued in earnest once formula pricing was introduced

and a group of staffers travelled to Houston to attend courses in refining economics. The advanced knowledge of oil marketing and trading was then shared among the members in Mexico, and each new generation of employees would undergo extensive training. Socialization derived from the subsidiary's tradition to retain its staff over the years and from the fact that PMI was a small place where all employees knew each other well. In the 2000s, most of the top executives had worked together since they began their professional careers decades.

Cohesion provided generations of PMI managers with the capacity for coordinated activity. Additionally, the specialization that had been developed over time helped constrain the government's ability to intervene in the company. By the 2000s, several respondents remarked that the analytical and operational work of PMI seemed quite arcane for outsiders, and that government officials were increasingly unwilling to appoint politicians to top managerial positions out of fear of losing oil revenues.

This chapter also serves to highlight how fiscal jeopardy can interact with market competition and affect the government's willingness to intervene in the company. Fiscal jeopardy encouraged the government to remove regulatory constraints and grant autonomy to the technical bureaucrats because it raised the cost of politically-induced managerial errors. The formal creation of PMI as an independent subsidiary in 1989, with its network of companies around the world, was a direct consequence of the government's fear of declaring a moratorium on its debt and having foreign courts confiscate the proceeds of petroleum sales abroad.

Petroleum marketing also allows for the examination of a change in the political ideology of the government on the policy utilization of the subsidiary. In the 1970s, when

a leftist ruling coalition controlled the Mexican government, the foreign trade of oil was linked to the promotion of domestic industrial activity. In exchange for supply agreements, foreign governments would be asked to engage in technological exchange programs with Mexico or to commit to make investments in the country. These policies fit within the general economic policy paradigm of the ruling coalition—import-substitution industrialization—which championed the notion that economic development primarily resulted from the promotion of domestic industrial activity. After the mid-1980s, when the political right consolidated its control over economic policy, PMI stopped seeking the industrial policy agreements. While in the 1980s and 1990s competitive pressures prevented the government from willing to intervene in the first place, it is noteworthy that in the 2000s, once competition decreased, the rightist Mexican governments still abstained from linking domestic industrial projects to oil commercialization.

The two following chapters in the dissertation are meant to complement the analysis of the case of PMI. Chapter 5 describes the history of PEP in order to underscore the effect of a high degree of managerial cohesion for a subsidiary company that does not face market competition. Chapter 6 compares two companies with lower levels of managerial cohesion but with changing levels of market competition.

## CHAPTER 5

### PEP: MANAGERIAL COHESION IN A MONOPOLY ENVIRONMENT

#### 1. The Argument in Brief

The history of *Pemex Exploración y Producción* (PEP, for short) illustrates the trajectory of a state-owned enterprise with a high level of managerial cohesion and specialization but operating in a monopolistic market. As explained in chapter 2, this organization displayed a middling level of performance with a downward trend. Compared to the dynamism of the international exploration and production industry, PEP parochialism paralyzed its technological evolution and innovative capacity.

This chapter makes the following main arguments. First, the PEP's historical level of business efficiency, by world standards, has been average; yet, it has deteriorated recently. Second, high managerial cohesion has curtailed the ability of the government to intervene and make political appointments to top executive positions. However, the lack of market competition has had two deleterious effects. It has removed incentives among the managers to improve their performance over time, and it has not compelled the government to soften the cumbersome regulatory and fiscal framework of the company.

Within this context, two auxiliary variables have stood out to explain changes in the relationship between PEP and the Mexican state. The *willingness* of the government to introduce non-aligned intervention has diminished during times of a threat of oil scarcity. When oil scarcity appears to be imminent, the government allows the company to operate more freely; otherwise, constraints on managerial autonomy are maintained. Additionally, the *ability* of the government to interfere with the operations of the firm has been diminished by the emergence of veto points in the political system with the advent



of democratization. This has been manifested primarily in the reduction of the fiscal burden.

Appendix B describes in greater detail the statistical analysis included in the chapter. An ordinary least-squares (OLS) regression is used to test the importance of the threat of oil scarcity on the degree of non-aligned government intervention. The statistical results confirm and quantify the findings of the qualitative analysis, showing that the level of NAGI responds negatively to decreases in the relative oil abundance in the country.

The analysis of PEP complements PMI's in two ways. At one level, PEP illustrates in depth the consequences of low market competition and high managerial cohesion over an extended period of time. Subsequently, by holding these variables constant, the case of PEP allows identifying more clearly the impact the government's political ideology, fiscal jeopardy, veto players. Chapter 6, which compares Pemex-Gas and Pemex-Refining, will emphasize the effect of an increase in market competition while holding managerial cohesion at a lower level.

## **2. An Overview of the Business of PEP**

Pemex-Exploration & Production was created in 1992 as a subsidiary company of Pemex out of the old Division of Primary Production. For the purposes of this chapter, PEP and the Division of Primary Production are analyzed together given that the new subsidiary comprised the same staff and offices as its predecessor. The main difference was organizational. Starting in 1992, PEP has operated at arm's length from the rest of the subsidiaries of the company and constitutes a separate legal entity.

PEP is in charge of all upstream oil and gas activities in Mexico. This entails the exploration, development, and management of reservoirs. Its responsibilities end when the hydrocarbons are put in pipelines for domestic processing (which are under the management of Pemex-Refining and Pemex-Gas) or when they arrive at the export terminals (at which point they are controlled by PMI).

Organizationally, PEP is divided into four regions and a subsidiary headquarters in Mexico City. The structure of each region is semi-autonomous in the sense that the regional chief has oversight over all the staff, and it is this managers who responds to the corporate executives. In practice, PEP has a highly decentralized administration where many operational decisions are made in the regions.

The four regions are North, South, Offshore Southwest, and Offshore Northeast. The northern region includes areas that were highly productive in the early 20<sup>th</sup> century but that have been in decline for many years. The southern region comprises the oil fields of the Chiapas-Tabasco area. These fields were discovered in the late 1960s and rendered large amounts of light crude in the 1970s and 1980s. However, they peaked soon thereafter. The two most important areas in the 2000s were the offshore regions, both of which are located in the Gulf of Mexico. The Offshore Northeast region has provided the bulk of Mexico's heavy oil since the 1980s. The Offshore Southwest region has historically produced less oil but has risen in notoriety because it includes the prospective deepwater areas in the Mexican side of the Gulf of Mexico.

The history of PEP is largely determined by the evolution of the Cantarell oil field. It is located in the Bay of Campeche in the Gulf of Mexico, in the Offshore Northeast region, and it has provided most of the Maya crude that Mexico has exported

over time. Its commercial production began in 1979, and, in 2004, only the Ghawar field in Saudi Arabia—the largest in the world—produced more oil than Cantarell (Adrián Lajous 2009). In that year, however, production peaked and by 2010 Cantarell was in a process of accelerated decline. While other fields—mainly Ku-Maloob-Zaap, also in the Offshore Northeast region—had been developed in the previous two decades, they did not fully compensate for the loss of production in Cantarell. Figures 3.1 and 3.2 in Chapter 3, respectively, present the evolution of total domestic production and consumption of oil from 1950 to 2008 and the average monthly production in Cantarell from 1980 to 2008.

PEP, like any exploration and production (E&P) company around the world, faces the challenge of increasing reserves of petroleum, minimizing development time (that is, the lag between discovery of a reservoir and commercial production), and maximizing the recovery rate from the reservoirs. Reserves may be the most salient measure of the long-term value of an E&P company (David Johnston and Daniel Johnston 2006; Arnott 2004). Richard Sears, former vicepresident for deepwater E&P at Royal Dutch Shell, sustains that “the upstream oil industry is exceptional in that inventories are valuable in and of themselves.”<sup>231</sup> Field development and reservoir management are important as well, as they are essential to “monetize” reserves on the ground. A reflection of the importance of these three activities is the fact that oil companies subcontract most other functions, but they invest heavily in attracting top human capital in these areas.

The accumulation of reserves is the product of successful exploration, which relies on the skill of the company’s geologists and geophysicists. Oil companies usually hire a service company to collect seismic data in prospective oil areas. In this process,

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<sup>231</sup> Author’s interview with Richard Sears, Cambridge, Massachusetts, 14 May 2009.

brigades of workers measure the time lag of sound waves bouncing off layers of rock beneath the soil—or, in the case of offshore activity, under water (Conaway 1999). Subsequently, geologists and geophysicists must interpret the mappings, identifying the types of rocks that are present and the probability that oil has been trapped inside of them.

Exploration is an inexact science that depends on the intuition and experience of the scientists analyzing the data. Back in the 1960s, relying exclusively on two-dimensional charts, exploration experts faced much more difficult odds. In the 2000s, with the advent of seismic data in three dimensions and advanced computing power, interpretation took place in formidable labs where researchers analyzed the subsoil from all possible angles. Yet, an expert geologist could still find a large reservoir where others had not. In fact, one of the most important discoveries of the late 20<sup>th</sup> century, BP's Thunder Horse field in the deepwater Gulf of Mexico, largely resulted from the ability of the company's geologists to use an innovative interpretation analysis in areas that others had abandoned as "dry" (Yeilding et al. 2005). In consequence, international oil companies invest heavily in recruiting and retaining top geologists.

Figure 5.1 shows the evolution of proven reserves in Mexico. This series is not fully comparable across time for two reasons. First, in the late 1970s and early 1980s, reserves are likely to be inflated. Mexico, as other countries have done over time, overestimated the reserves for political reasons. Second, the methodology to calculate reserves changed twice in recent years.<sup>232</sup> In 1997, transparency was increased and the

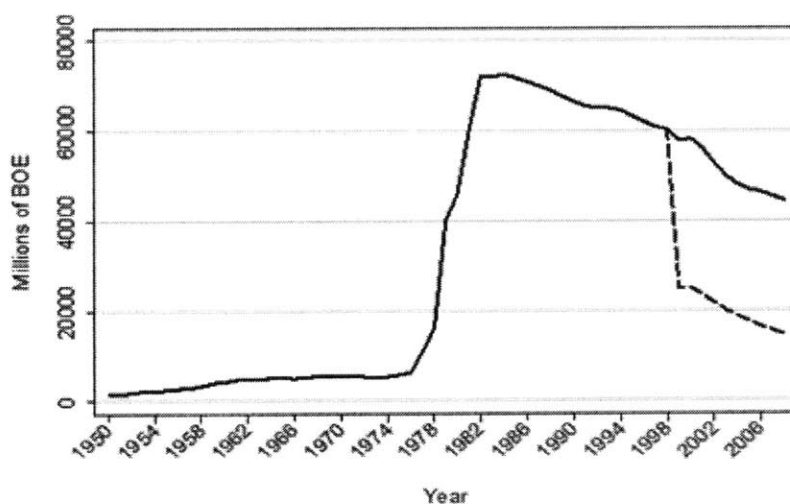
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<sup>232</sup> Three general classifications of reserves are found in the oil industry, known as the 3P's: proven, probable, and possible. Proven reserves refer to those which can be produced for economic gain under existing technological conditions. As the definition entails, their volume depends on *both* geological and

more stringent methodology of the Society of Petroleum Engineers was adopted, resulting in a considerably decline in reserves. Subsequently, in 2002, PEP introduced the methodology used by the Securities and Exchange Commission (S.E.C.) of the United States. Reserves declined further with this accounting change. The top line after 1997 shows what reserves would have been if no methodological changes had been made. The dotted line shows the reserves measured with the S.E.C. guidelines.

[FIGURE 5.1 HERE]

**Figure 5.1 Evolution of Oil Reserves in Mexico (1950 – 2008)**



Source: Pemex, Statistical Yearbooks

Even if oil is found, the well will be closed if the hydrocarbons are not highly concentrated or if production is more costly than the expected sales price. If the field is deemed to be commercially viable, a development project will be designed and executed.

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economic considerations. Probable and possible reserves are reservoirs that cannot be produced economically given current price levels or existing technologies. Total reserves add all three “P”s.”

Otherwise, the oil company will move on to a different prospective area. On occasions, companies will abstain from developing fields with large concentrations of oil because production is more expensive than the estimated future price of oil.

Development of a field generally takes several years, and timely completion of these projects is critical for the company's success. Drilling rigs and other machinery necessary to develop a field are very expensive. Delays in development cost an E&P company dearly simply in terms of rental fees and in terms of the opportunity cost of each day that a field is not in full production.

Project management expertise is crucial to minimize the time of development. In fact, project management is a core competency of oil companies, while specialized technical work is often subcontracted to service companies. The expertise lies in the knowledge of the available technology, the ability to bring different contractors together, and the logistical acumen to ensure safe and timely completion of deadlines. As Miller and Lessard (2000) explain, large engineering projects “are unforgiving and often unrewarding investments” (p. 12). “If a delay in the development of a field is long enough,” explains Richard Sears, “it can easily bankrupt a company.”<sup>233</sup>

The third main challenge of an upstream oil company entails optimizing the amount of oil that is recovered from a reservoir. Oil fields are not large pools of liquid hydrocarbons that can be drained until exhaustion. Instead, petroleum molecules are trapped within microscopic pores that exist in the rocks of the subsurface. The commercial exploitation of a reservoir depends on whether there is enough porosity in the rocks for the oil to flow through, whether the oil itself is fluid enough, and whether there is enough pressure in the reservoir to force the oil outwards through the well (Speight

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<sup>233</sup> Author's interview with Richard Sears, Cambridge, Massachusetts, 14 May 2009.

2001).<sup>234</sup> As more petroleum flows to the surface, the pressure of the field decreases, making a high percentage of the remaining oil unrecoverable. Furthermore, if oil is produced too quickly, the drop in pressure may be disproportionate to the amount of oil extracted, thus wasting much of the asset's productive capacity.

The successful planning and execution of "secondary oil recovery" endeavors is similarly crucial for reservoir optimization. In essence, these projects seek to increase the pressure of the reservoir so that additional oil can continue to flow through the wells.

Baviere (1991) describes the techniques of oil recovery as follows:

Oil is accumulated, together with water and gas, in reservoirs consisting of porous and permeable rocks. When an oil reservoir is brought into communication with the surface through a drilling operation, part of the oil is spontaneously produced because of the natural pressure that exists in the reservoir. The amount of oil produced by the energy of the reservoir itself, as well as by pumping of individual wells to assist the natural drive, is known as *primary oil recovery*. At the end of this depletion period, the recovery factor is low, usually lower than 15% of the original oil in place (OOIP). For improving oil recovery, water or gas can be injected in order to maintain or to restore the pressure and to flood the reservoir. These are *secondary oil recovery* processes.

However, these now conventional techniques still leave in the ground about two-thirds of OOIP. This is a result of both unfavorable

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<sup>234</sup> Porosity is a measure of the amount of open space in a rock, while permeability determines the ease with which a fluid can flow through those open spaces. Both are important for highly productive reservoirs.

reservoir characteristics, such as high oil viscosity or rock heterogeneity, which are responsible for areas of the reservoir that have not been flooded by the injected fluid, and the poor microscopic displacement efficiency of water and gas due to capillary forces which are highly active in such porous media. Therefore, methodologies have been developed to increase both the oil production rate and the recovery factor... They are called *enhanced oil recovery* (EOR) processes. (p. v)

The differential between gas and petroleum prices makes the project economical, even accounting for the cost of the gas-injection infrastructure. Typically, secondary oil recovery projects use carbon dioxide or natural gas—although in Cantarell PEP decided to use nitrogen injection.

Just like exploration, the management of reservoirs is one of the most important elements of know-how for oil companies and depends on intuition and expertise. Success is often measured by how well the company can maximize the amount of recoverable oil. While geologists and geophysicists work in exploration, reservoir development and management is generally the realm of petroleum engineers.

### **3. Measurement of Variables**

#### *3.1 Business Efficiency*

Economic efficiency is measured in several ways, seeking to address the three major tasks of an exploration and production company described above. Exploration efficiency is measured in terms of the success rate in exploratory wells drilled. The



success rate in development wells is not included since these are usually drilled in areas adjacent to others that are known to be productive. For that reason, exploratory wells are sometimes referred to as “true exploration” by oil companies.

Figure 5.2 presents the number of exploration wells drilled and how many of them were successful. The 1990s stand out for the historically low levels of exploration. In the 2000s, the exploratory success of PEP is comparable to that of similar state-owned enterprises, although lower than the most successful international private companies. For instance, in 2005, PEP drilled 74 exploratory wells and had a success rate of 53%. Brazil’s state-owned Petrobras drilled 73 wells and its success rate was 57%. PEP’s rate was higher than Colombia’s state-owned Ecopetrol’s at 38% (21 wells) and Malaysia’s Petronas’ at 29% (35 wells). By contrast, BP drilled 45 wells with a 69% success rate and Shell drilled 54 wells, also with a 69% success rate (Energy Intelligence 2007).<sup>235</sup>

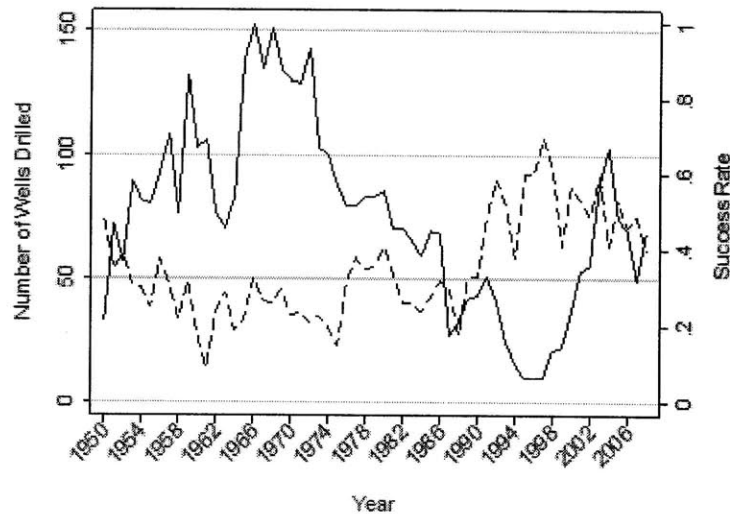
[FIGURE 5.2 HERE]

Project management expertise is more difficult to measure. Qualitative assessments of PEP’s major projects are used to gauge the logistical capacity of the company. Each oil field poses different challenges, but an assessment of performance can be made by comparing actual development time to (i) estimated time, (ii) the time other companies took to develop fields with similar geological challenges, and (iii) the time PEP took to develop fields in the past. Cost overruns are a measure of inefficiency unless they can be reasonably justified.

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<sup>235</sup> These figures are not directly comparable. Exploration in offshore areas generally has a different success rate than onshore, and disaggregated data is not available. Nevertheless, these indicators provide an indication of the standing of these companies that confirms qualitative assessments by industry experts.

**Figure 5.2 Number of Exploration Wells Drilled and Success Rate (1950 – 2008)**



Source: Pemex, Statistical Yearbooks

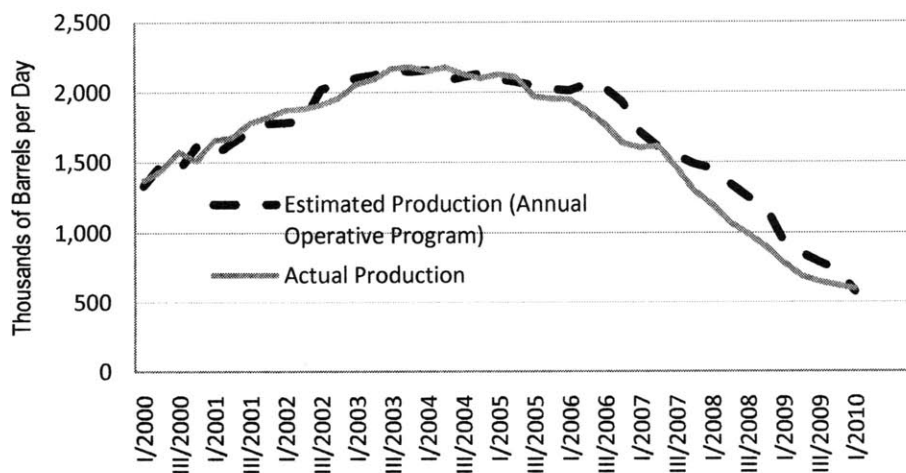
Reservoir optimization is measured as the percentage of oil recovered from the field out of the total amount estimated one year before. While companies do not necessarily meet their targets in terms of production, this comparison allows assessing how well the petroleum engineers understand the reservoir (in order to make forecasts and meet their production objectives). The same caveats of the measurement of project management expertise apply here, since different reservoirs pose different problems. Nevertheless, these quantitative assessments provide a baseline from which to evaluate the qualitative evidence.

Figure 5.3 compares actual production from Cantarell with PEP's estimates from its Annual Operative Program for the period 2000-2010. Until the fourth quarter of 2004, PEP's ability to forecast the behavior of the reservoir is exceptional. After the third quarter of 2005, however, it overestimates production in every single period (except for the second quarter of 2007 and the first quarter of 2010). The errors in planning become

severe in 2008, with actual production at least 20% below estimate for three consecutive quarters.

[FIGURE 5.3 HERE]

**Figure 5.3 Estimated and Actual Quarterly Production in Cantarell (2000-2010)**



### 3.2 Policy Orientation

In the case of an exploration and production branch, industrial policy can be identified by the presence of regulations obliging the company to purchase from domestic companies or to require contractors to have a given percentage of domestic employees in their workforce. Similarly, it is manifested in the policy of support for domestic industry in the form of price subsidies.

The strength of the policy orientation is measured in several ways. First, changes in the tax regime of the company indicate an attenuation or intensification of the use of

the company for fiscal purposes. Similarly, changes in the rules to hire workers or for procurement are indicative of changes across time.

### *3.3 Market Competition*

In an exploration and production company, market competition is different from a commercialization or a refining company. Often, the E&P firm will sell the crude to a subsidiary of the same parent company, which is then in charge of placing the oil in the market. In the case of PEP, oil production is sold to PMI for export or to Pemex Refining for domestic processing. These transactions are usually made at arm's length, but there is little in terms of competitive pressures.

Instead, competition in the E&P business takes place primarily in the exploration market. In countries with open exploration markets—such as the United States—oil companies must determine which areas have the highest potential and how much they are willing to bid in order to obtain the lease to develop commercial production.<sup>236</sup> The Shell Oil Company, for example, outpaced its competitors in the 1970s and 1980s by acquiring a sizable portion of the deepwater Gulf of Mexico when other companies remained skeptical of the region's productive potential (Priest 2007). Soon after, Shell's geologists were proven correct and gave the company an edge over the rest of the industry. In short, deciding which areas are desirable and acquiring them before other companies is the locus of competition in the industry.

Hence, PEP faced no market competition. In Mexico, only Pemex is allowed to conduct any exploratory activities. There is little urgency to assess the productive

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<sup>236</sup> The market for exploration combines both large companies and independent “wildcatters” searching for the best opportunities. This competitive rivalry keeps firms constantly seeking for the best human capital and technology to find oil reservoirs (McKie 1960).

potential of different regions effectively or to get to them rapidly. In consequence, effectiveness has deteriorated over time.

### *3.4 Managerial Cohesion*

The same discussion provided in the chapter on PMI applies for the case of PEP. However, cohesion does not change over time. In order to provide a quantitative measure of the degree of specialization, archival evidence is presented (see Chapter 6) showing the percentage of top executives who are petroleum engineers. For the most part, however, the assessment is qualitative.

### *3.5 Fiscal Jeopardy*

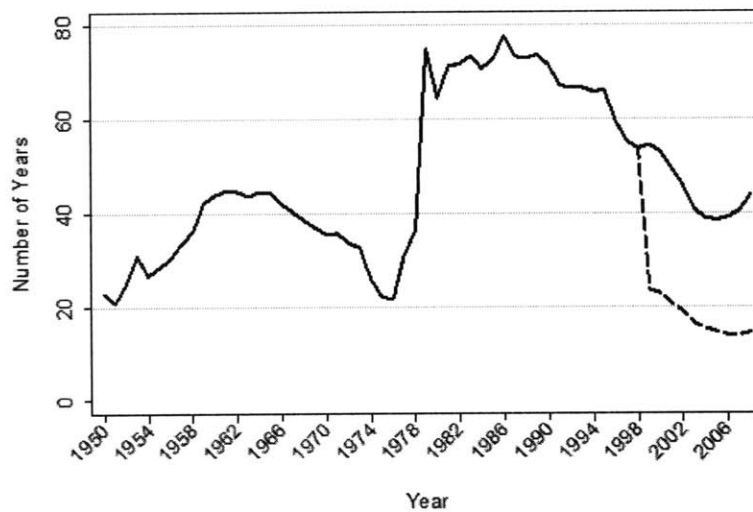
From the government's side, fiscal jeopardy is a critical variable decreasing the willingness to meddle in the productive activities of the firm. As far as PEP is concerned, fiscal jeopardy arises when oil scarcity is imminent. This is due to the fact that, for fiscal purposes, oil and tax revenues are relatively fungible, and the threat of running out of the former entails a severe shortage in the latter. However, unlike what happens in commercialization, the process of oil scarcity comes slowly and governments may have different thresholds regarding what constitutes as a threat of scarcity.

Quantitatively, the threat of oil scarcity (i.e., fiscal jeopardy) is measured as a continuous variable: the reserves-to-production ratio (R/P). As the name implies, this indicator is obtained by dividing the total proven reserves of a company (or country) by the production in a given year, and it is a critical variable to measure the long-term health of an oil company. When the ratio is low, the threat of oil scarcity increases. Figure 5.4

shows the evolution of Pemex's reserves-to-production ratio. The solid line shows the ratio using total reserves, while the dashed line shows the adjustment for proven reserves.

[FIGURE 5.4 HERE]

**Figure 5.4 Reserves-to-Production Ratio (1950-2008)**



Source: Pemex, Statistical Yearbooks

Two points merit further explanation. First, as explained above, Pemex changed the methodology to calculate reserves twice since the mid-1990s and thus the reserves series is not directly comparable across time. Yet, this is not as serious a problem from the perspective of measuring fiscal jeopardy. In this sense, what matters is the information that the government has when making decisions. Unless the government knows the “true” reserves and decides to publish exaggerated ones, then it will make decisions on the available data. In the case of Mexico, while several government officials

in the early 1990s suspected that reserves were overly optimistic, the general notion was that they were very high.

Second, in this regard, R/P indicators for state-owned and private companies are not directly comparable. Private oil companies generally carry lower ratios than national companies. A large ratio for a private firm may indicate that reserves are not being monetized adequately and shareholder value is not maximized. State-owned oil companies, on the other hand, are believed to prefer higher ratios to enhance their geopolitical standing and to ensure intergenerational distributive justice (saving oil reserves for future generations).

How to identify whether changes in the R/P measure are associated with the decrease of non-aligned government intervention? Regression analysis is used to show the effect of the R/P ratio on the number of exploratory wells drilled by the company, extending the methodology of Moroney and Dieck-Assad (2008). For results, see Appendix B.

### *3.6 Veto Players*

The most relevant veto player that has emerged in the Mexican political system for the case of PEP is an independent Congress. An independent lower chamber has influence over the budget of Pemex, while the upper chamber and the lower chamber both oversee the fiscal legislation of the company. For the present context, the relevant dates are 1997—the year when the ruling PRI lost its absolute majority in the lower chamber—and 2000—the year of turnover in the presidency and also when the ruling party lost an absolute majority in the Senate.

The case of Mexico allows for good identification of the role of veto players because, despite turnover in the presidency, the government's economic policy before and after the year 2000 remained the same. In fact, the staff at the Ministry of Finance was largely unchanged—except for the replacement of the top-level officials for others with a similar background.<sup>237</sup> Thus, while the Ministry of Finance stayed constant, the ability of Congress to challenge the former's fiscal and budgetary policies changed.

#### **4. The Evolution of PEP Across Time**

Unlike PMI, the evolution of PEP has not entailed qualitative changes in the degree of market competition and managerial specialization. Given that these two variables are held constant across time, the case of PEP permits a more nuanced understanding of the effects of the two auxiliary variables: fiscal jeopardy and veto players, both of which affect the perspective of the government. The former reduces the willingness of the government to steer the company towards non-productive activities; the latter constrains the government's ability to do so.

Table 5.1, however, shows the evolution of PEP according to these variables. In this context, oil scarcity has an impact analogous to fiscal jeopardy in the case of PMI, except that the urgency is less immediate. Veto points play a role in the implementation of policy, but they do not affect the ability of the government to make political appointments (since these do not require congressional approval).

[TABLE 5.1 HERE]

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<sup>237</sup> The Minister of Finance appointed by Vicente Fox in 2000, Francisco Gil Díaz, was a University of Chicago-trained Ph.D. in economics who was closely associated with the generation of economists that implemented the neoliberal economic policies of the late 1980s and 1990s .



**Table 5.1 Changes in the Level of Veto Players and Fiscal Jeopardy**

		Veto Points	
		Low	High
Fiscal Jeopardy	Low	1976-2000	2000-2006
	High	1965-1976	2007-2010

Holding market competition and managerial specialization constant, the combination of the threat of oil scarcity and the presence of veto points leads to an even lower level of intervention. A low threat of oil scarcity combined with a high level of veto points, and viceversa, leads to an intermediate level of intervention. Finally, the outcome of low oil scarcity and low veto points is a higher degree of non-aligned interventionism.

### **5. A Political and Economic History of PEP**

#### *Mexico runs out of “easy oil”*

In his annual state of the nation address, Mexico’s president warned about the imminent threat of oil scarcity and urged for a major initiative to safeguard the energy outlook of the country. “Today,” he said, “Mexico must face an era of difficult oil, which requires drilling at lower depths and strengthening offshore drilling.” Speaking in 1966, President Gustavo Díaz Ordaz continued: “*Petróleos Mexicanos* continues to seek a balanced development that will allow it to anticipate the rising demand, improve the

quality of its products, increase hydrocarbon reserves, and improve its means of oil production, storage, transportation, and distribution.”<sup>238</sup>

Up until the mid-1960s, Mexico had met domestic demand thanks to production from fields discovered by the international oil companies prior to the expropriation of 1938. In the 1940s and 1950s, the low international price of oil eliminated incentives to produce beyond self-sufficiency, and Pemex did not pursue an active exploration program. Instead, wells were drilled in areas adjacent to existing fields (Morales, Escalante, and Vargas 1988), with low risk but also low probabilities of making a major discovery.

Mexico’s rapidly industrializing economy would soon require an amount of oil that Pemex was unable to provide. A Pemex study published in the company’s 1965 annual report predicted a continued high growth in demand and an inability to increase production from existing fields at the same rates of the previous twelve years:

The forecasts for hydrocarbons demand for the remainder of this decade and for the period 1971-1980... show the need to develop all phases of the petroleum industry to levels far superior to the current ones, and it is necessary, as the fundamental point, to increase Mexico’s petroleum reserves.<sup>239</sup>

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<sup>238</sup> Gustavo Díaz Ordaz, Second State of the Union Address, 1 September 1966. Díaz Ordaz was president from 1964 to 1970.

<sup>239</sup> Pemex, *Memoria de Labores, 1965*, p. 10.

The predictions of the 1965 annual report were accurate.<sup>240</sup> Between 1965 and 1970, the average annual growth in gasoline consumption was a steep 7.83%, while production grew at an average of 5.42%. Starting in 1966, Pemex stopped exporting crude oil for the first time in its history, as the entirety of its production went to meet domestic needs. Between 1971 and 1973, in the first three full years of the Luis Echeverría administration (1970-1976), consumption of gasoline grew by 9.2% annually, while crude production rose by a mere 1.71%. In fact, between 1972 and 1974, right at the time of the first oil shock, Mexico became a net importer for the first time in the twentieth century.<sup>241</sup>

*The large exploration initiative of the late 1960s*

The Díaz Ordaz government and Jesús Reyes Heróles, the chief executive of Pemex, undertook an ambitious exploratory program. As a result, the number of field brigades collecting seismic data, the number of exploratory wells drilled, and the average depth of the wells increased considerably. In 1965, for example, 139 exploratory wells were drilled, up from 70 in 1963 and 83 in 1964. The yearly average from 1965 through 1970 was 140, compared to 95 for the previous *sexenio*. The activity of field brigades, measured as group-months worked, rose to 637 in 1965 from 547 the year before, and the six-year average for the Díaz Ordaz administration was 742, compared to 516 for the

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<sup>240</sup> By then, several other prominent actors had warned about the imminent threat of oil scarcity. Antonio Bermúdez, for example, who was chief executive of Pemex between 1946 and 1958, wrote to then president-elect Díaz Ordaz in 1964 about the dire production outlook. See “*Memorandum urgente de Antonio J. Bermúdez para el Sr. Lic. Gustavo Díaz Ordaz, Presidente Electo de México*,” 27 October 1964 (Hermida Ruiz 1974).

<sup>241</sup> In fact, Pemex should have become a net importer earlier, but Reyes Heróles allegedly preferred to keep refineries operating below capacity rather than admit the inability of Pemex to produce as much as the country needed (Meyer and Morales 1988).

previous government. Figure 5.2 (above) shows the rise in exploratory activity during the Diaz Ordaz administration.<sup>242</sup>

The efforts paid off. In 1967, Pemex geologists identified three prospective fields along the border of the southern states of Tabasco and Chiapas. Exploratory drilling began in early 1971, and two of them—Sitio Grande and Cactus—turned out to be highly productive (Meneses de Gyves 1983). These reservoirs came onstream in late 1973, and in 1975 production averaged over 300,000 barrels per day. This amount constituted 45.6% of national crude production that year and allowed Mexico to export oil once again (Sordo and Carlos Roberto López 1988). The development of Cantarell would follow shortly, crowning the high level of exploratory activity.

*The discovery that turned Mexico into a major petroleum power*

One February morning in 1971, a fisherman named Rudesindo Cantarell appeared at the Pemex offices in Coatzacoalcos, Veracruz. He asked to meet with the regional chief of exploration and reported that for several years he had noticed an oily spot in the sea, in the Bay of Campeche, which looked like petroleum to him (Meneses de Gyves 1983). He had first seen the oil during a fishing trip in 1961, but had not paid much attention to it. Eventually, he had become aware of the country's need for petroleum resources and felt compelled to speak with Pemex field executives about his finding (Morita 1997).

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<sup>242</sup> Starting in 1989, Pemex stopped reporting the activity of exploratory field brigades, so a full time series is not available. Up until 1988, the pattern is analogous to that of exploratory wells drilled. Additionally, development wells drilled are not reported given that they refer to wells from proven fields, which entail little risk (success rates usually surpass 90%).

Normally, Javier Meneses de Gyves, the regional chief of exploration, would not have paid too much attention to a stranger telling a story of oil seeping somewhere in the country. As it turns out, Pemex workers constantly received false alarms from laypeople claiming to have made an oil discovery. Mr. Cantarell's account, however, struck a chord: the shallow waters of the Bay of Campeche could potentially hold large petroleum resources—there were old records describing leaks oozing all the way to the surface—and the area was yet to be systematically explored.<sup>243</sup> Thus, he instructed one of his staffers, Narciso Paz, to gather a team and visit Campeche to determine the accuracy of the claim.<sup>244</sup>

The Pemex engineers were pleased with what they saw. Narciso Paz would report back to Meneses de Gyves that the large extension of the oil “spot”—covering approximately 50 square kilometers—and the shallow depth of the waters—35 meters—made him very optimistic about the potential for a large field lying underneath. “The hydrocarbons manifested in the aforementioned area have great economic importance,” Paz wrote on March 2, 1971. “Given its geological conditions... the area is favorable and I advise to initiate seismic exploration immediately” (qtd. in Meneses de Gyves 1983, p. 62).

Preliminary studies were conducted between 1971 and 1974, when the first exploratory well was drilled (Meneses de Gyves 1983). In 1976, the well Chac-1

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<sup>243</sup> Meneses de Gyves (1983) wrote: “Suddenly I remembered an old map that I found looking through some archives. It was an old geological map of Guatemala and Mexico, made by Tercier in 1932, that showed two unverified oil seepage areas in the waters north of Xicalango” (p. 60).

<sup>244</sup> Historical sources differ slightly on the point of the first contact between Mr. Cantarell and Pemex personnel. In an interview given soon before his death in 1997, Cantarell recalled having visited the Pemex office in Coatzacoalcos in 1968 and not hearing back until March 1, 1971. Javier Meneses de Gyves, on the other hand, reported in his memoirs meeting Cantarell in Coatzacoalcos in February of 1971 and dispatching an exploration brigade on February 28th. It is possible that Mr. Cantarell misremembered the dates, since the interview took place nearly thirty years later. Similarly, Mr. Meneses de Gyves may have wanted to downplay the amount of time that passed before a brigade was sent out.

confirmed the presence of large volumes of crude in the reservoir. Starting in early 1977, Pemex contracted the services company Brown & Root—now a subsidiary of Halliburton—to develop the field and begin commercial production as soon as possible (Pratt et al. 1997). Finally, in June of 1979, after a relatively fast development process, crude began flowing from the offshore production platforms in Cantarell to the main export terminal of Dos Bocas, in the neighboring state of Tabasco.

The Cantarell field, thus named after the person who first saw it, turned Mexico into a major oil producing power. At the time, it was the second largest field ever discovered, second only to Saudi Arabia's Ghawar field (Adrián Lajous 2009). Between 1979—the year it came onstream—and 2007, production averaged 1.26 million barrels per day.<sup>245</sup> For comparison, this rate is more than double the total produced by BP and its partners from the massive Prudhoe Bay field in Alaska during a similar time period.<sup>246</sup> From a different angle, total global oil production for ExxonMobil, the largest private oil company in the world, for 2004 was 2.57 million barrels per day (Energy Intelligence 2006), barely twice Cantarell's average.

Moreover, the geological characteristics of the area made Cantarell an exceptionally cheap area of production (Shields 2003). In 2008, for example, the cost per barrel in Cantarell was estimated at US\$4 per barrel, comparable to the Persian Gulf and several times below the cost per barrel of deepwater production in the Gulf of Mexico.<sup>247</sup>

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<sup>245</sup> Source: Pemex report on the history of Cantarell, accessed on 24 June 2009, <http://www.pemex.com/index.cfm?action=content&sectionID=137&catID=1222>.

<sup>246</sup> Source: Prudhoe Bay Fact Sheet, BP, August 2006. [http://www.bp.com/liveassets/bp\\_internet/us/bp\\_us\\_english/STAGING/local\\_assets/downloads/a/A03\\_prudhoe\\_bay\\_fact\\_sheet.pdf](http://www.bp.com/liveassets/bp_internet/us/bp_us_english/STAGING/local_assets/downloads/a/A03_prudhoe_bay_fact_sheet.pdf), accessed on 24 June 2009.

<sup>247</sup> Pemex E&P manager, author's interview, 9 June 2008.

This meant that petroleum would be abundant for years to come and that rents would be high.

### *The Impact of Oil Abundance on Government Intervention*

The end of the threat of oil scarcity eliminated the incentives for the government to align its objectives with the commercial success of the company. The government's *willingness* to intervene rose, especially given the lack of competitive market forces that could punish attempts to meddle in the operations of the firm. However, the *ability* to intervene would be constrained—first by the high degree of managerial cohesion and, eventually, by the rise of an effective opposition in the Congress that acted as a veto player in policy implementation.

In the case of PEP, in the years after the discovery of Cantarell, non-aligned government intervention was manifested in fiscal and regulatory policy. In the absence of relevant veto players in the political system, the government could implement policy unfettered. However, the ability to make political appointments was hindered considerably by the high degree of managerial specialization in this branch of Pemex.

### *The Sociology of PEP: High Managerial Cohesion*

As explained in Chapter 2, scholars of organizational sociology have long emphasized the importance of recruitment, socialization, and promotion practices in shaping the behavior of large bureaucracies (Kaufman 1960; Kunda 1992; Wilson 1968). Incentives within the organization are often the product of norms of loyalty and reciprocity that are transmitted in the performance of day-to-day activities. Sometimes,

particular types of people self-select into the group, increasing the chances that the resulting organizational outcome will take a certain form. In the case of PEP, organizational behavior cannot be understood without an analysis of the characteristics of the dominant executive- and operative-level professional in the company: the Mexican petroleum engineer.

Petroleum engineering is the university major *par excellence* for the crude oil production activities worldwide (exploration is generally the realm of geologists and geophysicists, while refining is reserved for chemical engineers). Petroleum engineering is mostly concerned with drilling wells and optimizing the life-cycle of the reservoirs. In E&P subsidiaries worldwide, petroleum engineers share leadership opportunities with geologists, and the orientation of a company is often the result of the training of the person at the helm. In the Shell Oil Company of the 1970s, for example, the strong emphasis on exploration was to a large extent the product of the CEO's worldview as a geologist (Priest 2007).

In Mexico, however, petroleum engineers reign at PEP. Geologists are few and, to a large extent, have joined the social circles of petroleum engineers. At the time when this study was conducted, the highest ranking geologist in PEP was the deputy director for planning, who had befriended petroleum engineers since his college years. In the National University, as it turns out, during the first two years petroleum engineers and geologists often enroll in the same courses.

Mexican petroleum engineers have the following characteristics. First, they are relatively few in number, so that little anonymity exists. Historically, only two universities have offered the major of petroleum engineering—the National University



(UNAM) and the National Polytechnical Institute (IPN), both in Mexico City—and generally no more than a handful of students graduate each year. In a subsidiary of almost 50,000 employees, the managerial group is drawn from a remarkably small circle.

Second, Mexican petroleum engineers, by and large, must join PEP. Virtually none of them is recruited to work abroad, and, given their specialized training, scarce employment opportunities exist outside the company.<sup>248</sup> In the language of Albert O. Hirschman (1970), they lack an “exit” option.

Third, operative work as a petroleum engineer is dangerous, taking place in remote areas where the smallest oversight can lead to a deadly accident. This experience is shared by most petroleum engineers, who thus develop strong bonds both directly with their reservoir teammates and indirectly with other members of the profession due to this common “rite of passage.” José Ángel Gómez Cabrera, a professor of petroleum engineering at the National University, explains that the vast majority of graduates go through the same career socialization process: “After graduating, the petroleum engineer has to go to the field. You have to be in the wells, in the platforms, you have to be there for a while, from 3-5 years, to really get to know what is going on.”<sup>249</sup>

Fourth, promotion is slow and depends on years of proven service and loyalty. It is only after years in the field that a petroleum engineer can take on executive jobs within PEP, and then competition for promotion is fierce, since few positions are available. Not alienating the superiors is critical to stand the chance of moving upwards. “The discipline of the subordinates is essentially like in the military” remarked a veteran petroleum

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<sup>248</sup> A few petroleum engineers choose a research career at the Mexican Petroleum Institute and others find employment at the Federal Electricity Commission working in geothermal facilities.

<sup>249</sup> Author’s interview with José Ángel Gómez Cabrera, Mexico City, 16 April 2008.

engineer who asked for anonymity. “Disagreements are not allowed,” or else future promotion opportunities are severely compromised.<sup>250</sup>

*How the organizational structure of PEP strengthens the culture of petroleum engineers*

The reform of 1992 modernized Pemex by improving its governance structure, enhancing the transparency of its transactions and, for the first time, creating a reliable system of statistical records. At the same time, it allowed for a “feudalization” of the industrial branches. With newfound independence, subsidiary and regional directors amassed power, garnering the ability to steer their organizations into paths different from those envisioned by their superiors. A manager in PEP who requested anonymity remarked:

In the regions, there is a director of planning, but he doesn’t report to the subsidiary’s director of planning. Instead, he reports to the director of the region. And the subsidiary’s director of planning does not report to the corporate director of planning, he reports to the subsidiary’s director-general. The same thing happens with finance, human resources, etcetera. How can accountability be enforced along the chain of command? It’s impossible. That’s why no one takes the corporate headquarters seriously and why the power lies in the subsidiaries and in the regions.<sup>251</sup>

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<sup>250</sup> Petroleum engineer, personal interview, 11 April 2008.

<sup>251</sup> Author’s interview, June 2008.

*Consequences of the sociology of petroleum engineers*

The strong bonds created amongst petroleum engineers and the lack of “exit” options creates a military-style sense of discipline which generally helps the performance of the subsidiary but which, in the absence of market competition to keep the managers honest, has led to some parochialism and a concomitant downward trend in performance. On the positive side, high discipline allows a highly decentralized organization—operating in many unsupervised areas—to carry out tasks with a sense of mission. This is especially remarkable given that in PEP, as in many state-owned enterprises worldwide, the firing of a bad employee is virtually unheard of. Close observers of the Mexican industry believe that the middle managers of PEP are compelled to work harder than their counterparts in Refining given that the failure of PEP entails the end of their means of subsistence and that they do not want to be shunned from their primary social circle for irresponsible behavior.

Additionally, politicians are seldom appointed to top managerial positions in PEP. The technical nature of the activities means that most jobs are closed for non-petroleum engineers. Moreover, given the scarcity of well-paid executive positions, the rank-and-file feel strongly offended when outsiders join the company at a managerial level. José Ángel Gómez Cabrera describes the reaction of petroleum engineers to political appointments:

[T]hey see [political appointments] with a lot of resentment. We feel that people coming in know very little about the company. I was telling you that, in order to be a manager in PEP, many years have to go by, years of

hard work in stressful, dangerous conditions. And then you see that in other subsidiaries things are different, where recent college graduates make it to high positions right away. These are people who don't know anything about the petroleum industry and come to Pemex to learn, but they come to learn as managers and as deputy directors. This has a big impact on morale in the operating segment of the company.<sup>252</sup>

In general, the government does not test the resolve of the petroleum engineers to challenge a political appointment. On occasion, however, someone external is appointed to a mid-level position and the PEP managers close ranks against him. A person closely familiar with PEP activities described the case of an outsider manager appointed by the director-general of Pemex who was isolated and ignored by those around him, both superiors and subordinates. Those above him would not include him in the decision-making process and those below him would openly disregard his instructions—with the complicity and support of the superiors. Frustrated, the outsider resigned.<sup>253</sup>

On the negative side, however, PEP has been largely closed from the outside world and has also blocked beneficial external interference. More specifically, PEP has been capable of preventing outsiders from modernizing the organization, in spite of the fact that the technological lag between PEP and its international counterparts has become more severe over the years. Former Pemex director-general Adrián Lajous explains this eloquently: “[PEP] has developed a much stronger esprit-de-corps than the rest of the

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<sup>252</sup> Author's interview with José Ángel Gómez Cabrera, Mexico City, 16 April 2008.

<sup>253</sup> Author's confidential interview with a top energy ministry executive, Mexico City, April 2008.

company... They have defended themselves so that no one can infiltrate them. Thus, it is a more isolated group. That's their strength and that's their weakness."<sup>254</sup>

*Effect of Low Market Competition I: Lack of Incentives to Improve Efficiency*

The lack of market competition helps to explain the downward trend in the efficiency of PEP's staff as well as two instances of distortionary government intervention: regulatory and budgetary suffocation. In a context of abundant oil, the lack of signals of performance given by competitive forces meant that the optimization of company operations was not a top concern for a government already occupied in a plethora of other public policy domains.

Muñoz Leos argues that the main negative consequence of no market competition was in the loss of human capital in exploration. "For about twenty-five years, the exploration budget was restricted by the Ministry of Finance, and the little money they got was spent exploring right next to the known areas. There was no incentive to do better, to explore in areas that entailed risk, and in those conditions we were not attracting the best geologists in the world."<sup>255</sup>

Luis Téllez, chief of staff for President Ernesto Zedillo and later Secretary of Energy, explains the predicament on the government's side. "What happens," he argues, "is that the discount rate for the government is extremely high, and we needed oil revenues immediately in order to grow. The choice was to prioritize production in order to obtain revenues, and only subsequently seek to explore. So yes, there was an explicit

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<sup>254</sup> Author's interview with Adrián Lajous, Mexico City, 7 July 2008.

<sup>255</sup> Author's interview with Raúl Muñoz Leos, Mexico City, 30 July 2008.

policy, which is manifested in the data, to prioritize production.”<sup>256</sup> In short, in light of the tradeoffs that any government must make, exploration could wait given that no other companies could compete for exploration opportunities against Pemex in Mexico.

*Effect of Low Market Competition II: The Government is Unwilling to Withdraw*

PEP has never faced a competitive market that punishes the presence of suboptimal regulatory practices. This issue is perhaps best understood in comparison to the history of PMI. In the mid-1980s, the management of PMI persuaded the Ministry of the Comptroller to exempt international crude oil sales from the regulatory framework that was applied to the rest of the state enterprise system, including PEP and Pemex Refining. Then PMI director-general Adrián Lajous describes the urgency of obtaining a regulatory exemption: “Imagine what would have happened if they had forced us to sell Mexican crude by public tender. No company in the world did that. We would have been destroyed in the market. I had to speak with the Comptroller and with Carlos Salinas and Pedro Aspe when they were in the Ministry of Planning and Budget, and they understood this.”<sup>257</sup>

Luis Téllez explains the problems faced by a state-owned enterprise such as PEP:

The issue is that there is an oversight system that is excessively rigid and inefficient. It’s built for a bureaucracy and not for a business, and Pemex must be a business enterprise. It’s been difficult, and the government

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<sup>256</sup> Author’s interview with Luis Téllez, telephone communication, 26 June 2009.

<sup>257</sup> Author’s interview with Adrián Lajous, Mexico City, 7 July 2008.

hasn't known how to resolve this question... In the area of crude oil production, rents are so high that many of the inefficiencies are hidden.<sup>258</sup>

*Non-Aligned Government Intervention I: Regulatory suffocation of PEP*

The main constraint lied in the area of procurement. The bulk of purchases had to undergo a public bidding process, regardless of quality or technical compatibility considerations. The consequence was a delay in almost all unanticipated project decisions—which could not be made without a lengthy bureaucratic approval process—without a substantial decrease in corruption. As a high ranking Pemex official said, lamenting the high level of corruption, “it is incredibly easy to collude with a company so that it wins a public bid.”<sup>259</sup>

The regulatory framework was problematic because it severely restricted the possibility that a manager of a state-owned enterprise—Pemex included—could make operational decisions based on the so called “business judgment rule” (Boué 2002). The business judgment rule is an important element of the corporate governance tradition worldwide. In simple terms, it means that managers are not legally liable for decisions made in good faith for the improvement of the company, regardless of whether those decisions lead to positive or negative outcomes. Unless it is demonstrated that a manager had ill intent—something very difficult to prove in a court of law—he or she cannot be sued by shareholders claiming that a decision affected the earnings of the company (Block, Barton, and Radin 1987).

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<sup>258</sup> Author's interview with Luis Téllez, telephone communication, 26 June 2009.

<sup>259</sup> Confidential author's interview, 4 July 2008.

The absence of the business judgment rule in a commercial enterprise introduces extreme risk-aversion incentives, as managers are generally unwilling to deviate from business-as-usual practices for fear of legal sanctions, including incarceration. For example, Pemex managers became extremely reluctant to pilot-test innovative technologies in refineries or wells, afraid that the temporary suspension of service would result in administrative penalties. Similarly, as Boué (2002) points out, a broad interpretation of the Federal Penal Code could, in the worst cases, allow for politically-motivated prosecution and, most often, promote “bureaucratic paralysis.” Former Pemex director-general Raúl Muñoz Leos explains the problems faced by the company as follows:

The legal framework with the comptroller complicates things greatly for a state-owned company. Let’s say that your project design called for a certain type of pipe. Then the contractor comes to you and says: “Look, you proposed this pipe, but this other pipe is better for this project because of this reason. Can you authorize that I use this pipe instead?” Within the current legal framework, the bureaucrat who dares to authorize such type of change places himself at great legal risk, since the assumption is that he’s being bribed in order to agree to using different pipes. Therefore, in order to authorize a change, they have to go through a long process, but it’s not like the contractor can stop the work. What can the contractor do? If he uses the bad pipe, he knows that it’s not going to work as well and there may be adverse consequences later. If he uses the good pipe, he is



taking the risk that the change isn't approved and doesn't get reimbursed for the expense. So things just get more and more complicated, to the point that it becomes impossible to disentangle the paperwork. The result: long delays in the project, costs are double of what was anticipated, and you have all kinds of rumors and gossip about the bad management. And bureaucrats do what's safer for them, since they don't want to end up in jail.<sup>260</sup>

The origin of the regulatory framework preventing PEP from adopting a more flexible business orientation is found in a series of reforms implemented by the government of Miguel de la Madrid (1982-1988) to diminish corruption in government agencies (Barriga Fernández 1988). Ironically, in spite of the good intentions, the reforms severely hindered the flexibility and operational autonomy of state-owned enterprises.

The changes were part of De la Madrid's broader *Moral Renovation* program, which amended several legal codes soon after taking office.<sup>261</sup> In late December of 1982, he introduced a new Federal Law of Responsibilities of Public Servants—for administrative offenses—and added a section to the Federal Penal Code on “Crimes Committed by Public Servants”—for criminal offenses. Both of them proscribed specific types of behavior by public servants, and at least two of their clauses were overly restrictive.<sup>262</sup>

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<sup>260</sup> Author's interview with Raúl Muñoz Leos, Mexico City, 30 July 2008.

<sup>261</sup> For a discussion of the effects of the Moral Renovation program on the relationship with the union, see Grayson (1988).

<sup>262</sup> Article 47, section 1 of the Federal Law of Responsibilities stated that all public servants ought to “fulfill with maximum diligence the service that is assigned and abstain from any act or omission that causes the suspension or deficiency of such service or implies abuse or undue exercise of a job, duty, or commission.” Similarly, article 214, section III of the Federal Penal Code now read: “A public servant will

Many of the regulatory restrictions existed since before the reforms of the De la Madrid administration, but they were not always enforced. Prosecution of public servants was constrained because article 111 of the federal constitution stipulated that they had to be tried by public jury. This condition had been preserved from the original constitutional text of 1917 despite the fact that, in 1929, public juries were eliminated from the Mexican judicial system for “common” crimes (Ovalle Favela 1980b). In theory, a public jury could be summoned specifically to discuss a case against a public servant, but in practice the legal system had little institutional ability to do so (Ovalle Favela 1980a). In December of 1982, De la Madrid removed the anachronistic reference to the public jury in article 111, thus opening the way for the Federal Law of Responsibilities and the Federal Penal Code to be enforced freely, with perverse consequences for the management of a productive enterprise.

#### *Why the Regulatory Constraints Hurt PEP's Efficiency*

The 1980s witnessed a transformation of the upstream oil industry around the world, whereby oil companies pursued new reserves in more difficult terrains and became leaner from the divestiture of non-core assets. By 1982, after oil prices had begun their gradual march downwards, industry executives had come to terms with the new bargaining power of oil-producing countries. The nationalizations of the 1960s and early 1970s had shocked the *majors*, accustomed to dictate the terms of trade to host countries,

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commit the crime of undue exercise of public service when, having knowledge by reason of employment, duty, or commission that, for any act or omission, the patrimony or interests of any entity of the centralized federal public administration system, of the Federal District, of the decentralized organisms, enterprise with majority state ownership, association and society belonging to these, and public trusts, of the Congress of the Union or of the federal judicial branch or of the Federal District can be gravely affected and does not inform the hierarchical superior in writing or prevents it if it is within scope.”

but by the early 1980s there was a broad-based acknowledgement that expropriations had come to stay (Grant and Cibin 1996).

Moving from a state of “denial” to a state of “accommodation” (Grant and Cibin 1996), the loss of access to areas with abundant oil resources compelled company executives to change their old business models in two fundamental ways. First, international oil companies further developed the capacity to produce in frontier environments, such as Alaska, the Gulf of Mexico, the North Sea, and West Africa, which they had pioneered in the 1970s. Not only did IOCs invest heavily in technological innovation programs, but they also acquired advanced managerial skills from supervising the construction of large engineering projects that they could then transplant to other parts of the world.

Both private and state-owned firms moved forward in this respect. In 1983, for example, Shell drilled an exploratory well in the Gulf of Mexico “in a world record water depth of 6,448 feet” (Priest 2007, p. 222). In 1988, a fixed platform was installed in the deepwater Bullwinkle field, and in 1993 production began at its Auger field in 2,800 feet. The company’s emphasis on deepwater exploration and production, to a large extent, responded to its need to open up new productive areas (Priest 2007). Likewise, in 1985 Petrobras drilled at 1,256 feet in the Marimba field off the coast of Brazil, and by 1992 the Brazilian state-owned company was operating in 2,562 feet (Bertani 2008). By contrast, the Ixtoc-1 well in Cantarell was drilled in 1978 in only 157 feet of water in the continental shelf (Boehm and Fiest 1982). Pemex E&P had different technological needs than its peers, but the gap in project management was widening.

Second, the lack of easy oil elicited the need to optimize operations, thus allowing for making profits at the margin. Optimization upstream revolved around the divestiture of non-core activities and assets, making companies leaner and more flexible. Coal and minerals subsidiaries were sold. Even activities that erstwhile had been done in-house, such as drilling and the collection of seismic data, were increasingly subcontracted out to services companies. This practice not only reduced overhead costs, but also led to the development of unparalleled expertise by services companies through specialization (Grant and Cibin 1996). Moreover, several *majors* further specialized in particular segments of the industry in order to exploit their comparative advantage. Mobil, for example, focused on enhancing its leadership in lubricants and other refined products (Grant and Cibin 1996).

Similarly, the divestiture of low-yield upstream assets became generalized, as the accumulation of oil fields no longer served a purpose in and of itself. Oil fields that had low rates of return for some companies—and where production would have been postponed—were desirable for others willing to invest at higher levels. Optimal exploitation of the entire portfolio of assets became the goal, and reservoirs that did not meet the companies' desired returns were traded.

The technological and project management results were evident by the 1990s. The management of the Cantarell Project, the largest investment of Pemex in over a decade, was outsourced to the external engineering firms, allegedly due to a lack of internal capability.<sup>263</sup> Additionally, PEP engineers were forced to rely excessively on external consultants to analyze the desirability of different projects—a sign of faltering in-house

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<sup>263</sup> Former Pemex director-general Raúl Muñoz Leos, author's interview, 30 July 2008. In the international oil industry, project management is a core competency of oil companies, which generally leave the specialized technical work to contractors in the services companies.

skills to make strategic and procurement decisions.<sup>264</sup> By 2008, several top-ranking Pemex executives complained about the inability of the company to manage large engineering projects and the financial losses caused by long delays in project completion.

The nature of industrial relations in PEP can be explained in a similar way. The main constraint of the rigid labor practices for operations regards the fact that surplus labor cannot be laid off or even transferred to different geographic areas.<sup>265</sup> The high rents obtained from upstream activities, however, have generally been sufficient to keep the government from challenging the power of the oil workers' union. The result has been a suboptimal use of labor throughout the company.

#### *Non-Aligned Government Intervention II: Fiscal Suffocation of PEP*

Over the past twenty years, Pemex has been noted as one of the state-owned oil companies with the heaviest fiscal burden in the world, and no subsidiary has faced more stringent fiscal obligations than PEP. In industrial enterprises, the percentage of profits that is reinvested in the firm—the plowback ratio—is considered critical to take advantage of future growth opportunities. In the Mexican oil sector, this ratio is determined by the fiscal legislation. Prior to democratization, this legislation was “rubber-stamped” by the Congress; after democratization, a negotiation takes place between the executive branch and the different parties in the legislature to set the taxes and duties of the company, as well as any expenditure restrictions.

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<sup>264</sup> Confidential author's interview with international oil industry expert, 23 June 2009.

<sup>265</sup> Power in the oil workers' union follows from the number of union members in each union district. Accordingly, union leaders have established a system where workers cannot be transferred by the management to districts different from the one of their incorporation. This mechanism perpetuates the regional distribution of power in the national union, and it prevents Pemex from sending workers from low demand to high demand areas.

The fiscal burden of Pemex grew rapidly starting in the 1980s and especially in the late the 1990s and the early 2000s. Between 1960 and 1982, the company operated under a simple fiscal scheme, paying only 12% of net income. This amount was increased in 1975 with an additional export tax. Starting in 1983, a duty on hydrocarbons was put in place for the production of crude, and an additional one was added for the export of petroleum, raising the total contribution to 56.7% of net income by 1985 (Díaz Escalante 1997). Reforms in the 1980s established “ordinary,” “extraordinary,” and “additional” duties on the extraction of oil reaching 78.9% of PEP’s net income. These charges were mostly comprised of a “duty on hydrocarbons” equal to 60.8% of total income plus a “surplus profit tax” equal to 39.2% of the difference between the annual average of Mexican crude and the amount forecast by the government at the end of the previous year (Martínez Ramírez 1997; Suárez Coppel and Yépez 2007). After the payment of duties, PEP would be subject to the payment of a corporate income tax.

Figure 3.4 (see Chapter 3) shows the actual amount of taxes paid by Pemex as a percentage of total sales from 1950 to 2008. In the 1970s, as Mexico becomes a net exporter, taxes rise significantly. Interestingly, the highest percentages of taxes paid occur after the time when Mexico settles its main foreign debt crisis in 1989.

In the international oil industry, high taxes and royalties are common as states seek to capture their share of the rest associated with the production of a scarce resource. Yet, Mexico’s fiscal scheme stands out as one of the most onerous. The high fiscal burden meant that, between 1998 and 2005, total duties and taxes surpassed total profits of the company before taxes (Suárez Coppel and Yépez 2007).

In addition to the low plowback ratio, the fiscal scheme prevented PEP from responding to changes in the international price of crude oil when making investment decisions. Suárez Coppel and Yépez (2007) document the relationship between the price of oil and Pemex's cash flow per barrel before and after taxes and duties. Before taxes, cash flow increases considerably as the price rises; after taxes, however, cash flow per barrel remains constant.

### *Peak and Decline of Production*

The early years of the 21<sup>st</sup> century witnessed a dramatic rise in production in Pemex E&P—peaking in 2004—followed by a precipitous decline. The era of rising oil prices coincided at first with record-high export volumes, but by 2007 the outlook was grim: unless major exploratory activity took place, Mexico could become a net importer again within a decade. Moreover, the rapid decline in reserves threatened the short-term revenue base of the state, accustomed to financing much of its budget from the export of crude. Why did production decline so rapidly? What were the political consequences of that decline?

### *Downward Trend in Efficiency: Problems Managing the Reservoirs*

An analysis of the decline in production of Cantarell can help to understand the middling performance of PEP. The management of the reservoir has been the subject of much controversy in the Mexican petroleum industry, with some analysts arguing that its decline was the product of an excessively high level of production in the early 2000s that prematurely decreased its pressure. The truth is that Cantarell was expected to decline

considerably in the second half of the 2000s and PEP engineers cannot be blamed for the inevitable geological fact of the exhaustion of a reservoir.

On the other hand, PEP engineers in the late 2000s consistently failed to forecast correctly the one-year-ahead production level of Cantarell. In 2005, the first full year of decline, actual production was 99% of the amount originally estimated. In 2007, production dropped to 94.4% of the forecast; in 2008, it was only 80.1% (Adrián Lajous 2009). (See Figure 5.3.)

While any forecasting exercise is bound to miss the mark occasionally, the fact that actual output systematically fell short of expected production was evidence that Pemex engineers were not in control of the reservoir. An international oil industry expert remarked: “In the industry, much of the work is focused in ‘beating the earth,’ constantly trying to extract more oil than what you initially thought was possible. In Cantarell, however, it is clear that the earth beat Pemex engineers.”<sup>266</sup>

It was not surprising that the decline of Cantarell overwhelmed the technical capacity of PEP. For nearly three decades, the shallow waters of the Bay of Campeche had provided abundant and easily accessible oil. Furthermore, in the previous five years, the injection of nitrogen had made the reservoir more productive than ever before. As long as two million barrels of oil continued to flow daily from Cantarell, political oversight would not be concern with the question of whether PEP was failing to extract a few thousand barrels of oil here and there. Vast rents concealed inefficiencies. However, once the reservoir peaked, PEP could not develop the needed expertise quickly enough.

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<sup>266</sup> Author’s confidential interview, 14 May 2009.



As one observer of the Mexican oil industry remarked, “For many years, PEP engineers were hypnotized by the productivity of Cantarell.”<sup>267</sup>

In that environment, signals of performance to measure the effectiveness at analyzing and managing the reservoir were blurry for two reasons. First, the Pemex director-general and the political superiors lacked the technical knowledge to question whether PEP was optimizing the assets. Second, the absence of competing companies managing other fields in Mexico meant that no reasonable counterfactual existed to gauge the technical capacity of Pemex.

#### *How Veto Players Diminished NAGI: The Role of Democratization*

Veto players in the political system constrain the ability of the government to intervene in the operations of the state-owned enterprise. In the case of Pemex, the relevant veto player is the legislature, and it can influence two areas: regulation and fiscal policy. As explained earlier, prior to the year 1997, Mexico’s Congress was not a reliable veto player; instead, deputies and senators were subordinated to the executive branch. After the midterm elections of 1997, the ruling PRI lost its absolute majority in the lower chamber although not in the Senate. In 2000, Vicente Fox of the opposition PAN won the presidential election, but his party had minority status in both chambers of Congress. The independent Congress was then able to intervene in the relationship between the Ministry of Finance—representing the executive branch on fiscal issues—and Pemex.

The Ministry of Finance and Pemex have historically engaged in a process where, as one former Finance official put it, “each side has a different objective function, information asymmetries are widespread, and therefore the final result is suboptimal.” In

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<sup>267</sup> Author’s interview with Mexican oil industry expert (Mex.Exp.#10), Mexico City, 11 April 2008.

terms of fiscal policy, this official explained that the mission of the Ministry in its relationship with Pemex has been to obtain the largest possible revenues subject to the constraint that Pemex “does not die.”<sup>268</sup> Another government official remarked: “Judging by the fiscal and budgetary control of Pemex, there is no doubt that the owner of Pemex is the Ministry of Finance.”<sup>269</sup>

As expected, Pemex managers have complained forcefully against the power wielded by the Finance officials. For instance, Francisco Rojas, Pemex director-general between 1987 and 1994, stated:

Hacienda was put in charge of major government initiatives, and we reached the extreme where Hacienda would tell a productive enterprise like Pemex that it had to spend 35% of its budget in the first quarter of a year and 40% in the last quarter. It is truly insane for Hacienda to set rules on how a productive enterprise should allocate its budget throughout the year.<sup>270</sup>

By the early 2000s—a time of macroeconomic stability—the control was extreme. Economists at the Ministry of Finance, not necessarily versed in petroleum matters, authorized the budget line-by-line to determine which projects Pemex could and could not undertake. Former Pemex director-general Raúl Muñoz Leos, however, complains that the Finance Ministry does not understand that the inefficiencies of Pemex derive from the lack of experience managing large engineering projects, and that greater

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<sup>268</sup> Author’s interview with former Ministry of Finance official, telephone communication, 26 June 2009.

<sup>269</sup> Author’s interview with former Ministry of Finance official, Mexico City, 29 July 2008.

<sup>270</sup> Author’s interview with Francisco Rojas, Mexico City, 30 July 2008.

expertise can only be obtained gradually by undertaking the types of projects that Finance officials are reluctant to authorize.

Additionally, the view of the Ministry of Finance is that Pemex is an inefficient company and thus extreme mechanisms of fiscal and budgetary control are necessary to force the company to keep costs down given a business environment lacking market competition. Finance officials argue that, in the negotiation of the budget, no one can truly determine whether the company's forecasts are made correctly, and the Ministry's task is to push the budget as far down as possible and thus force Pemex to cut wasteful spending.

Thus, the year 2000 marks the emergence of a relevant veto player that could influence the relationship between the Ministry of Finance, on one side, and Pemex, on the other. The legislature between 1997 and 2000 was not fully a potential veto player because the lower chamber, by itself, cannot reform fiscal or regulatory laws without the consent of the Senate. While the Chamber of Deputies does have sole control over appropriations, the effect on the Pemex budget was limited for at least two reasons. First, after the budget for 1998 was passed, the PAN negotiated an agreement with the PRI that effectively eliminated the veto power during the budget debates for 1999 and 2000. Second, many opposition leaders were in charge of congressional committees for the first time and faced a multiplicity of challenges. In the list of their priorities, PEP, forecast to increase production drastically in the upcoming years, was not towards the top.

Ricardo García Sainz, the chair of the Budget Commission in the Chamber of Deputies between 1997 and 2000, explains the lack of emphasis on Pemex expenditures at the time:

Our priorities were others. We were focusing on transparency in the allocation of the budget. In that regard, we had the support of [Santiago] Levy—the undersecretary of Finance expenditures—with regards to everything that dealt with good governance in the federal budget, so we made progress in that direction. However, our budgets did not have too many improvements in terms of the allocation of resources... The main substantive issue regarding the allocation of appropriations was on the Fobaproa bank bailouts. We debated that issue for a long time, and in the end the PAN voted with the PRI.<sup>271</sup>

After democratization, the process whereby the new veto player constrained the ability of the government to intervene was protracted. Yet, in the end, the outcome was a less onerous fiscal burden on the company. The process, however, is illustrative of the manner in which policy can be moderated by a legislature with policy preferences different from those of the executive.

In 2003, President Fox introduced a fiscal reform package to Congress that essentially left the fiscal regime of Pemex intact. This bill was rejected, and several months later, in 2004, the Chamber of Deputies developed its own proposal to reform Pemex's fiscal code. This new bill was approved easily in the lower chamber in October of 2004 with 391 votes in favor and zero against. In April of 2005, the Senate passed its own version of the bill, which was returned to the lower chamber for reconciliation in 2005. Francisco Salazar, a moderate member of the PAN who played a central role in the

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<sup>271</sup> Author's interview with Ricardo García Sainz, Mexico City, 17 July 2008.

fiscal reform as chair of the Energy Commission in the Chamber of Deputies, described the events as follows:

In the Chamber of Deputies we weren't too pleased with the Senate version, but we understood that it was an improvement and we approved it in those circumstances, even though it wasn't unanimous anymore. But then there was a presidential veto. The objections of the president would be sorted out during the legislative recess, and the reform finally passed in the November of 2005.<sup>272</sup>

The new fiscal framework, which applied starting in January of 2006, lowered Pemex's contributions to the government. Taxes and duties would amount to 79% of net income, Pemex would be allowed to make larger deductions than before, and, in order to promote investment in high value projects, the ranking of projects according to net present value would be the same before and after taxes (Suárez Coppel and Yépez 2007). Moreover, two years later, the Congress approved an additional reduction of taxes and duties from 79% to 70%.

*How Fiscal Jeopardy Diminished NAGI: Threat of Oil Scarcity in 2008*

On March 18, 2007, only a few months after taking office, conservative President Felipe Calderón expressed great concern regarding the exhaustion of Mexican oil reservoirs and the imminent danger of becoming, for the first time since 1974, a net importer of crude:

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<sup>272</sup> Author's interview with Francisco Salazar, Mexico City, 2 July 2008.

I am worried by the fact, for example, that the ratio of proven reserves with respect to production of crude oil provides us with a productive horizon of only 9.3 years... This is due, we know, to the fact that for several decades we have every day extracted more oil than we have discovered. And it is clear to all of us that we must act now if we want to safeguard the future... If we do not act soon to replenish our reserves, we will not be able to overturn the decrease in production in the last few years and in very little time our country will face grave problems, not only to finance its development, but also instead of being exporters we will become importers of crude and its refined products.<sup>273</sup>

In early 2008, Calderón introduced an initiative to reform Pemex. The goal was to address issues of procurement, corporate governance, and regulatory oversight. Additionally, funding for exploration activities was substantially increased. In a nationally-televised speech promoting his proposal, Calderón argued that Pemex's problem was "fundamentally technological and operational" and urged "to act now, because time and oil are running out."<sup>274</sup>

Arguably, the situation of energy jeopardy led Calderón to undertake an extremely risky reform initiative. Interest groups around the country vowed to derail any attempt to allow private participation in the oil sector, and the proposal gave opposition leader Andrés Manuel López Obrador a cause to rally against the government. The extent

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<sup>273</sup> Felipe Calderón, 18 March 2007, ceremony to commemorate the 69<sup>th</sup> anniversary of the oil expropriation, Ixhuatlán del Sureste, Veracruz.

<sup>274</sup> Felipe Calderón, 8 April 2008, message regarding the initiative submitted to the Senate of the Republic.

of potential social outcry was uncertain, and Calderón endangered consensus-building for other important items of his domestic policy agenda—most prominently the pressing need to combat organized crime. Yet, the threat of becoming a net oil importer within a few years tilted the political calculus towards reforming Pemex.

In order to verify the government’s level of interest in the question of PEP’s exploratory activity, a content analysis of all State-of-the-Union addresses by Mexican presidents between 1952 and 2006 was conducted. Table 5.2 presents the number of times that each president used a variant of the word “exploration” in explicit reference to petroleum during all six speeches of his term. While the exact number of times may respond to idiosyncratic factors, a clear finding emerges. As expected, Gustavo Díaz Ordaz shows the greatest rhetorical interest in oil exploration, while conservative Ernesto Zedillo exhibits the least.

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**Table 5.2. References to petroleum exploration in  
State of the Union addresses (1953-2006)**

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<i>President</i>	<i>Number of Explicit References</i>
Adolfo López Mateos (1958-1964)	6
Gustavo Díaz Ordaz (1964-1970)	43
Luis Echeverría (1970-1976)	3
José López Portillo (1976-1982)	3
Miguel de la Madrid (1982-1988)	3
Carlos Salinas (1988-1994)	4
Ernesto Zedillo (1994-2000)	0
Vicente Fox (2000-2006)	2

Note: Content analysis consisted of counting the number of times the president mentioned any variant of the word "exploration" in direct reference to the petroleum industry. President Felipe Calderón changed the format of the State of the Union address and delivers instead televised thematic speeches to the country.

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Felipe Calderón, facing the threat of oil scarcity, had the strongest rhetorical interest in exploration since Díaz Ordaz. It is not possible to make direct comparisons with his predecessors, given that he changed the format of the State of the Union address, but the available evidence suggests a very high level of attention. For example, in 2008, Calderón delivered a series of short, thematic speeches to the country. In the speech dedicated to energy, he mentioned variants of the word “exploration” five times, more than for any *entire* presidential administration since Díaz Ordaz.

An econometric analysis confirms that the government is more inclined to authorize exploratory activity—which is what E&P companies generally seek to do—when the threat of oil scarcity increases—measured by changes in the reserves-to-production ratio. The results presented in Appendix B show that, holding the price of oil constant, a one-year decrease in the R/P ratio leads to 0.34 additional exploratory wells drilled during the following year.<sup>275</sup> In other words, the Finance Ministry’s authorization of exploration investment responds to its perceived threat of oil-related fiscal jeopardy rather than to the fluctuations in the price level.

## **6. Conclusion**

In 2008, Pemex Exploration & Production (PEP) was, by international standards, an average performer in the upstream oil industry. Its human capital consisted of Mexican geologists and petroleum engineers well versed in the fundamentals of oil exploration and production, and, for nearly three decades, Pemex had extracted millions of barrels of oil per day to meet the energy needs of the country and beyond. Yet, PEP appeared unable to

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<sup>275</sup> This result refers to Model 2 in Appendix B, for changes in total reserves. Changes in proven reserves lead to a slightly lower, but still statistically significant, increase.



tame the decline of Cantarell and had not discovered sizable reserves since the 1970s.<sup>276</sup> Moreover, its ability to manage large engineering projects—precisely a core competency of international oil companies—was questionable.

This chapter explains the reasons why PEP became an average performer in the upstream oil industry—highly cohesive group with low government interference but also with deteriorating performance. Additionally, this chapter explains that variation in the history of PEP, holding competition and managerial cohesion constant, has been driven by the government's perceived threat of oil scarcity and by the rise of Congress as a real veto player in the macropolitical system.

The lack of market competition obscured signals that could allow outsiders to gauge performance. For decades, no rival oil company has operated alongside Pemex to provide counterfactuals on the limits of the possible. If another company were allowed to explore for oil in Mexico—and succeeded at rates higher than Pemex—then political superiors would have a point of reference. Without such baseline, it has been difficult to detect whether exploration failure is due to lack of funding, lack of technical capacity, or poor geological conditions. Similarly, if competitors operated assets in fields adjacent to those owned by Pemex, then oversight could also compare the recovery rates between firms. Low productivity and operational inefficiency have been the natural outcomes. This problem was compounded by the nature of upstream activities, which take several years to come to fruition and thus provide slow feedback on the causes of mediocre or poor performance.

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<sup>276</sup> The most important source of potential reserves in Mexico today is in the Chicontepec region, an area discovered during the late 1970s. Chicontepec's geology poses difficult challenges for commercial production, which partly explains why Pemex did not develop it while Cantarell was producing healthily.

PEP's internal cohesion guaranteed that orders could be transmitted swiftly throughout a decentralized organization operating in remote locations. Additionally, it helped to overcome collective action problems in repelling political interference. The chief of PEP has never been a professional politician, as the government has feared explicit and implicit sabotage from staffers worried that their organization is under attack.<sup>277</sup> This stands in contrast to the history of Pemex Refining and Pemex-Gas.<sup>278</sup>

In the case of PEP, an overly rigid system of regulation prevented the organization from optimizing its operations, but exact causes of its inefficiencies were difficult to pin down across time and, in any case, the lack of a competitive environment ensured that inefficiencies did not become a major political problem for the government. Unlike what happened in the commercialization of crude oil, where errors would be punished rapidly and severely by the market and create crises in the political environment, in the upstream industry there were few incentives to change the status quo. Additionally, PEP was subject to an onerous fiscal system and received scarce funding for long-term investment projects.

When the threat of running out of oil has been high, the government, regardless of its ideological orientation, has invested heavily in upstream activities and taken steps so that the regulatory and corporate governance of the company improve. When the threat of running out of oil has been low, then the willingness of the government to intervene in the operations of the company has risen.

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<sup>277</sup> Confidential interview, April 2008.

<sup>278</sup> Yet, the same cohesion that protects petroleum engineers from outside managerial interference has promoted a degree of parochialism that, over time, has decreased the absorptive capacity of Pemex E&P. This has become a problem more recently in blocking external reform attempts.

**CHAPTER 6**  
**THE DOWNSTREAM COMPARED: A CHANGE IN COMPETITION WITH**  
**LOW MANAGERIAL COHESION**

**1. The Argument in Brief**

Pemex-Refining and Pemex-Gas are the two industrial subsidiaries included in this study that operate in the “downstream” segment of the oil and gas industry—that is, in the processing, transportation, and distribution of the hydrocarbons. While the former is charged with petroleum and the latter with gas, the essence of their activities is similar. They both purchase the unprocessed (“crude”) oil and gas from PEP, then they refine their feedstock in refineries and gas processing plants, and they transport and distribute it to the marketing centers—Pemex gasoline station franchises and local natural gas distribution companies. Yet, Pemex-Gas is widely regarded as a relatively efficient subsidiary while Pemex-Refining is considered to be an archetype of an inefficient state-owned enterprise. What accounts for this difference?

The puzzle of the divergent outcomes of these two subsidiaries is exacerbated by the fact that the industrial activities of both subsidiaries are conducive to similar levels of managerial specialization. Chemical engineers are the dominant profession in both refineries and natural gas processing plants and, as it was explained in the previous chapter, their cohesion is lower than that of petroleum engineers. Moreover, both Refining and Gas have extensive transport and distribution operations where chemical engineers have no comparative advantage in training—thus diluting their presence in the organizational chart and their capacity for collective action.

This chapter argues that the primary cause of the divergence in business efficiency is the fact that, since 1995, Pemex-Gas has faced competition in the natural gas

industry. This competition is limited in scope for two reasons. First, it is only allowed in transportation, storage, and distribution and not in gas processing. Second, few companies have had the interest and capability to enter markets where Pemex is the dominant player. Yet, the introduction of this small degree of competition has been sufficient to align some of the government intervention with the business interests of Pemex-Gas and has provided the top management enough incentives and leverage to modernize the company. By contrast, Pemex-Refining has remained stagnant throughout those years, in spite of a generalized sense of awareness throughout the Mexican oil industry that its business efficiency is low and that change is needed.

The policy orientation of both subsidiaries has been similar throughout. On the fiscal realm, both companies are taxed at the same corporate rate that any industrial firm in the country has to pay. On the industrialist realm, government policy is implemented with pricing subsidies that result in support for the upper and middle classes of the country and for the large industrial consumers. In terms of political patronage, Pemex-Refining is home to a wide clientelistic network based on the delivery of products by truck—an inefficient process compared to pipelines. Pemex-Gas, while not immune to this practice, has managed to increase the percentage of the fuel supply transported via pipeline.

## **2. An Overview of the Business of Pemex-Gas and Pemex-Refining**

Until 1990, both refining and gas processing activities, along with their transportation, storage, and distribution services, were managed by the Division of

Industrial Transformation of Pemex.<sup>279</sup> In that year, refining tasks remained under the Division of Industrial Transformation while gas processing—along with petrochemicals production—was transferred to the newly created Division of Petrochemicals. One year later, this latter unit's name changed to the Division of Petrochemicals and Gas. Soon after, with the restructuring of Pemex that gave birth to the subsidiary companies in 1992, the Division of Industrial Transformation became Pemex-Refining, while the Division of Petrochemicals and Gas was split and Pemex-Gas was founded.

In the 2000s, both subsidiaries owned a large network of productive assets throughout the country. Pemex-Refining owned six refineries in Mexico, in the cities of Ciudad Madero and Minatitlán on the coast of the Gulf of Mexico, Salamanca and Tula in the center, Cadereyta in the north, and Salina Cruz on the Pacific. Pemex-Gas operated twelve gas processing plants, mostly clustered along the coast of the Gulf of Mexico.

With regards to their organizational structure, Pemex-Refining and Pemex-Gas were similar. All productive assets—refineries and gas processing plants respectively—were administered by a single deputy director for production. This differed from PEP, where regional deputy directors managed decentralized assets and where deputy directors for exploration and production also participated in the administration of the fields. Additionally, unlike PEP, both Refining and Gas administered their respective distribution and marketing operations throughout the country. Finally, the organizational reform of 1992 that created the subsidiaries had put the network of petroleum, natural gas, and refined products pipelines under the control of the downstream—rather than the upstream—subsidiary. Thus, deputy director for pipelines managed these assets in each subsidiary.

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<sup>279</sup> See *Memoria de Labores, 1990*. The Petrochemicals Division was created on February 15, 1990.

In the decades that followed the oil expropriation, the downstream units of Pemex evolved more rapidly than the exploration and production. The company had to meet the rising domestic demand for fuel, and scarce investment resources were steered towards ramping up the refining capacity rather than pursuing exploration projects. According to Snoeck (1989), by 1970, the Mexican refining industry was relatively modern. This stood in contrast to the difficult conditions in the upstream, with Mexico facing the prospect of becoming a net importer of oil. In conjunction with the Mexican Petroleum Institute (IMP), Mexico's oil research and development center, Pemex began to invest in upgrading technologies that could assist in the processing of Mexican oil (Aboites, Domínguez, and Beltrán 2004).<sup>280</sup>

Starting in the 1980s, investment priorities shifted and the downstream received less attention (Snoeck 1989). Between 1979 and 1981, the first stage of the refineries of Cadereyta and Salina Cruz was completed. These centers were modern and capable of processing the heavy oil that Mexico had begun to produce. However, no significant investment in refining would take place until the late 1990s, in spite of the fact that the rest of the refineries could only process lighter crudes.

The largest gas processing plants in Mexico were also laid out in the 1970s. The plant in Cactus, the largest in the country (located on the border between the states of Chiapas and Tabasco), began operating in 1979. Another large plant, in Nuevo Pemex, Tabasco, opened in 1984. Afterwards, investment became scarce, not only to upgrade the facilities but also to provide maintenance.

Business efficiency in the international refining and gas processing industries entails the optimization of production in the industrial centers and the prompt, reliable,

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<sup>280</sup> Author's interview with Enrique Aguilar, researcher at the IMP, Mexico City, 14 April 2008.

and cost-effective transportation and distribution of the products to the customers. Both refining and gas processing are mature industries, with long established production processes and where innovation has rendered only marginal improvements for decades (Peterson and Mahnovski 2004). In this regard, the downstream business contrasts with exploration and production, which has continuously witnessed great technological advances in the search for oil in areas of more difficult access (Grant and Cibin 1996).

In the case of gas processing, optimization consists in maximizing the amount of liquids that can be extracted from the stream of natural gas. Most of the natural gas coming from the wellhead is methane, which is gaseous at surface temperatures. Natural gas liquids are compounds that, as the name suggests, are liquid at surface temperatures, and they generally carry a higher value in the market than methane itself.<sup>281</sup> Thus, natural gas coming from the wellhead is known as “wet,” and it may also contain a high amount of sulfur or metals that make it unfit to be fed into the distribution pipelines. The process of removing the liquids also makes the gas “dry” or “pipeline ready.”

In the case of refining, optimization is a more complex process that takes into account the relative prices of the inputs and the outputs, subject to the configuration of the refinery. Refineries are customized to process certain types of crude oil in order to maximize the yield of “light” products that can be extracted—primarily gasoline, diesel, and jet fuel. Those refineries with the most capital intensive facilities can process cheaper “heavy” crudes, which are more viscous and relatively more difficult to refine (Boué 2002; Ocic 2005). Given that constraint, the refinery manager must optimize the slate of products to send to the market and the crude streams that will render those products in the

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<sup>281</sup> These liquids include propane, butane, pentane, hexane, and heptanes. Liquefied petroleum gas (or LPG) is one of the most important commercial products produced with these liquids.

most cost-effective manner. The relative prices of gasoline, diesel, and jet fuel vary depending on supply and demand conditions, and refining profit margins partly rely on exploiting these differences.

Optimization in a petroleum refinery is more complex, but it is likewise a well developed process that is known by all participants in the industry. Some refinery managers are better than others are optimizing based on changing market conditions, but differences in profit margins due to this comparative advantage are small. Efficiencies in distribution and successful marketing provide additional profits (Francisco Flores-Macías 2009).

In Mexico, however, there are at least two structural constraints that make the efficiency challenges of Pemex-Refining and Pemex-Gas different from other countries. First, there is a mandate to keep the domestic market well supplied. In the case of natural gas, after the legal reform of 1995, customers may independently purchase gas abroad and import into Mexico. However, this is not the case with gasoline, which must all be purchased from Pemex.

Second, prices do not follow market conditions freely but instead are determined by separate price boards. Gasoline prices are set by a Committee on Prices for Petroleum Products, which is controlled by the Ministry of Finance. Natural gas prices and liquefied petroleum gas prices, on the other hand, are dictated by the Ministry of Energy. Pemex-Refining and Pemex-Gas managers often complained about the inability to receive market signals rapidly via an open price setting mechanism.

In general, the administration of the pipelines demands a cost-effective control system to increase the flow in the company's network and deliver the products on time to



the different customers. In this regard, Pemex-Gas faces greater challenges than Refining. The latter is the only entity allowed to use gasoline pipelines and thus requires fewer instruments of control. Pemex-Gas, on the other hand, is obligated by law to allow private distribution companies to use its pipelines to distribute gas purchased and sold to third parties. Controlling this “unbundled” market of gas processing, transportation, and distribution is more challenging, since the number of players and transactions is much larger.<sup>282</sup>

Finally, both Pemex-Refining and Pemex-Gas face the challenge of a rapid rise in demand that has taken place in the last two decades. Especially in the early 2000s, Pemex production was outpaced by domestic consumption, leading to higher imports. This trend let industry critics in Mexico to blame the government for not investing in additional refining capacity and for exporting cheaper crude oil while importing more expensive refined products (Shields 2003). In the case of gas, this debate has not emerged, mostly because Mexico is not a major exporter of gas.

### **3. Measurement of Variables**

The level of productivity of the two subsidiaries is primarily measured qualitatively. Each of these companies conducts several activities for which data collection is difficult, yet expert opinion on the degree of modernization is readily available. For example, with regards to the pipeline infrastructure, Adrián Lajous

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<sup>282</sup> Author’s interview with Ernesto Estrada (deputy director for pipelines, Pemex-Gas, 1995-1996), telephone communication, 14 July 2010.

commented that “there is a monstrous difference between the Pemex-Gas and the Pemex-Refining pipelines. The control center in Refining is among the worst in the world.”<sup>283</sup>

The policy utilization is analyzed in a similar way to that of the previous chapters. Qualitative assessments of the change in the orientation of the government over time are made. Much of the non-aligned government intervention in the downstream is similar to the case of PEP, and therefore it is emphasized less in this chapter. The procurement regulation, for instance, is the same.

The change in the level of market competition is done by examining the legal reform of 1995 that liberalized certain segments of the natural gas market. This change is not measured quantitatively given that, according to several industry experts, the actual entry of rival companies into the gas industry would be negligible. Thus, what is analyzed is the change in the possibility of entry. Furthermore, as in previous chapters, the qualitative discussion of the level of managerial cohesion is complemented with a discussion of the professional background of the top managers.

#### **4. The Evolution of Pemex-Gas and Pemex-Refining over Time**

In terms of business efficiency, Pemex-Gas and Pemex-Refining began diverging around 1995. Prior to that point, both subsidiaries were regarded as equally inefficient. Afterwards, Pemex-Gas modernized while Pemex-Refining remained stagnant. However, neither subsidiary is structurally endowed with the type of managerial cohesion and specialization that would thwart the governments’ ability to intervene in the firm—especially through the appointment of politicians as top executives. Still, the government

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<sup>283</sup> Author’s interview with Adrián Lajous, telephone communication, 2 July 2010.

has shown less willingness to intervene in gas operations than in refining, and when it has done so, it has done so at a smaller scale.

The policy orientation of both subsidiaries has been similar. Industrial policy was once high, focused on promoting regional development and subsidizing industrial growth (Bermúdez 1976; Morales et al. 1988). In the 1980s, active promotion of industrial interests decreased—although it did not disappear. The main instrument for industrial policy was the price of the products, which remained controlled by the government. The main difference, however, was a switch from a policy of actively keeping prices below market level to the pursuit of price stability. Thus, the real price of gasoline was kept constant throughout the 1990s and 2000s, and large industrial consumers of natural gas were protected against price spikes in the international markets.

## **5. A Contemporary History of the Downstream Sector in Mexico**

### *The Explosions that Shocked Mexico*

On the evening of July 26, 1996, a massive explosion devastated the gas processing plant of Cactus, located 33 kilometers southeast of Villahermosa, Tabasco.<sup>284</sup> The incident underscored the dismal state of some of the production facilities of Pemex-Gas. The destruction of several parts of the Cactus plant represented the temporary loss of nearly one-third of Mexico's supply of pipeline-ready natural gas. More importantly, six workers died and many others were injured.<sup>285</sup>

Unfortunately, high profile industrial accidents were not novel in the downstream sector in Mexico. Only four years earlier, in April of 1992, several explosions destroyed

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<sup>284</sup> See López, René Alberto, "3 explosiones en el complejo de Cactus," *La Jornada*, 27 July 1996.

<sup>285</sup> See Dillon, Sam, "Blast Mars Pemex's 22% Earnings Gain," *The New York Times*, 2 August 1996.

parts of the city of Guadalajara after gasoline from the underground pipeline network leaked into the water distribution system. According to official reports, over 200 people died and hundreds more were injured.<sup>286</sup>

Accidents are unfortunately not uncommon in the oil and gas sector, but in the case of Pemex-Gas and Pemex-Refining, they reflected broader problems of performance. Infrastructure had been poorly managed for years and a culture of excellence was lacking throughout the companies. Pedro Haas, director-general of Pemex-Gas between 1994 and 1996, lamented the dire state of the company's facilities in the early 1990s. The pipeline control system was obsolete, and a lack of attention to industrial safety was widespread.<sup>287</sup> "Pemex-Refining," he explains, "was just as chaotic as Pemex-Gas."

What was the state of the downstream industry in Mexico in the early 1990s? How did it reach that point? The following section describes the context of the downstream sector in Mexico leading to these accidents.

#### *The level of NAGI in the Downstream Sector in Mexico*

Several factors contributed to the "chaotic" state of the refining and gas activities in Mexico. Many of these problems resulted from the way in which the government utilized them as instruments of policy. In fact, the degree of non-aligned government intervention has historically been greater and more extensive in refining and gas than in other subsidiaries. In the words of a long-time Pemex top executive, "in the downstream

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<sup>286</sup> See Zapata, Belén, "Guadalajara conmemora 18 años de las explosiones que dejaron 210 muertos," CNN Mexico, available online at <http://mexico.cnn.com/nacional/2010/04/22/guadalajara-conmemora-18-anos-de-la-tragedia-del-22-de-abril> (accessed on July 5, 2010).

<sup>287</sup> Author's interview with Pedro Haas, 24 June 2010 (telephone communication).

sector in Mexico, the problems of state ownership have been exacerbated.”<sup>288</sup> An expert on the Mexican refining sector remarked: “It is schizophrenic to expect Pemex to perform like a private enterprise when the rules of the game do not allow it to behave as such. Pemex-Refining is not an enterprise. It is an instrument of public policy.”<sup>289</sup>

Throughout their history, these branches have had at least two policy mandates: keeping the domestic market fully supplied and controlling the price of energy. As a company of “public benefit” (*beneficio público*), Pemex must provide fuel even in areas of the country where it would be uneconomical for a private company to do so—for example, opening gasoline service stations in rural areas with low demand. A top Pemex-Refining executive explains: “Pemex cannot stop supplying an area of the country, whether it is profitable to do so or not.”<sup>290</sup>

Second, the downstream branches have been the primary means to implement industrial policy in the private sector. The government has consistently subsidized the prices of fuels for both industrial and residential consumers, and Pemex has been required to absorb the losses (Snoeck 1989). A former Ministry of Finance official argued that “from the perspective of public finances, it makes no difference whether Pemex absorbs the subsidies or not.”<sup>291</sup> However, Pemex managers complained about the distortions caused by the excess demand for cheap energy and argued that the Ministry of Finance seldom acknowledged the foregone investments due to its policy of subsidies.

Refining and gas activities were also vulnerable to political pressures not present in PEP due to their presence in the entire country. High levels of patronage and

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<sup>288</sup> Author’s interview with Bernardo de la Garza, Mexico City, 7 April 2008.

<sup>289</sup> Author’s interview with Mexican oil industry expert, Mex.Exp.#3, Mexico City, April 2008.

<sup>290</sup> Author’s interview with José Antonio Gómez Urquiza, deputy director for Finance and Administration in Pemex Refining, Mexico City, 12 June 2008.

<sup>291</sup> Author’s interview with former Ministry of Finance official (MF.#3), Mexico City, July 2008.

inefficiency permeated the distribution networks of both subsidiaries. This was observable in the fact that, unlike what happens in most countries, a sizable percentage of the transportation of gasoline and gas was done by trucks rather than by pipelines.<sup>292</sup> Fuel transportation by trucks is more costly and more dangerous, yet it also provided high rents to a handful of well connected business groups.

### *The Effect of the Lack of Market Competition*

The lack of market competition increased the willingness of the government to implement these policy mandates and thus contributed to the loss of economic efficiency. Without the need to undersell competitors, for example, the government felt no need to remove inefficiencies by tackling the entrenched trucking interests. Additionally, over the years, not having market competition consolidated a corporate culture that emphasized production at the expense of cost. In other words, signals of performance were not available for the management to set goals properly.

The effects of monopoly protection are described by Guillermo Ruiz, who arrived as deputy director for planning in Pemex-Refining in 1994 and noticed an absence of cost-efficiency considerations in the company:

The incentives were all about maximizing volume. It's not entirely an incorrect view. If you ask any refiner in the world, he'll say that the primary thing is to maximize the utilization of the capacity. True, but you have to maximize it with respect to economic value. That did not happen

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<sup>292</sup> Author's interview with Rosendo Zambrano, former CEO of PMI, Mexico City, 12 June 2008.

in Pemex-Refining. Instead, since we're a monopoly here, you're missing those market signals. It was "maximize volume," period.<sup>293</sup>

Others Pemex managers agreed that the lack of signals of performance made it more difficult to moderate the engineering culture of the company that focused exclusively on volume maximization. One interviewee went as far as to say: "What Pemex engineers cared about is how much you could produce, not how much things cost and they certainly did not care about good record-keeping."<sup>294</sup> Moreover, the lack of competitive pressures is compounded when the mandate for the company consists in fully supplying a large domestic market such as Mexico's.

#### *Liberalization in the Natural Gas Industry*

On May 11, 1995, the government of President Ernesto Zedillo enacted a reform to the Enabling Law of Article 27 of the Constitution with regards to Petroleum. The new Article 4 of the Enabling Law liberalized several segments of the industry in Mexico, namely the transportation, storage, and distribution of natural gas. Production and gas processing remained under exclusive control of PEP and Pemex-Gas, respectively. The production, transportation, storage, and distribution of gasoline and other refined oil products also remained under strict state control.

For the first time in decades, the private sector would be allowed to compete with Pemex in specific segments of the market. Luis Téllez, one of the top advisors to President Zedillo at the time and one of the masterminds of the reform, referred to the

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<sup>293</sup> Author's interview with Guillermo Ruiz, deputy director for Planning at Pemex-Refining from 1994 to 2001, Mexico City, 25 July 2008.

<sup>294</sup> Interview with a Pemex manager who requested confidentiality (Pem.Ref.#1), Mexico City, June 2008.

reform as a “small but significant step forward” towards increasing the competitiveness of the energy markets in Mexico.<sup>295</sup>

The practical impact of the reform would be as follows. Industrial consumers would now be able to import natural gas from third parties rather than have to purchase it from Pemex, and they would not even have to contract with Pemex for the transportation of the gas in the pipelines. Moreover, private parties would be allowed to build pipelines and to utilize Pemex’s pipeline network—now “open access”—for their own commercial projects.<sup>296</sup>

There is reason to believe that the Zedillo administration would have also sought to liberalize the refining market if its political symbolism had not been as high. In other words, the decision to reform the gas market and not the refining one resulted from causes relatively external to these subsidiaries, namely political reasons outside of their control. Luis Téllez explained his thinking as follows:

The activity of Pemex Refining is industrial in nature, where raw materials are transformed in derived products. Even if you keep the state’s control over oil production, there is no reason, in my opinion, why the state should continue to run refining activities. Refining is not a strategic activity and has no rents. The solution would be to open refining to the private sector, but this could not be done.<sup>297</sup>

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<sup>295</sup> Author’s interview with Luis Téllez, telephone communication, 26 June 2009.

<sup>296</sup> “Open access” pipelines in the natural gas industry are those that do not favor transportation of the gas owned by the operator of the pipeline. Transportation of the gas by other parties is done by the operator on a fee-for-service basis (Busby 1999).

<sup>297</sup> Author’s interview with Luis Téllez, telephone communication, 26 June 2009.



In hindsight, the reform would not drastically change the competitive landscape of the gas industry. Pedro Haas, who was leading Pemex-Gas at the time of the reform, believes that private companies were reluctant to enter the market, among other things, because prices were never entirely liberalized.<sup>298</sup> This constraint to a free market was exacerbated due to the subsidies that were authorized by the Ministry of Energy to improve the competitiveness of large industrial consumers when the international price of natural gas spiked in the year 2000 (Adrián Lajous 2003). An effect of this policy was that consumers along the U.S. border preferred to purchase subsidized gas from Pemex rather than to import it, which under free market conditions would have been preferable due to the lower cost of transportation.

Furthermore, entry into the local distribution of natural gas was also hindered by the fact that the residential demand for natural gas in Mexico has historically been low compared to liquid petroleum gas (LPG). The distribution of LPG was not included in the reform and the incentives to transition into natural gas use in the households were low. Finally, competition at the wholesale level was also limited in many parts of the country by the fact that natural gas production in Mexico is concentrated in the south. Away from the U.S. border, Pemex enjoyed a large advantage due to the lower transportation costs.

If competition did not arrive in the way intended by the reform, how can the natural gas transportation and distribution sector be characterized? A manager in Pemex-Gas, who acknowledged that competition in the industry is very limited, referred to the state of the sector as one of “latent competition.”<sup>299</sup> In fact, the regulatory framework established by the Mexican Energy Regulatory Commission (CRE) is known as a

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<sup>298</sup> Author’s interview with Pedro Haas, telephone communication, 24 June 2010.

<sup>299</sup> Author’s interview with Pemex manager (Pem.Gas.#2), telephone communication, June 2010.

“transitory regime.” The different market participants know that a permanent regime ought to be finalized at some point, but as of 2010 that moment had yet to arrive. In other words, while there has never been a true competitive natural market, since 1995 there has been a strong *threat* of competition.

#### *The Response of Pemex-Gas to the Liberalization*

The reform of 1995, however, ignited a process that allowed the managers of Pemex-Gas to greatly reduce the inefficiencies of the subsidiary. Pemex-Refining remained stagnant, falling further behind its international counterparts, while Pemex-Gas implemented a large-scale modernization effort. The results were visible to observers of the Mexican petroleum industry, most of whom unambiguously believed that Pemex-Gas had become much more efficient than Pemex-Refining. From gas processing infrastructure to pipeline controls to customer service, Pemex-Gas greatly improved its operations.

The change in the legislation that allowed market competition had both direct and indirect effects on the ability of the management to improve the efficiency of the company and on the government’s ability to intervene in the internal operations of the subsidiary. Direct effects were those that were triggered in order to abide by the new regulation, and they took place soon after the reform was passed. Indirect effects, on the other hand, occurred when reform-oriented managers of Pemex-Gas strategically used the threat of competition to push for changes within the subsidiary, with the government, and with the clients.

One of these direct effects has been described by one Pemex-Gas manager as the development of “a market-oriented mentality.”<sup>300</sup> Among other things, the subsidiary’s business plan now included a strategy on how to achieve competitiveness with regards to the private sector, even if these companies had not yet entered the Mexican industry. One component of this strategy consisted in developing a more precise knowledge of the clients’ needs. A high-level manager at Pemex-Gas in the 1990s explains that, in natural gas marketing, companies do not compete with the commodity that they sell, but rather with the quality of their service, and that Pemex-Gas needed to be up to the task.<sup>301</sup>

Hence, Pemex-Gas managers embarked on a project to understand how Pemex-Gas could better serve its customers. In a company that had had a captive demand for decades, this simple process constituted a momentous change. As CEO of Pemex-Gas, Pedro Haas spearheaded this effort, motivated by his awareness of the behavior of international oil companies as former CEO of PMI. Looking back at the change in the corporate culture of the subsidiary, Haas remarked: “That shows you, to some extent, that changing the culture within a state-owned enterprise like Pemex is completely feasible.”<sup>302</sup>

A second direct effect was the modernization of the pipeline infrastructure for natural gas. In 1995, the pipeline control system in Pemex-Gas was obsolete. Pedro Haas describes the state of affairs in that year as follows:

The network of natural gas and LPG pipelines in Pemex was terrible. The first time I went to Venta de Carpio [an area located north of Mexico

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<sup>300</sup> Author’s interview with Pemex manager (Pem.Gas.#2), telephone communication, June 2010.

<sup>301</sup> Author’s interview with Pemex manager (Pem.Gas.#3), telephone communication, June 2010.

<sup>302</sup> Author’s interview with Pedro Haas, telephone communication, 24 June 2010.

City], which has one of the pipeline control centers, I found out that there was no actual control center. It was an old room built in the 1950s with pneumatic controls—valves controlled manually, for example. There was no system to measure how much gas was being dispatched from the pipeline. You couldn't tell if the client had gotten more or less gas than you had agreed.<sup>303</sup>

The new law, however, required an advanced control system so that different companies could transport their gas in an organized way. Otherwise, the “open access” system would be unfeasible. Accordingly, the government authorized investment expenditures on the pipelines. Ernesto Estrada, deputy director for pipelines at the time of the reform, explains the program that was implemented:

There were two sets of projects: removing bottlenecks to be able to transport more and the introduction of the remote electronic control system. The entire network today is operated remotely thanks to this system, and it is something that Pemex-Refining never did.<sup>304</sup>

A third direct effect consisted in the strengthening of the company's gas trading operations. Pemex-Gas has a group, based in Mexico City, that conducts trading activities in the United States via a subsidiary in Houston, Texas. When the law was passed, the

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<sup>303</sup> Author's interview with Pedro Haas, telephone communication, 24 June 2010.

<sup>304</sup> Author's interview with Ernesto Estrada, former deputy director of Pemex-Gas, telephone communication, 14 July 2010. The new control system is known in the industry as SCADA (Supervisory Control and Data Acquisition system). It is the industry standard in the operation of pipelines around the world. As of 2010, Pemex-Refining still had not been able to introduce it into its network.

trading branches of companies such as Enron and El Paso had become very active in the U.S. market, and Pemex-Gas managers feared that competition would be too strong. In hindsight, U.S. trading companies would choose not to participate heavily in the Mexican market, but the development of human capital in Pemex-Gas would stay afterwards.

A fourth direct effect consisted in the development of commercial know-how to create long-term supply contracts with large industrial customers. Prior to 1995, delivery of the gas was done based to very simple demand models and clients could not choose from different delivery schemes to optimize their own operations. The “open access” pipelines, however, provided customers with choice, as they could contract their gas with a company that would offer different configurations of base and swing load volumes and costs. Accordingly, Pemex-Gas had to acquire expertise rapidly to estimate demand throughout the system with more realistic models and offer clients a menu of configurations.

This commercial know-how was put to the test in 1999 with the bidding for the Monterrey III power plant. The gas liberalization had occurred soon after an opening in the Mexican electricity sector that allowed independent power producers (IPPs) to build plants and sell electricity to the state-owned *Comisión Federal de Electricidad* (CFE). Monterrey III was the first IPP plant built after the reform of 1995, and in the public bidding, CFE allowed companies to propose to either purchase their gas supply from Pemex or from abroad. In this instance, imported gas provided realistic competition given the proximity of Monterrey to the northern border. Pemex-Gas had to provide to each bidding consortium the cost estimates for all the different combinations of base and swing loads and then be able to demonstrate to the Mexican Energy Regulatory

Commission that the estimates were fair for all companies and correctly modeled. In the end, the company that won the bid had proposed a supply contract with Pemex-Gas.<sup>305</sup>

The most significant indirect effect provided by the liberalization law was the leverage that it provided to the managers of Pemex-Gas to implement change. This leverage helped Pemex-Gas both in terms of improving the culture of the company, in terms of obtaining more investment resources, and in negotiating with clients and the union. Pedro Haas explains how the liberalization law assisted him in the modernization of the subsidiary as follows:

I used the liberalization law in order to persuade people internally, tell them that “competition is coming” even though I knew that in reality we were to face only limited competition. It was a means to mobilize the staff and even to mobilize the clients. I used it in order to persuade the clients to sign contracts with Pemex-Gas, which they hadn’t done before.<sup>306</sup> In the case of LPG, I would tell them that what was happening with natural gas could easily occur in the LPG market, and that it was in their best interest to have the protection given by clear contracts.<sup>307</sup>

Ernesto Estrada echoed Haas’s viewpoint:

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<sup>305</sup> Author’s interview with Felipe Luna, former deputy director of Pemex-Gas, telephone communication, 29 June 2010.

<sup>306</sup> Haas explains that until the early 1990s, LPG transactions between Pemex and its clients—local distribution companies—were made without contracts. Clients would often not honor their accounts payable with Pemex, which had little ability to seek legal remedy without contracts and knowing that the clients had monopoly distribution rights over different cities. Thus, the introduction of contracts before making transactions was seen as a fundamental step in order to improve the internal control system of the company as well as its financial health.

<sup>307</sup> Author’s interview with Pedro Haas, 24 June 2010.

The excuse to accomplish much of this—the way in which we convinced a lot of people, both within Pemex-Gas and elsewhere in the government, that we needed to modernize—was that there was discussion on a bill to open the natural gas market. So the liberalization was an incentive to change, and it also provided an excuse to do many things.<sup>308</sup>

The leverage provided by the liberalization also reached the gas processing plants. Investment in modern control systems was authorized in part due to the need to service multiple pipeline administrators. In fact, a manager of Pemex-Gas mentioned: “The liberalization helped to justify investments across all areas, including the processing plants.”<sup>309</sup> The explosion in Cactus increased the interest of the government in making investments in the plants. By then, however, the pipeline modernization process was already underway.

### *The Sociology of the Managers in the Downstream*

The sociology of the managers of Pemex-Refining and Pemex-Gas differs in important respects from that of PEP, which was discussed in Chapter 5. First, the dominant professional in both refining and gas processing activities is the chemical engineer. This stands in contrast to the situation in PEP, where petroleum engineers control most of the managerial positions.

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<sup>308</sup> Author’s interview with Ernesto Estrada, former deputy director of Pemex-Gas, telephone communication, 14 July 2010.

<sup>309</sup> Author’s interview with Pemex manager (Pem.Gas.#2), telephone communication, June 2010.

Chemical engineers undergo a much less intensive socialization process. Each year, there are hundreds of chemical engineering graduates around the country. The program is offered in many universities and technical institutes, so that friendships are not molded at a young age. Additionally, chemical engineers can work in a variety of industries and companies, so the sense of commitment to the Mexican petroleum industry is weaker. Finally, work in the downstream sector generally provides fewer opportunities to build lifetime bonds. Even those working in refineries have the ability to leave the workplace every night and return to their homes scattered in the cities nearby. Thus, the social circle of the chemical engineers is wider.

Adrián Lajous explains the differences between chemical and petroleum engineers as follows:

Chemical engineers are scattered, and they can work in many places besides Pemex. Petroleum engineers, for the most part, can only work in Pemex. Hence, chemical engineers have many outside options, and there has always been a greater flow of professionals in and out of Pemex-Refining. In short, the world of chemical engineering is less closed than petroleum engineering.<sup>310</sup>

The second major distinction results from the fact that Pemex-Refining and Pemex-Gas carry out a more diverse set of activities than PEP and thus can more easily accommodate managers with backgrounds different from chemical engineering. Most of the managerial positions in PEP are directly associated with exploration and production

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<sup>310</sup> Author's interview with Adrián Lajous, Mexico City, 7 July 2008.



tasks, where petroleum engineers enjoy a comparative advantage in terms of technological knowledge. Thus, in Pemex-Gas and Pemex-Refining the deputy director for production and the managers of the refineries have customarily been chemical engineers, but many of the deputy directors have had other backgrounds.

Table 6.1 summarizes the professional background of the directors and deputy directors of Pemex-Gas, Pemex-Refining, and PEP since their founding as subsidiaries. In each case, the first column presents the profession of the director, the second column shows the number of deputy directors in the organizational chart, and the third gives the percentage of those deputies who are members of the dominant profession (chemical engineering in the cases of Gas and Refining and petroleum engineering in the case of PEP). The number of deputy directors is important because it shows the ease with which one “outsider” can swing the balance within each company’s top executive team. Among five deputies, adding a third non-chemical engineer can affect decision-making more drastically than among ten or more.

[TABLE 6.1 HERE]

The difference between PEP and the other two subsidiaries is striking. PEP has always been led by a petroleum engineer, while Gas and Refining have seen, in addition to chemical engineers, CEOs with degrees in economics, business administration, and even petroleum engineering. This does not entail that cohesion in a downstream branch necessitates a chemical engineer—it certainly does not. However, coordination channels and collective action would be structurally easier if this were the case.

**Table 6.1 Professional Background of Top Executives in Gas, Refining, and PEP (1993-2010)**

Year	Pemex-Gas			Pemex-Refining			PEP		
	Director	Number	Pct.	Director	Number	Pct.	Director	Number	Pct.
1993	Econ	5	N/A	Chem. Eng.	8	25%	Petro. Eng.	13	85%
1994	Econ	5	60%	Chem. Eng.	8	25%	Petro. Eng.	13	85%
1995	Econ	5	60%	Econ	8	25%	Petro. Eng.	13	85%
1996	Chem. Eng.	6	33%	Econ	8	25%	Petro. Eng.	14	86%
1997	Chem. Eng.	6	33%	Econ	8	38%	Petro. Eng.	15	80%
1998	Chem. Eng.	6	33%	Econ	8	38%	Petro. Eng.	17	82%
1999	Chem. Eng.	6	33%	Econ	8	50%	Petro. Eng.	17	76%
2000	Chem. Eng.	6	33%	Econ	8	50%	Petro. Eng.	17	76%
2001	Chem. Eng.	6	33%	Chem. Eng.	8	63%	Petro. Eng.	17	76%
2002	Chem. Eng.	6	33%	Chem. Eng.	9	44%	Petro. Eng.	17	71%
2003	Chem. Eng.	6	33%	Bus. Adm.	9	33%	Petro. Eng.	17	59%
2004	Chem. Eng.	6	33%	Bus. Adm.	9	33%	Petro. Eng.	18	61%
2005	Chem. Eng.	6	33%	Bus. Adm.	9	33%	Petro. Eng.	19	63%
2006	Chem. Eng.	6	33%	Chem. Eng.	9	33%	Petro. Eng.	19	58%
2007	Chem. Eng.	6	33%	Petro. Eng.	9	44%	Petro. Eng.	19	63%
2008	Chem. Eng.	6	33%	Petro. Eng.	9	44%	Petro. Eng.	19	63%
2009	Chem. Eng.	6	50%	Petro. Eng.	9	33%	Petro. Eng.	18	61%
2010	Econ	6	50%	Chem. Eng.	9	22%	Petro. Eng.	18	61%

*Source: Archival information provided by Pemex by request under the Freedom of Information Law. In those instances where more than one deputy director served in one year, the one who spent the most time is included in the count.*

Petroleum engineers have also managed to keep the number of deputies in PEP high. Having 17 deputy directors in 1998, adding additional executives with other backgrounds hardly changed the balance—which never declined below 50%. In Refining and in Gas the reserve was true.

*How the Sociology of the Managers Affects Performance and the Level of NAGI*

The lower level of specialization of the managers in the downstream has had two discernible consequences on the behavior of Pemex-Refining and Pemex-Gas. From the perspective of governmental intervention, managers in these subsidiaries have less instinctive collective action potential to thwart the appointment of politicians to top executive positions. While this has not been a generalized practice, two cases have drawn the attention of observers of the Mexican oil industry: the arrival of Juan Bueno as CEO of Pemex-Refining in 2003 and of Jordy Herrera as CEO of Pemex-Gas in 2010.

Both Juan Bueno and Jordy Herrera were politicians closely associated with the ruling National Action Party who had low managerial experience and limited exposure to the oil and gas refining industry. Bueno was appointed by Vicente Fox over the objection of Pemex CEO Raúl Muñoz Leos, who advised the president about the delicate state of the refining branch and the desirability to appoint a CEO seasoned in the industry.<sup>311</sup> Herrera arrived in Pemex-Gas regarded as a close collaborator of President Felipe Calderón.<sup>312</sup> In fact, he had been the latter's assistant at different points in his career. While Herrera had served as under-secretary for planning in the Ministry of Energy between 2006 and 2009, he lacked a managerial background.

The tenure of Bueno was strongly criticized by industry experts. A former advisor to the CEO at the time commented: "We could not believe the horror stories coming from Refining. There was no technical knowledge in decision-making."<sup>313</sup> Raúl Muñoz Leos,

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<sup>311</sup> Author's interview with Raúl Muñoz Leos, Mexico City, 30 July 2008.

<sup>312</sup> See Cervantes, Jesusa, "Nombran a Jordy Herrera director de Gas y Petroquímica de Pemex," *Proceso*, 4 January 2010.

<sup>313</sup> Author's interview with a former advisor to the Pemex CEO, Mexico City, July 2008.

CEO at the time, lamented by saying that “Bueno’s arrival cut short our optimization efforts.”<sup>314</sup>

The arrival of politicians or otherwise underqualified people to managerial positions is not limited to the CEO position. Most of these appointments are made in the middle management ranks, away from the media spotlight, and their turnover is high. Thus, human capital in these subsidiaries is lower than in PEP, where managers at least have acquired industry experience over the years.

#### *Alternative Explanations for the Divergence in Outcomes I: Better Managers*

The following sections discuss possible alternative explanations for the divergence in outcomes between Pemex-Gas and Pemex-Refining. In some interviews, respondents explained the inefficiency of Pemex-Refining based on several structural constraints. Interestingly, however, most of the same issues are found in Pemex-Gas, thus strengthening the claim that market competition—albeit limited in practice—played a crucial structural role to enable the management of Pemex-Gas to improve the efficiency of the subsidiary.

One logical explanation is that Pemex-Gas simply had better managers than Pemex-Refining. This is certainly feasible between 2003 and 2005, when the inexperienced Juan Bueno was head of Refining while Marcos Ramírez led Pemex-Gas. Ramírez had been deputy director of PMI in the early 1990s, gaining managerial experience in a competitive environment. Moreover, he had been director of Pemex-Gas since May of 1996 and had helped to modernize the subsidiary in the years following the reform of 1995.

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<sup>314</sup> Author’s interview with Raúl Muñoz Leos, Mexico City, 30 July 2008.

Nevertheless, between 1994 and 2001, both Pemex-Gas and Pemex-Refining had management teams with very similar characteristics. When Adrián Lajous was appointed director-general of Pemex, he named two of his top collaborators from his years in the Division of Foreign Trade to lead these two branches—Pedro Haas in Gas and Jaime Mario Willars in Refining. Both of them were trained as economists and each of them assembled teams of deputy directors coming from the ranks of PMI.<sup>315</sup> Lajous was well aware of the problems of Pemex-Refining and supported the modernization efforts proposed by the management.<sup>316</sup> Still, by 2001, Pemex-Gas had already improved its efficiency considerably while Refining had not.

A plausible conclusion, however, is that the continuity of Marcos Ramírez as head of Pemex-Gas enabled a faster consolidation of the modern market-oriented practices that began to be implemented in 1995. Changes in large bureaucracies such as Pemex-Gas and Pemex-Refining take time to become permanent. Had a politician been appointed chief of Gas, some of the improvements could have been lost. Similarly, had incompetent managers been appointed to lead Gas from the beginning, the outcome would have been different. Rather than a difference in managerial ability, the explanation likely lies in the one structural change—market competition—that facilitated reform in one place but not in the other.

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<sup>315</sup> For example, Guillermo Ruiz and Pedro Carlos Gómez were appointed deputies for planning and distribution, respectively, in Pemex-Refining. Both were former PMI staffers, just like Marcos Ramírez and Felipe Luna, who became deputies for planning and marketing in Pemex-Gas. Source: archival information obtained from Pemex-Refining, Pemex-Gas, and PMI.

<sup>316</sup> Author's interview with Adrián Lajous, telephone communication, 2 July 2008.

*Alternative Explanations II: The Union, The Budget, and The Regulatory Burden*

Other arguments help to explain the low efficiency of Pemex-Refining in absolute terms, but not in comparative terms with Pemex-Gas. This is the case of all those structural constraints that affect the two subsidiaries fairly equally. For example, a refining manager said: “Pemex-Refining cannot perform better for three simple reasons: the union, the Ministry of Finance, and the environmental regulation. They all strangle the company.”<sup>317</sup> His reasoning was as follows. First, since the union controls the hiring, firing, and reallocation of personnel, industrial facilities are overstaffed. “The objective of the union is not to increase productivity, but only to increase the number of jobs,” he said. Second, since the Ministry of Finance is concerned with keeping public finances balanced throughout the year, appropriations are transferred irregularly throughout the year. “The operating budget approved by Congress the year before is not received until March,” he explained. “For the first two months of the year, Pemex-Refining has no money to pay its bills. Then they release investment money in December, and if you don’t spend it, you lose it for the following year.” Third, the manager complained about the environmental regulation imposed by the Ministry of the Environment, which required Pemex-Refining to comply with norms beyond the capacity of the existing facilities.

Yet, Pemex-Gas faces similar challenges. It is true that the union looks to increase the number of employees in refineries,<sup>318</sup> but gas processing plants face the same problem

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<sup>317</sup> Author’s interview with Pemex manager (Pem.Ref.#3), Mexico City, July 2008.

<sup>318</sup> This point was confirmed, among others, by José Antonio Gómez Urquiza, deputy director for finance and administration in Pemex-Refining, who believes that refineries have excess personnel in the area of maintenance. Most refineries around the world subcontract maintenance operations only during the time of the year when that type of work is required. In Pemex, however, a full-time maintenance staff is employed throughout the year, whether the service is needed or not. Author’s interview with José Antonio Gómez Urquiza, Mexico City, 12 June 2008.

of excess personnel. Furthermore, the characteristics of union members are not different in each of the two branches. A Pemex manager with experience interacting with the union explained: “The differences in the culture of the subsidiaries manifest themselves among the *de confianza* personnel, not in the union. Unionized workers do not see themselves as members of PEP or of Refining or what not. They see themselves as members of Pemex, period.”<sup>319</sup> An expert on the Mexican refining sector would agree with that assessment and stated that the union leadership in Pemex-Refining was not any more rigid than in other subsidiaries.<sup>320</sup> Furthermore, all subsidiaries face similar budgetary restrictions. A former Pemex-Gas manager complained about the lack of investment money authorized by the Ministry of Finance just as strongly as the Pemex-Refining managers did.<sup>321</sup>

Likewise, the challenge posed by environmental regulations is illustrative of additional differences in the efficiency between the two subsidiaries. Observers do believe that some environmental standards have been unreasonable given the state of the infrastructure of Pemex-Refining and its scarcity of investment funds. The most cited example is the case of the Official Mexican Standard SEMARNAT-NOM-086 (commonly known simply as the NOM-086), which in 2005 revised the guidelines for sulfur content in gasoline sold in the largest cities in Mexico. As it turned out, Mexican refineries lacked the technology to meet the standard by the deadline, so Pemex-Refining was forced to import gasoline at a high cost to meet domestic demand.

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<sup>319</sup> Author’s interview with a Pemex manager who requested confidentiality (Pem.Ref.#1), Mexico City, June 2008.

<sup>320</sup> Author’s interview with Mexican oil industry expert (Mex.Exp.#3), Mexico City, April 2008.

<sup>321</sup> Author’s interview with a former Pemex-Gas manager (Pem.Gas.#1), Mexico City, August 2008.

A careful investigation, however, reveals that Pemex-Gas has been subject to similar challenges in terms of environmental constraints but has known how to navigate through the Mexican bureaucracy to utilize the regulations in its favor.<sup>322</sup> In the case of the NOM-086, officials in the Ministry of the Environment contemplated imposing similarly stringent measures for gas processing plants. Pemex-Gas managers, however, had developed a history of sound environmental protection and a collegial relationship with the regulators in the Ministry of the Environment. Upon learning about the proposal for the NOM-086, Pemex-Gas adopted a conciliatory approach and rapidly negotiated a new standard that, while stringent, was still within reach.<sup>323</sup> Pemex-Refining, by contrast, adopted a confrontational approach and, after a protracted process, was unable to prevent the new measure.

### *Alternative Explanations III: Differences in Scale*

The improvement of Pemex-Gas in relation to Pemex-Refining, however, could have been facilitated by the smaller size of its operations. While the former is a company of approximately 12,000 employees, the latter employs 45,000. Additionally, optimization processes in refineries are more complicated than in gas processing plants. Still, the scale of Pemex-Gas was, in absolute terms, very large. Moreover, prior to the reform of 1995, Pemex managers had been unable to enhance the efficiency of its operations, in spite of being a smaller company. These considerations give further credence to the claim that the introduction of competition played a more significant role than other variables.

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<sup>322</sup> Author's interview with a Pemex manager (Pemex.Env.#1), Mexico City, July 2008.

<sup>323</sup> Author's interview with a Mexican oil industry expert (Mex.Exp.#2), Mexico City, July 2008.



## 6. Conclusion

Pemex-Gas and Pemex-Refining conduct many of the same activities, although the former processes and distributes gas while the latter is in charge of refining crude oil. Until the early 1990s, both subsidiaries were marred by inefficient practices and poor industrial safety. Explosions in Guadalajara and in the gas processing plant of Cactus underscored a broad problem with the management.

While the downstream was traditionally a preferred government instrument to implement industrial policy, starting in the mid-1980s the policy utilization of the companies had decreased. Rather than actively providing energy at low prices, the government instead sought to stabilize the real price of gasoline and natural gas. This more limited—albeit still present—industrial policy continued through the 2000s.

Starting in the late 1990s, the business efficiency of Pemex-Gas improved, while Pemex-Refining fell behind. This chapter attributes the difference in performance to the introduction of market competition in some segments of the natural gas market in Mexico in 1995. In hindsight, the entry of rival firms would be very limited; however, at the time of the reform, Pemex-Gas managers used the threat of competition to implement changes throughout the company. A new market-oriented mentality was developed and relations with customers improved. Additionally, the reform made evident the need to modernize the network of pipelines in Pemex-Gas.

Presumably, the quality of the talent of the top managers at Pemex-Refining in the late 1990s was as good as in Pemex-Gas; yet, the absence of competition did not provide the former with leverage to compel reluctant middle managers to change their culture.

Similarly, budgetary authorities in the Ministry of Finance were less willing to authorize modernization investments in a Refining subsidiary that was not legally entitled to them and could seemingly survive without them.

In 2003, the efforts to improve efficiency in Pemex-Refining were hindered with the appointment of a politician to the subsidiary's chief executive position. Interviewees familiar with the sociology of Pemex commented that such a move would be very difficult in PEP, where petroleum engineers would have been to thwart the government's ability to intervene in such a way by sidestepping the CEO. In Pemex-Refining, on the other hand, managers lacked the collective action capacity provided by strong managerial cohesion. As a result, optimization operations were suspended and political patronage took priority in the company's decision-making. In Pemex-Gas, by contrast, three different CEOs between 1995 and 2010 consolidated the new market-oriented managerial mentality.

The present discussion of the downstream subsidiaries in Pemex concludes the series of empirical chapters developed to show how variation in the main explanatory variables affected the observed outcomes. The case of PMI (Chapter 4) presented the history of a company that faced both high and low levels of competition and that managed to develop managerial cohesion over time. The case of PEP (Chapter 5) illustrated the behavior of a company with high managerial cohesion but that operates in a monopolistic environment. In doing so, it detailed the ways in which a government may exercise non-aligned intervention and how the lack of market competition exacerbates its willingness to do so. This chapter complemented the previous two by showing the change

that occurs in a subsidiary with low managerial cohesion that suddenly switches from a monopoly to a context of market competition.

In all four subsidiaries, the political ideology of the government changed from a leftist to a rightist orientation only once, in the early to mid-1980s. The result, across Pemex, was less emphasis on industrial policy. Yet, the two subsidiaries discussed in this chapter had the highest level of industrial policy utilization of all three. This was not surprising, given that they are the companies where Pemex interacts directly with consumers, that they are directly affected by the government's energy pricing policy, and that they have the lowest levels of managerial cohesion.

## **CHAPTER 7 CONCLUSION**

### **1. New Light on the Study of State-Owned Enterprises**

This dissertation sheds new light on the analysis of state-owned enterprise behavior thanks to the use of a variety of theoretical and methodological tools from three different fields: political science, economics, and organizational sociology. The study of public enterprises within traditional disciplinary boundaries has only rendered partial accounts of their behavior. State-owned enterprises are often large bureaucracies embedded in the intersection of political and economic life, and an interdisciplinary approach is better suited to identify the primary variables at play and how they interact with each other.

Additionally, this study employs multiple empirical techniques to examine political, economic, and sociological variables. Unlike many economic studies, I base my organizational accounts on several months of participant-observation inside of Pemex. Unlike many sociological and political science accounts, I examine the technological characteristics of the different industrial activities in order to measure variables correctly and identify more precisely when and how government intervention matters. Finally, unlike many social science studies based on in-depth fieldwork, this dissertation complements the qualitative evidence with extensive econometric analysis.

The study also benefitted from the use of the sub-organizational research design, a novel method to analyze differences among state-owned enterprises. The study of the subsidiary companies of Pemex allowed holding many confounding variables constant and focusing on the explanatory variables of interest that determined the divergent

outcomes. While the external validity of the findings remains to be tested, the internal validity is strong given the robustness of this comparative research design.

## **2. The Contributions of the New Framework of SOE Behavior**

This dissertation makes several contributions to the study of state-owned enterprises. First, to my knowledge, this is the first explicit attempt to explain differences in governments' policy utilization of state-owned enterprises. Analyzing the multidimensional policy opportunities of a government is challenging. The approach adopted here focuses on one widely relevant type of policy—the promotion of domestic industry—with an appeal to the political ideology of the government. While other policy objectives—e.g., political patronage—are not explicitly explained, they are addressed throughout the analysis.

A second major contribution, from a theoretical perspective, consists in the conceptual clarity provided by analyzing both business efficiency and policy utilization simultaneously. By doing so, the tradeoffs between the two are more easily understood and the importance of political variables becomes clear. The result is the realization that non-aligned government intervention (NAGI), an eminently political variable, serves as a bridge between the entrepreneurial and the ministerial elements of SOEs.

Third, non-aligned government intervention is further “unpacked” into two elements. On the one hand, to intervene, a government must be *willing* to do so. Additionally, it must be *able* to steer the SOE—usually a large bureaucracy within the state apparatus—in that direction. This conceptual insight greatly simplifies the analysis, since it clarifies the role played by the different explanatory variables. Three types of

interventions are discussed: the appointment of politicians to top managerial positions, regulatory policy, and fiscal and budgetary controls.

The analytical discussion is careful not to conflate all kinds of government intervention. After all, not all government participation is deleterious to the efficiency of a state company. To avoid that conundrum, the analytical framework focuses on those actions that are not explicitly meant to enhance the business operations of the firm—in other words, that are not aligned with its commercial interests.

Fourth, the dissertation reveals how explanatory variables can affect business efficiency and policy utilization directly as well as indirectly. Market competition and managerial cohesion, for example, improve business efficiency directly just like they would in the case of a private company. However, they also affect the level of NAGI, and by doing so, they have an indirect impact on both business efficiency and policy utilization. Similarly, political ideology affects policy utilization directly—by setting the direction of the mandate—and it has an influence on business efficiency and policy utilization indirectly by setting an upper bound to the government’s willingness to intervene.

A fifth major contribution of this dissertation, made possible by its “inside the firm” approach, is revealing the causal mechanisms whereby market competition and managerial cohesion improve the performance of a public enterprise. Without a doubt, the main driving force for business efficiency among the subsidiaries of Pemex has been the level of competition in the market environment of the firms. In the case of PMI, for example, the times when competition grew most severe led the company to implement highly successful innovations in its commercial strategies. Inaction for PMI meant

suffering large financial losses, and the managers rallied looking for solutions. Perhaps ahead of rival companies, PMI understood that the nature of competition in international oil marketing resided in the reliability of the service as much as in the price and quality of the product. Customers were willing to pay a premium in exchange for a less volatile commercial relationship. In the case of Pemex-Gas, competition allowed the managers to implement simple reforms that greatly improved the productivity of the firm.

On the other hand, in exploration and production and in refining, the company and the government never felt threatened by rivals seeking to undersell them in the market or to outbid them in exploration opportunities. When a sense of urgency is lacking, the managers lack “pressures to change” and the government does not provide “means to change.” As the rest of the world moves ahead, the Pemex subsidiaries without market competition remained static—falling further behind the industry leaders.

Similarly, a significant finding of the present study is the realization of the strong impact that professional careers can have in improving company performance and in dictating its relationship with the government. The importance of team cohesion among managers has been examined at length in the management literature, and sociology scholars have long emphasized the role of personal identities shaping the behavior of groups. However, these perspectives had never been analyzed in the context of a state-owned enterprise. As it turns out, the sociology of the managers can play a crucial role to enhance efficiency not only because of its role in facilitating communication and taking advantage of specialization, but also because it limits the capacity of the government to interfere in the commercial decisions of the company. The case of PEP is paradigmatic in this regard, where managers are members of the highly specialized profession of

petroleum engineers first and foremost. They are professionally driven rather than ideologically driven, and they view the appointment of politicians to managerial posts as an affront to their way of life. In consequence, they have been known to coordinate easily among themselves to sidestep political appointments or political orders that seem to run counter to their opinion of the best interests of the firm.

Team cohesion, however, is not fully preordained by the professional background of the managers. Sharing the common language and life experience that a specialized training provides facilitates the creation of bonds among workers, but there are other cohesion-building mechanisms. The findings of this study do indicate, however, that outsiders who arrive in a state-owned enterprise are better served if they learn the patterns of socialization of the insiders and thus earn their trust.

Finally, the dissertation underscores the importance of the type of industrial sector as a key variable in political economy. Too often, even in the privatization literature, the efficiency of state-owned enterprises has been analyzed without commenting on the characteristics of the industry at stake. It is important to acknowledge, as this study makes clear, that the nature of market competition is different across economic sectors. In some industries, performance feedback loops are short and financial losses brought about by competition can be sudden and severe. In others, feedback loops are long and high rents disguise inefficiencies—even if multiple players participate. Similarly, some industries are more susceptible to the development of strong bonds among the managers than others.



### **3. The Different Faces of Pemex, Reconsidered**

What is Pemex, if not a bureaucratic colossus of nearly 150,000 employees, mired by corruption, fiscal and regulatory suffocation, and technical backwardness? This dissertation shows that the conventional wisdom on the business efficiency of Pemex is misleading. Pemex has several faces, some of which are as ugly as popular accounts portray, but not all. Pemex-Refining best exemplifies the concept of an inefficient state-owned enterprise, while PMI shows that some SOEs may have strikingly high levels of performance.

Can the ugly faces of Pemex be improved? The findings presented in this study provide reasons to be optimistic. After all, the cases of PMI and Pemex-Gas illustrate that the corporate culture in a large state-owned enterprise is relatively fluid. The Foreign Trade Division needed less than a decade to change from a disorganized and informal group into a highly specialized team of analysts and traders. Similarly, Pemex-Gas was able to raise its productivity, revamp its infrastructure, acquire a market-oriented mentality, and modernize its relationship with clients in only a few years.

When the right drivers of change are absent, however, reform is painstakingly slow. For decades, Pemex and government officials have been aware of the inefficiency of Pemex-Refining, yet the problems continue. Similarly, PEP's lack of experience handling large engineering projects or managing assets with unexpected technical challenges has been evident for several years; yet, little evidence of improvement has been seen.

The results of the dissertation suggest several ways in which the Mexican government could improve the business efficiency of the different branches without the

need to privatize any of the subsidiaries of the company. First, the different branches stand to benefit with the introduction of market competition. Thus, the Mexican state could retain control over policy utilization, if it considered it necessary, but the cost of non-aligned government intervention would be clearer. Additionally, competition would provide the managers with “pressures to change” and thus avoid the long-term problems associated with the lethargy of a mandated monopoly environment.

However, liberalizing several segments of the value chain would entail yielding control of national petroleum resources that the Mexican government may be legitimately unwilling or unable to surrender. Therefore, it is crucial to understand that efficiency benefits may arise even if the liberalization takes place in peripheral segments of the value chain with smaller symbolic value. In this regard, the history of Pemex-Gas is highly illustrative. The opening of the transportation of natural gas to the private sector was politically feasible and enhanced not only the pipeline administration and infrastructure in Pemex-Gas, but it also had positive effects in other areas.

In the case of PEP, there are two obvious areas where competition could be introduced: the market for exploration opportunities and the market for the inputs of Pemex-Refining and Pemex-Gas.<sup>324</sup> In the first instance, the threat of losing promising blocks onshore or offshore in Mexico would pressure Pemex to train and retain top geologists and thus accelerate the discovery of new reserves. In the second case, PEP would face additional competitive pressures if the downstream industrial plants had the choice to purchase their feedstock elsewhere in order to optimize their operations. While the first option may be more direct, it may not be in the best interest of the government to

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<sup>324</sup> Pemex-Refining and Pemex-Gas are not allowed to purchase crude feedstocks from other suppliers, even if these could be acquired at a lower price to optimize operations.

hand over control over subsoil rights. In consequence, the second policy may be a great opportunity to introduce some kind of competitive pressures into PEP without entering into a nationalistic quagmire.

In Refining, a necessary first step for reform would be the liberalization of consumer prices. Market signals cannot be transmitted smoothly in the presence of a government-run price board. Once prices followed supply and demand conditions, competition could be introduced at the retail level. If private investors could open franchises to sell non-Pemex gasoline, the relationship between Pemex-Refining and some of its clients would change.

Competition at the refinery level, however, poses additional challenges. After all, even if rival firms were allowed to build and operate refineries, there is no guarantee that they would find it economical to do so. However, it is again possible that the mere threat of entry by competitors can introduce some of the “pressures to change” discussed throughout this dissertation.

The general strategy for policy reform should be clear at this point. Each branch of the company can be subject to small changes in areas that are less politically salient and thus less likely to elicit major disagreements or resistance. Yet, these minor alterations can trigger significant changes in the corporate culture and even provide modernizing managers better tools to overcome regulatory constraints or non-aligned political intervention. A well coordinated campaign of small, yet widespread changes throughout the company may be more effective and more feasible than an ambitious program requiring constitutional amendments that would distract the managers with political calculations and which may never even materialize.

#### **4. A Research Agenda for State-Owned Enterprises in the Oil Industry**

If the analytical framework advanced in this dissertation reflects the differences in behavior within Pemex in a conceptually clear fashion, what can it contribute to the understanding of other state-owned enterprises? A natural starting point to answer this question is to examine the international oil industry and the different segments of its value chain. A preliminary glance at other companies in Latin America suggests that the framework presented in this dissertation may help explain variation in outcomes beyond the Mexican case.

One avenue to extend the present study is by examining the case of Venezuela and analyzing differences among the subsidiaries of its national oil company, PDVSA. Corporate governance in Venezuela is similar to Mexico's. Like Pemex, PDVSA is also 100% state-owned, and it is also divided into subsidiary companies.<sup>325</sup> Moreover, there is reason to believe that these subsidiaries show variation in their level of business efficiency. For example, a comparison can be made between the operations of PDVSA-Refining in Venezuela, under monopolistic conditions, and those of Citgo, a wholly-owned subsidiary of PDVSA that operates in the competitive market of the United States. Preliminary research has shown that Citgo has displayed high levels of efficiency since it was acquired by the Venezuelan government in the 1980s, in large part due to the competitive pressures of its environment (López Mendoza and Nanda 1999a, 1999b; Francisco Flores-Macías 2009). Inside of Venezuela, on the other hand, PDVSA has not developed the ability to optimize operations.<sup>326</sup>

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<sup>325</sup> Author's interview with Ramón Espinasa, former chief economist of PDVSA, 19 May 2009.

<sup>326</sup> Author's interview with Luis Pacheco, former deputy director for planning of PDVSA, 1 July 2009.

The recent history of PDVSA also supports the claim that political ideology is a major factor to explain the industrial policy utilization of the company, and illustrates the role that a high level of managerial cohesion can play to decrease the government's ability to intervene in its internal operations. After the leftist Hugo Chávez was elected president of Venezuela in December of 1998, he sought to steer the company towards the implementation of industrial promotion and regional development programs (Mares and Altamirano 2007). The career managers of PDVSA, known for having a high degree of esprit-de-corps (Matsuda 1997), resisted and hindered the execution of the president's plans for several years. The clash between Chávez and the company executives reached a critical point in late 2002, when a large number of middle- and upper-level managers went on strike to protest the level of government intervention (Lander 2004).

Another path for future research consists in analyzing differences in the behavior of the subsidiary companies of Brazil's state-owned *Petróleo Brasileiro* (Petrobras). In Brazil, a reform in 1997 liberalized the oil industry, thus providing a good case to compare longitudinal differences in performance. Additionally, expert accounts suggest that the degree of market competition in the different segments of the value chain has been mixed. In the case of refining, the liberalization did not encourage the entry of rival companies, presumably because they did not believe they could compete with Petrobras under fair terms.<sup>327</sup> In the case of exploration and production, the regulatory agency forced Petrobras to divest many of the blocks offshore that it had set aside for future exploration. This process led to the implementation of a major initiative within the

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<sup>327</sup> Author's interviews with members of the Brazilian National Petroleum Agency, Rio de Janeiro, Brazil, May 2010.

exploration division of Petrobras to determine, in a short amount of time, which areas had the greatest potential and let go of the rest.<sup>328</sup>

Preliminary interviews with Petrobras' employees suggest that the managers of its exploration and production subsidiary also have a stronger level of cohesion than those in other parts of the company. The socialization process is similar to PEP's, as bonds among the geologists and petroleum engineers are developed based on the common experience of working in remote and dangerous areas early in their careers.<sup>329</sup> Brazilian sociologists have already researched this process (Alveal Contreras 1993), although the impact of this cohesion on the level of non-aligned government intervention remains to be examined.

Finally, the policy utilization of Petrobras in recent years also appears to be explained by the changes in the political ideology of the government. Observers of the Brazilian industry argue that the leftist government of President Luiz Inácio Lula da Silva (2003-2010) actively sought to use the company for the promotion of local industries.<sup>330</sup> That approach contrasted with the low industrialist orientation of the government of Fernando Henrique Cardoso (1995-2002), a more centrist politician who pursued neoliberal economic policies while in office.<sup>331</sup>

In general, with state-owned enterprises currently reigning in the energy industry, opportunities to extend the current research beyond the confines of Pemex should be forthcoming. To the extent that governments continue to own industrial companies, a sharper and more extensive knowledge of the drivers of business efficiency and policy

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<sup>328</sup> Author's interview with Lincoln Guardados, manager for exploration in Petrobras at the time of the liberalization of 1997, Rio de Janeiro, Brazil, 29 May 2010.

<sup>329</sup> Author's interview with Lincoln Guardados, manager for exploration in Petrobras at the time of the liberalization of 1997, Rio de Janeiro, Brazil, 29 May 2010.

<sup>330</sup> Author's interview with a Brazilian oil industry observer (Int.Exp.#2), Rio de Janeiro, Brazil, May 2010.

<sup>331</sup> Author's interview with Rafael Schechtman, former manager in Brazil's National Petroleum Agency, 19 May 2010.

utilization will permit a better understanding of comparative political economy and should provide concrete policy recommendations for reform-minded politicians and managers. Other Latin American state-owned oil companies, such as PDVSA and Petrobras, provide a natural first step for comparative analysis. Eventually, the research can be pursued in other regions of the world and in other industries, and the “external validity” of the findings of this dissertation can be confirmed or disproved.

## **APPENDIX A**

### **TIME SERIES ANALYSIS OF OIL MARKET COMMERCIAL POLICIES**

#### *Introduction*

This appendix provides the technical discussion of the econometric results included in Chapter 4. Time series analysis is conducted in order to test empirically the qualitative claims made by the oil industry experts interviewed for the study. A large dataset from 1983 to 2009 was collected to quantify the impact of the most important commercial policies adopted by PMI. The results generally have coefficients with the expected signs based on the experts' assessments, and in some cases they are statistically significant at the 5% level. Additionally, this discussion shows that some of the policies had a considerably stronger impact than others.

The effect of four commercial policies is tested. Three of these were devised by PMI and one was not. The introduction of formula pricing, the acquisition of a 50% equity stake—and subsequent deep conversion upgrade—in the refinery of Deer Park, Texas, and the supply contracts signed with refining companies in the United States (which led to additional investments in deep conversion capacity) were included in the econometric model. Additionally, the impact of the use of netback pricing by Saudi Arabia from 1985 to 1987 in order to regain its market share is also tested. There are two dependent variables of interest: volume of exports and price. Industry practitioners often referred to the joint objectives of maximizing these two quantities—a proposition analogous to maximizing revenues.

The statistical methodology, Vector-Autoregression-Intervention-Analysis (VARIA), follows from the univariate approach by Box and Tiao (1975) and that was generalized to the multivariate setting by Abraham (1980). Enders and Sandler (1993)



subsequently introduced the methodology to the political science literature. Granger and Newbold (1986) and Enders (2004) provide textbook discussions of the methodology.

A distinction is made in the analysis between the immediate and the cumulative impacts of the commercial policies. The former refers to the effect in the month when the policy was introduced; the latter, as the name implies, shows the impact over time. The distinction is important as some policies may have a strong short-term effect that dwindles rapidly, while others may be moderate in any given month but sustained and statistically significant over time.

Controlling for confounding factors, formula pricing has had the strongest positive impact on both prices and the level of exports of Mexican crude. The investment in the Deer Park refinery had a positive and statistically significant immediate impact on the level of exports, but its immediate impact on prices is small and undistinguishable from zero (in fact, in some models its sign is negative and in others it is positive). The long-term supply contracts with refineries in the United States, by contrast, significantly increased the price of Mexican crude, but their impact on exports volume was insignificant. Finally, as expected, the use of netback pricing by Saudi Arabia had a negative sign in all models, but it never achieved statistical significance—a result that may be due to the small number of observations.

*Methodology: A Vector Autoregression – Intervention Analysis*

A VAR framework is appropriate for time series where the dependent variables are jointly endogenous (Freeman, Williams, and Lin 1989). This is often the case when supply and demand series interact over time to determine price levels. In the global

petroleum market, it is intuitive that price is dependent on both supply and demand, that supply is dependent on both demand and prices, and similarly for demand. Estimation in a VAR is conducted by regressing each endogenous variable on lagged values of itself and all other endogenous variables in the model for a specified number of lags.

The essence of the VARIA approach is to include dummy variables in the vector autoregression (VAR) in order to indicate the presence of a policy at a particular point in time and estimate its effect on the dependent variables. Heuristically, intervention analysis can be understood as testing for a statistically significant change in the mean of each series. The simplest mathematical representation of a VARIA approach has two endogenous variables, one lag, and one policy intervention:

$$y_{1,t} = \alpha_{1,0} + \gamma_{11}p_{1,t} + \beta_{11}y_{1,t-1} + \beta_{12}y_{2,t-1} + \varepsilon_{1,t} \quad (1)$$

$$y_{2,t} = \alpha_{2,0} + \gamma_{21}p_{1,t} + \beta_{21}y_{1,t-1} + \beta_{22}y_{2,t-1} + \varepsilon_{2,t} \quad (2)$$

where  $p_1$  is an indicator variable equal to one if the policy is in effect at time  $t$ . The direct impact of the policy on the dependent variables is simply given by the coefficient  $\gamma_{11}$  and  $\gamma_{21}$ . If the right-hand-side of all equations is symmetric, then ordinary least-squares is an efficient estimator. If equations are not symmetric, whereby some coefficients are *a priori* restricted to equal zero, then seemingly unrelated regression (SUR) estimation is efficient (Enders 2005). Moreover, statistical inference after a VAR requires that all dependent variables be covariance stationary—that is, that the mean and variance are finite and independent of time. In practice, this means that if an augmented Dickey-Fuller test fails to reject the null of a unit-root process, the series should be differenced.

The structure of the VAR model that underlies the VARIA in this chapter follows from Kilian (2009), who proposes a model with three jointly endogenous variables: (i) global crude oil supply, (ii) real global economic activity as a measure of aggregate demand, and (iii) the real price of oil. Shen (2009) also estimates Kilian’s model, which includes 24 monthly lags in order to capture both short- and long-term relationships among the series. As in the classical regression model, the effect of overparameterization of a VAR model is a loss of efficiency in the estimates. Misspecification due to underparameterization, on the other hand, is more problematic, as it leads to biased coefficients. This result follows from the fact that estimation is conducted by ordinary least-squares (OLS). In matrix form, the underlying VAR used by Kilian is:

$$\mathbf{B}_0 \mathbf{y}_t = \boldsymbol{\alpha} + \sum_{i=1}^{24} \mathbf{B}_i \mathbf{y}_{t-i} + \boldsymbol{\varepsilon}_t, \quad (3)$$

where  $\mathbf{B}_0$  and  $\mathbf{B}_i$  are matrices of coefficients and  $\boldsymbol{\alpha}$  is a vector of constant terms. Kilian also uses a Cholesky decomposition to identify the impact of the structural shocks in each of the endogenous variables.

The models used in this chapter have three major differences from Kilian’s “workhorse” model. First, the addition of the intervention dummy variables modifies equation (3) as follows:

$$\mathbf{B}_0 \mathbf{y}_t = \boldsymbol{\alpha} + \boldsymbol{\Gamma} \mathbf{p}_t + \sum_{i=1}^{24} \mathbf{B}_i \mathbf{y}_{t-i} + \boldsymbol{\varepsilon}_t, \quad (4)$$

where  $p$  is a vector of dummy variables and  $\Gamma$  is a matrix of coefficients. Second, the variable measuring the price of oil is different, since the emphasis is on the results of Mexican commercial practices. Thus, the price of Maya is used in two different ways—described below. Third, some of the models have an additional endogenous variable: exports of Mexican oil. This achieves two objectives. It allows gauging the impact of the commercial policies on the level of Mexican exports. More importantly, it belongs in the model on *a priori* theoretical grounds: given that heavy, sour crudes constitute a submarket of the global oil market, it is sensible to believe that shifts in the level of exports have an impact on the price of Maya, holding other variables constant. In some instances, monthly dummy variables are included to control for seasonal effects.

#### *Description of variables and data*

Monthly data for the period 1983m1 through 2009m12 (324 observations) were collected. Table A1 describes the operationalization of the variables.

#### [TABLE A1]

Crude oil supply (SUPPLY) is the natural logarithm of the total world production of crude oil, published in the Petroleum Marketing Monthly issues of the Energy Information Administration (EIA) of the U.S. Department of Energy. This is the same source used by Kilian (2009). The series has a unit root, so the series is differenced. In addition to removing the unit root, differencing the log of a series has the advantage that it approximately equals the percentage change from period to period. The total exports of

Maya are extracted from this series prior to any transformations to avoid a spurious correlation between those two variables.

The demand variable is operationalized using the natural logarithm of an index based on representative dry cargo single-voyage freight rates (*FREIGHT*), which is the measure used by Killian and is publicly available on his personal website. In his paper, he provides a comprehensive justification for the variable. In essence, Killian argues that “freight rates may be used as indicators of strong cumulative global demand pressures” (p. 1056).<sup>332</sup> The augmented Dickey-Fuller tests also suggest that the series has a unit root; therefore, the series is differenced.

The two dependent variables of interest are the level of exports of Maya crude and the effects of commercial policies on the price of Maya. The *EXPORTS* variable is straightforward, simply accounting the number of barrels of Maya sold by Mexico per day in international markets. Tests suggest that this variable also has a unit root process, so the difference of the natural logarithm is used.

The price variable is measured in two ways. One method is to track changes in the real price of Maya (*MAYA*), which is deflated using the U.S. consumer price index. However, while this may allow to track the impact of these policies on the price of Maya, it is possible that this effect becomes unidentifiable from oil-market specific changes that

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<sup>332</sup> Killian (2009) writes: “While an index of real economic activity based on global dry cargo freight rates offers clear advantages compared to, for example, measures of global industrial production, it is not free of drawbacks. In particular, the presence of a ship-building and scrapping cycle may weaken the link between real economic activity and the freight rate index. Given the procyclicality of shipbuilding, one would expect the real freight rate index to lag increases in real economic activity (as spare capacity in shipping cushions the impact of higher demand on freight rates) and to lead to decreases in real economic activity (as the arrival of new ships depresses freight rates), thus accentuating upswings in real economic activity. On the other hand, the proposed index is a direct measure of global economic activity which does not require exchange-rate weighting, which automatically aggregates real economic activity in all countries, and which already incorporates shifting country weights, changes in the composition of real output, and changes in the propensity to import industrial commodities for a given unit of real output” (p. 1056).

lead all types of crude oil to rise or decrease at the same time. In theory, assuming that the data generating process of the price of Maya has been modeled correctly, the price of other types of crude should be irrelevant. However, given the small number of observations prior to the policy interventions and the potential for model misspecification, an alternative measure, PRICE, is introduced. This variable measures the difference between the real prices of Maya and a fairly comparable crude stream: Alaska North Slope (ANS). This crude has the advantage that its price series is available for the entire 1983-2009 period, that it has been relatively abundant throughout that time period, that it is marketed in the North American market (as is Maya), and that its physical characteristics (31.9° API, 0.93 % Sulfur) are closer to Maya than those of other marker crudes such as WTI or Brent. Changes in production of ANS are not included in this more elaborate model since this crude stream is not expected to impact the price of crude oil, as it is sufficiently fungible with other medium, sweet crudes.

The purpose of the VARIA analysis is to estimate the effect of four policies: (1) the introduction of formula pricing by Pemex in February of 1986 (FORMULA), (2) the use of netback pricing by Saudi Arabia (NETBACK) between October of 1985 and November of 1987, (3) the completion of the deep conversion upgrade in the refinery in Deer Park, Texas in April of 1995 (DEER), and (4) the completion of the deep conversion upgrade in Premcor's refinery in Port Arthur, Texas (ARTHUR), in , which was the first of the series of upgrades after the supply contracts with external refineries.

*Summary of the Models*

In the models that follow, some of the coefficients of the policy interventions are constrained to equal zero. These constraints simply mean that, based on economic theory, those variables do not belong to the equations for certain endogenous variables. Accordingly, SUR estimation is efficient. Furthermore, small-sample adjusted standard errors are estimated in order to avoid an unwarranted asymptotic assumption. In effect, this makes it more difficult to incorrectly reject the null hypothesis of no effect of a policy intervention.<sup>333</sup> Table A2 presents the variables included in each of the models estimated.

[TABLE A2]

For better exposition, and now that the models and the variables have been described, we can re-write all the equations that are included in equation (4). For model 5, these are:

$$SUPPLY_t = a_1 + \sum_{i=1}^{24} \mathbf{B}_{11,i} FREIGHT_{t-i} + \sum_{i=1}^{24} \mathbf{B}_{12,i} PRICE_{t-i} + \sum_{i=1}^{24} \mathbf{B}_{13,i} EXPORTS_t + \varepsilon_1 \quad (5)$$

$$FREIGHT_t = a_2 + \sum_{i=1}^{24} \mathbf{B}_{21,i} SUPPLY_{t-i} + \sum_{i=1}^{24} \mathbf{B}_{22,i} PRICE_{t-i} + \sum_{i=1}^{24} \mathbf{B}_{23,i} EXPORTS_t + \varepsilon_2 \quad (6)$$

$$PRICE_t = a_3 + \sum_{i=1}^{24} \mathbf{B}_{31,i} SUPPLY_{t-i} + \sum_{i=1}^{24} \mathbf{B}_{32,i} FREIGHT_{t-i} + \sum_{i=1}^{24} \mathbf{B}_{33,i} EXPORTS_t + \gamma_{31} NETBACK_t + \gamma_{32} FORMULA_t + \gamma_{33} DEER_t + \gamma_{34} ARTHUR_t + \varepsilon_3 \quad (7)$$

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<sup>333</sup> In the language of statistics, it reduces the probability of a Type II error.

$$\begin{aligned}
 EXPORTS_t = & a_4 + \sum_{i=1}^{24} B_{41,i} SUPPLY_{t-i} + \sum_{i=1}^{24} B_{42,i} FREIGHT_{t-i} + \sum_{i=1}^{24} B_{43,i} PRICE_t + \\
 & \gamma_{41} NETBACK_t + \gamma_{42} FORMULA_t + \gamma_{43} DEER_t + \gamma_{44} ARTHUR_t + \varepsilon_4
 \end{aligned}
 \tag{8}$$

where each  $B$  is a vector of coefficients and  $a_i$  is a constant scalar. In order to estimate Model 6 instead, a series of eleven monthly dummy variables are added to each equation.

### *Results*

Table A3 presents the results of the immediate impact of each policy intervention for each model, along with fit statistics (which are only comparable when the variables are coded in the same way). Results vary according to different specifications, although a general pattern is evident. Focusing on the most complete model specifications (Models 5 and 6), FORMULA, DEER, and ARTHUR all have a statistically significant impact on PRICE, EXPORTS, or both. NETBACK, according to expectations, always has a negative impact on PRICE and EXPORTS, although it never achieves statistical significance—presumably due to the small number of time periods.

### [TABLE A3]

According to the estimates of model 6, for example, the introduction of formula pricing had an immediate direct impact on the success of PMI by increasing the price of Maya, relative to Alaska North Slope, by almost two dollars and by increasing exports of Maya by almost 11%. The completion of the deep conversion facility in Deer Park also had a positive immediate effect on exports, raising them by nearly 4%. Interestingly, the completion of the upgrade in the Port Arthur refinery (along with the other projects that



followed) appears to have had a small impact on exports. At first glance, this result is striking, since this policy was implemented in anticipation of the large increase in production in the Cantarell field (which substantially raised exports of Maya). However, this period largely corresponded with an increase in global economic activity.

Accordingly, higher global demand would have absorbed the additional supply of Maya even without the long-term supply agreements. However, these had a significant impact in preventing the price of low-quality Maya from deteriorating severely. In fact, these long-term agreements had an immediate impact of raising the price of Maya by half a dollar relative to Alaska North Slope.

The dynamic impact of the each policy intervention on prices and exports is presented in Figures A1 and A2, respectively. These charts, based on the (non-cumulative) dynamic multiplier estimates for Model 5, show the “response” of the dependent variables to the introduction of the policies for a period of 18 months. The gray area along the lines depicts the 67% confidence interval and the dashed lines show the 95% confidence intervals.

[FIGURE A1]

[FIGURE A2]

The charts reveal that policies have a more sustained impact on prices than on exports. For the latter, effects are undistinguishable from zero, even at the 67% level, after three months. Moreover, effects during the month when the policy is introduced tend to be somewhat compensated during the next month. On the other hand, the introduction of formula pricing had a sustained impact on prices that lasted for several months.

**Table A1. Description and Operationalization of Variables**

<b>Variable</b>	<b>Description</b>	<b>Operationalization</b>
SUPPLY	World supply of crude oil minus exports of Maya crude (thousands of barrels per day)	Dataset collected from the Petroleum Supply Monthly publication of the EIA and INEGI
DEMAND	World demand of crude oil (thousands of barrels per day)	Dataset collected from the Petroleum Supply Monthly publication of the EIA
FREIGHT	Global aggregate industrial activity	Dataset used by Kilian (2009) and available online at <a href="http://www-personal.umich.edu/~lkilian">http://www-personal.umich.edu/~lkilian</a> .
MAYA	Real price of Maya	Data for F.O.B. nominal price of Maya available in the Sistema de Informacion Economica at <a href="http://www.inegi.org.mx">www.inegi.org.mx</a> . Prices are deflated using the U.S. consumer price index (base = January 1983)
PRICE	Difference between the real prices of Maya and Alaska North Slope	Data for the first purchase price of Alaska North Slope available at <a href="http://www.eia.doe.gov">www.eia.doe.gov</a> . Prices are deflated using the U.S. consumer price index (base = January 1983)
ISTHMUS	Difference between the real prices of Isthmus and Alaska North Slope	Data for F.O.B. nominal price of Isthmus available in the Sistema de Informacion Economica at <a href="http://www.inegi.org.mx">www.inegi.org.mx</a> . Prices are deflated using the U.S. consumer price index (base = January 1983)
EXPORTS	Total exports of Maya (thousands of barrels per day)	Data for exports of Maya available in the Sistema de Informacion Economica at <a href="http://www.inegi.org.mx">www.inegi.org.mx</a> .
NETBACK	Use of netback pricing policy by Saudi Arabia	Dummy variable equal to 1 between October of 1985 and November of 1987
FORMULA	Use of formula pricing by PMI	Dummy variable equal to 1 beginning in March of 1986, the first full month of use of formula pricing
DEER	Operation of deep conversion facility in Deer Park, TX refinery	Dummy variable equal to 1 beginning in May of 1995, the date when the deep conversion upgrade in the refinery became operational
ARTHUR	Operation of deep conversion facility in Clark's Port Arthur, TX refinery	Dummy variable equal to 1 beginning in December of 2000, the date when the deep conversion upgrade in the refinery became operational

**Table A2. Specification of VARIA Models**

	<b>Endogenous Variables</b>	<b>Coefficient Restrictions</b>
Model 1	D.log(SUPPLY) → D.log(FREIGHT) → D.log(MAYA)	No effect of policies on global supply and demand
Model 2	D.log(SUPPLY) → D.log(FREIGHT) → D.log(MAYA) → D.log(EXPORTS)	No effect of policies on global supply and demand
Model 3	D.log(SUPPLY) → D.log(FREIGHT) → D.log(MAYA) → D.log(EXPORTS)	No effect of policies on global supply and demand, monthly dummies
Model 4	D.log(SUPPLY) → D.log(FREIGHT) → PRICE	No effect of policies on global supply and demand
Model 5	D.log(SUPPLY) → D.log(FREIGHT) → PRICE → D.log(EXPORTS)	No effect of policies on global supply and demand
Model 6	D.log(SUPPLY) → D.log(FREIGHT) → PRICE → D.log(EXPORTS)	No effect of policies on global supply and demand, monthly dummies

As a check against a spurious result, the real price of ANS is used as a dependent variable in the models instead of the spread between Maya and ANS. The *a priori* expectation is that NETBACK will have a negative and significant effect on the price of ANS, but the other variables should have no statistically significant impact. As explained above, the price of ANS should respond to global supply and demand conditions and not to the marketing policies of PMI that primarily affect the specialty market for heavy, sour crude in the U.S. Gulf of Mexico. Indeed, that is the case—only the NETBACK variable has a significant effect (barely missing the 5% level with a 1.90 t-statistic) and it is negative.<sup>334</sup>

<sup>334</sup> This result refers to Model 5. If Model 6 is used, the coefficients are almost identical, but the standard errors are slightly larger.

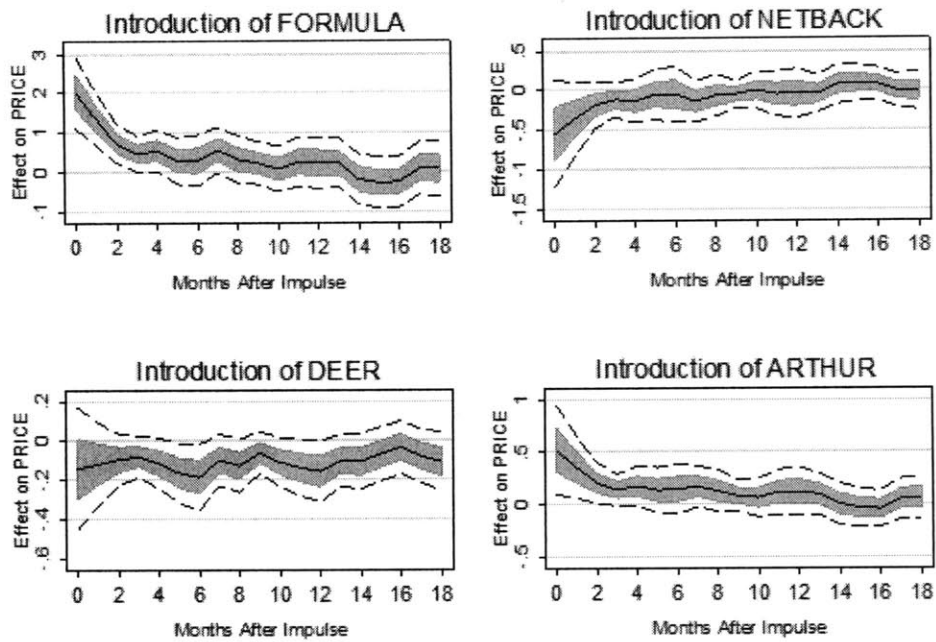
Table A3. Results of VARIA Analysis

	Models											
	(1)		(2)		(3)		(4)		(5)		(6)	
	PRICE	EXPORTS	PRICE	EXPORTS	PRICE	EXPORTS	PRICE	EXPORTS	PRICE	EXPORTS	PRICE	EXPORTS
NETBACK	-0.0101 (0.0289)		-0.0434 (0.0296)	0.0184 (0.0309)	-0.0463 (0.0293)	0.0185 (0.0315)	-0.2255 (0.3083)		-0.5473 (0.3449)	-0.0348 (0.0391)	-0.5318 (0.3459)	-0.0371 (0.0402)
FORMULA	0.0630* (0.0386)		0.0519 (0.0366)	0.0380 (0.0381)	0.0564 (0.0360)	0.0396 (0.0387)	1.7945*** (0.4514)		2.0083*** (0.4618)	0.1034** (0.0523)	1.9303*** (0.4616)	0.1088** (0.0537)
DEER	0.0241 (0.0176)		0.0278 (0.0165)	0.0152 (0.0172)	0.0279* (0.0164)	0.0144 (0.0176)	-0.2559 (0.1591)		-0.1408 (0.1585)	0.0371** (0.0180)	-0.1422 (0.1592)	0.0369** (0.0185)
ARTHUR	-0.0122 (0.0186)		-0.0020 (0.0178)	-0.0185 (0.0185)	0.0004 (0.0178)	-0.0177 (0.0191)	0.4430** (0.2078)		0.5188** (0.2169)	0.0071 (0.0246)	0.5019** (0.2187)	0.0089 (0.0254)
EXPORTS	0.0730 (0.0626)						0.9865* (0.5428)					
Parameters												
N	289		289		289		289		289		289	
AIC	-10.319		-12.1612		-12.2720		-6.1735		-7.8149		-7.9580	
BIC	-7.351		-7.0358		-6.5884		-3.2049		-2.6900		-2.2744	

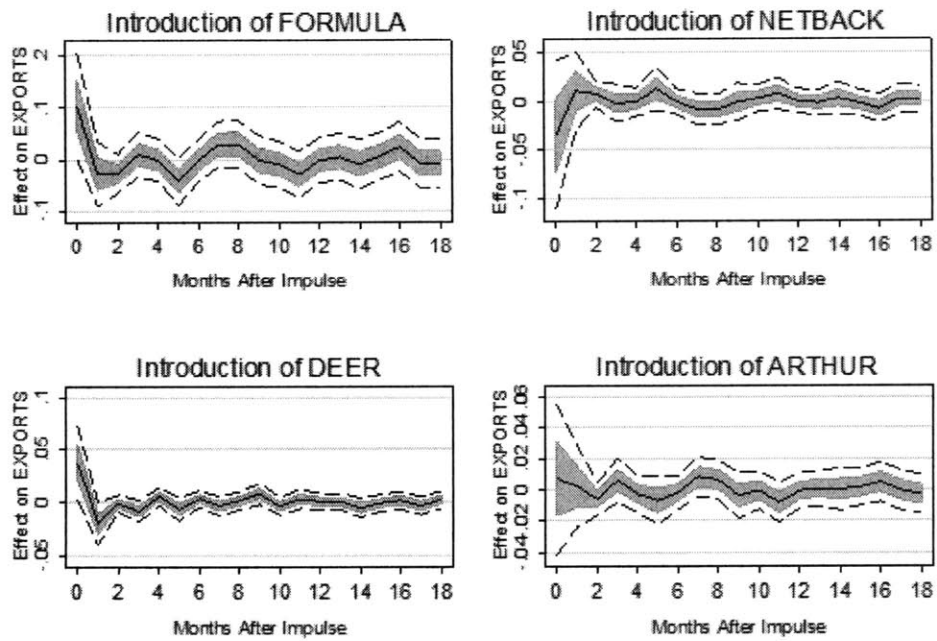
Small-sample adjusted standard errors in parenthesis.

\* p<0.10; \*\* p<0.05; \*\*\* p<0.01

**Figure A1. Impact of Policies on the Price of Maya**



**Figure A2. Impact of Policies on Exports**



## APPENDIX B REGRESSION ANALYSIS ON EXPLORATORY ACTIVITY

### *Introduction*

This Appendix provides the technical discussion of the econometric results discussed in Chapter 5. The objective of the statistical analysis is to assess the impact of the threat of oil scarcity—conceptualized as an instance of fiscal jeopardy from the perspective of the Ministry of Finance—on the willingness of the government to approve the drilling of exploratory wells. In the case of PEP, Chapter 5 argues that the threat of oil scarcity decreases the willingness of the government to introduce distortionary intervention in the company, instead aligning the government objectives with the commercial interests of the firm.<sup>335</sup>

The econometric results support this argument. The central finding is Pemex's emphasis on exploration activities has responded to the threat of oil scarcity and *not* to fluctuations in the price. This claim revises the argument of Moroney and Dieck-Assad (2008), who analyzed a shorter dataset and concluded that the after-tax price signal was the primary explanatory variable. In fact, the results presented here not only show that the price of oil is not a statistically significant predictor—they also show that its point estimate is very small.

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<sup>335</sup> For private oil companies, the size of the reserves is the most significant component of their valuation in the market (David Johnston and Daniel Johnston 2006). As Arnott explains, “reserves reports should provide a better reflection of the underlying value of the company than its balance sheet” (2004, p. 3). Therefore, more than anything else, private E&P companies seek to increase the size of their oil stock in the ground.

### *The Model*

The empirical model draws from Moroney and Dieck-Assad, extending both the theory and the empirical analysis. Assume that the state-owned enterprise has a desired long-run level of exploration intensity for year  $t$ ,  $y_t^*$ . Moroney and Dieck-Assad specify a model where this level of exploration is a linear function of the net (after-tax) price of oil:

$$y_t^* = \alpha + \beta \text{ NET PRICE}_t + v_t \quad (1)$$

This specification would be most realistic if drilling decisions were entirely made by the managers of the company. However, the nature of the relationship between the Ministry of Finance and PEP raises some doubts. As Chapter 3 explains, throughout most of the time under consideration (with the exception of the Díaz Serrano years), the Ministry of Finance has controlled the amount and allocation of investments in Pemex. Individual projects must be approved by the Ministry before funds are appropriated, as investment decisions respond first to the needs of the country's public finances and not to changes in market conditions. While the goals of the Ministry may occasionally coincide with those of the managers, that is not necessarily the case.

The role played by the Ministry of Finance leads to two revisions to the specification originally proposed by Moroney and Dieck (2008). First, the relevant price signal for the entity in charge of decision-making, the Ministry, is not the after-tax price, but rather the pre-tax one. Second, planning and appropriations for exploration are made in the year prior to the observed drilling activity.

The most important concern with their specification, however, is that it neglects the relative abundance or scarcity of oil for the company. If this latter variable is superfluous, the damage of including it in the equation is small: the coefficients estimated remain unbiased, but the standard errors lose efficiency (see, for example, Greene 2007). On the contrary, if the relative scarcity is an integral part of the model, then the price coefficient is biased.

In consequence, the following changes are proposed. First, the pre-tax (real) price of oil is used, since this is the relevant measure for the entity approving the projects—i.e., the Ministry of Finance. Second, a variable measuring the relative scarcity of oil at different points in time is added. Third, since the planning takes place at the end of the previous year, the explanatory variables come in with a lag of one time period (and do *not* enter the equation contemporaneously with the dependent variable).<sup>336</sup> This has the additional advantage that, by treating the relative scarcity as predetermined (that is, already set at time  $t - 1$ , when the planning is made), the possibility of contemporaneous reverse causality of exploration intensity to relative scarcity of oil is eliminated. The modified model is the following:

$$y_t^* = \alpha + \beta PRICE_{t-1} + \gamma SCARCITY_{t-1} + v_t \quad (2)$$

Moroney and Dieck-Assad (2008) appeal to a partial adjustment model to account for the fact that the change in the number of wells from one year to the next may not

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<sup>336</sup> A point can be raised as to whether this has been the budgeting procedure for Pemex for the entire time period under consideration. Interviews with respondents familiar with the early relationship between Pemex and the Ministry of Finance suggest that this is a reasonable assumption.



reach the desired long-run level. In a partial adjustment framework, the following equation is standard:

$$y_t - y_{t-1} = (1 - \theta)(y_t^* - y_{t-1}) + u_t \quad (3)$$

The factor  $1 - \theta$  represents the fraction of the desired adjustment that is actually accomplished. If  $\theta$  equals 0, then the adjustment to the desired long-run level takes place in one time period. The closer that  $\theta$  is to 1, the longer it takes to reach the long-run level.

Substituting equation 3 into equation 2 renders the following:

$$y_t - y_{t-1} = (1 - \theta)(\alpha + \beta PRICE_{t-1} + \gamma SCARC_{t-1} + v_t - y_{t-1}) + u_t \quad (4)$$

$$y_t = a + b PRICE_{t-1} + g SCARC_{t-1} + \theta y_{t-1} + \varepsilon_t \quad (5)$$

Here, I make an appeal to a different causal mechanism but which results in the same estimating equation (that is, equation 5). Rather than assuming that a long-run desired level of exploration intensity exists, I simply allow for the possibility that government budgets are “sticky” from year to year and, thus, if a given level of exploratory wells is approved at a given point in time, the number for the next year will be close to that of the previous year.<sup>337</sup> To account for that, the estimating equation

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<sup>337</sup> This is a standard argument among scholars of the budgetary process. An OECD report on the matter states: “If expenditures were not sticky, budgeting would not be incremental. A government could treat new and old claims alike, and broaden its discretion to the full amount of expenditure. Stickiness has a positive side, for it stabilizes government, gives citizens clear expectations of the services that will be available in the future, and diminishes conflict over resources. It would be a mistake, however, to regard expenditures as perfectly sticky” (Schick 2009, p. 436).

includes an autoregressive term in the right-hand-side. In either case, the coefficient of the autoregressive term estimates the level of stickiness from one year to the next. The equation that I estimate is below. In essence, it is the same as the one used by Moroney and Dieck-Assad but the use of the greek letters is meant to represent that no appeal is made to a partial adjustment model:

$$y_t = \alpha + \beta PRICE_{t-1} + \gamma SCARCITY_{t-1} + \varphi y_{t-1} + \varepsilon_t \quad (6)$$

#### *Data*

Annual data was collected for the period 1950-2008. Exploration intensity is measured as the number of exploratory wells completed in a given year, obtained from Pemex's statistical yearbooks. The price of oil posed some difficulty, given the scarcity of publicly available information prior to the 1970s (Parra 2005). In order to keep the time series comparable for the entire period under study, the data used is the average real first purchase price of domestic crude oil in the United States, collected by the U.S. Department of Energy.<sup>338</sup> While this indicator is not the actual export price of Mexican crude, it provides a good approximation.<sup>339</sup>

Oil scarcity is measured by the reserves-to-production ratio—a key statistic in the oil industry that shows the company's ability to maintain levels of production. As explained in Chapter 5, Pemex changed the methodology to measure reserves in the late

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<sup>338</sup> Parra (2005) argues that it was in the interest of the international oil companies to maintain opacity regarding prices. It is only after the nationalizations of the 1970s that time series on international prices become readily available. In order to maintain continuity in the time series, the average domestic first purchase prices in the United States, in real terms, is used (available online at <http://www.eia.doe.gov/aer/txt/ptb0518.html>, accessed on 20 July 2010).

<sup>339</sup> A robustness check was made by using the real price of Maya starting in 1979, when it first becomes available. Results are virtually identical to the ones presented in the text.

1990s and early 2000s (see Figure 5.1). While it is reasonable to assume that the Ministry of Finance officials made decisions based on the updated reserves estimates given by the new methodology, the analysis below presents results using both the old and the new method as a check for robustness. The substantive implications of the results do not change.

### *Results*

Estimation is conducted by ordinary least-squares (OLS). In their Montecarlo comparison of the use of different estimation techniques with a lagged dependent variable, Keele and Kelly (2006) found that under conditions similar to those in the present context, the bias of OLS coefficients is less than that of generalized least-squares and alternative estimators even in small samples. Diagnostics tests on the regression results showed that heteroskedasticity and serial correlation of the errors is likely to be low, further suggesting that the use of OLS is appropriate.<sup>340</sup> As checks for robustness in the estimation of the standard errors, both the White (1980) and the Newey-West (1987) covariance estimators were used.<sup>341</sup> In all instances, the results are virtually identical to those shown below.

Table A1 presents the results of five different model specifications using yearly data from 1950 to 2008. The first three columns use variables in “levels,” while the last two employ variables in logged form. Model 1 is the specification used by Moroney and Dieck-Assad (2008), although using a longer dataset (theirs only covers the period 1970-

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<sup>340</sup> In the presence of a lagged dependent variable, the Durbin-Watson test is likely to be biased (Green 2007); thus, the Breusch-Godfrey test is used, and the null hypothesis of no serial correlation cannot be rejected.

<sup>341</sup> The Newey-West covariance was estimated with a maximum lag equal to 6.

2000).<sup>342</sup> Covering the new time period, it was not possible to replicate their findings.

While they had found that the net price had a significant positive effect on the number of exploratory wells drilled, the results of this analysis showed no significant effect.

Models 2 and 3 expand on the specification by including the reserves-to-production ratio, which is meant to measure the relative abundance of oil. Using the measure of total reserves, for example, an increase of one year in the R/P ratio at time  $t-1$  is associated with a -0.343 decrease in the number of wells drilled. Interestingly, the price level is also not a significant determinant of exploratory drilling for any of these models.<sup>343</sup>

Models 4 and 5 are analogous to Models 2 and 3, except that the all variables are logged. This common practice allows interpreting the coefficients as percentage changes rather than as level changes. The results are, in essence, unchanged. In Model 4, for example, a one percent increase in the total R/P ratio leads to a 0.28% decrease in the number of wells. In Model 5, a one percent increase in the proven R/P ratio is associated with an 18% decrease in exploratory wells drilled.

[TABLE A1 HERE.]

As mentioned earlier, these results are robust to different estimation methods and operationalization of variables. When the covariance matrix is estimated following the Newey-West (1987) method, standard errors becomes slightly smaller. Similarly,

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<sup>342</sup> This specification uses the net, after-tax, estimate of the price of oil, following Moroney and Dieck-Assad (2008).

<sup>343</sup> In fact, the sign becomes negative, although it is not possible to reject the null hypothesis of no effect.

different methods of measuring the price of crude oil also render virtually identical coefficients and standard errors.

**Table A1. Results from Ordinary Least-Squares Estimation**

VARIABLES	(1) Wells	(2) Wells	(3) Wells	(4) Log(Wells)	(5) Log(Wells)
Wells (t-1)	0.824*** (0.0703)	0.773*** (0.0742)	0.797*** (0.0699)		
Net Price (t)	0.360 (0.280)				
Net Price (t-1)		-0.0929 (0.227)	-0.211 (0.219)		
<b>R/P (t-1), total reserves</b>		<b>-0.343**</b> <b>(0.169)</b>			
<b>R/P (t-1), proven reserves</b>			<b>-0.253*</b> <b>(0.127)</b>		
Log(Price) (t-1)				0.0280 (0.0932)	-0.0656 (0.0879)
<b>Log(R/P) (t-1), total reserves</b>				<b>-0.278**</b> <b>(0.121)</b>	
<b>Log(R/P) (t-1), proven reserves</b>					<b>-0.184**</b> <b>(0.0782)</b>
Log(Wells) (t-1)				0.823*** (0.0635)	0.845*** (0.0597)
Constant	16.82** (6.907)	35.92*** (12.14)	31.29*** (10.59)	1.718*** (0.609)	1.520*** (0.534)
Observations	58	58	58	58	58
Adjusted R-squared	0.744	0.755	0.754	0.813	0.813
Standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

**APPENDIX C  
LIST OF INTERVIEWEES**

<b>Name</b>	<b>Position Held</b>	<b>Date</b>
Aguilar, Enrique	Mexican Petroleum Institute (IMP) Researcher	4/14/2008
Almazán, Manuel	Mexican government official	4/7/2008
Aspe, Pedro	Secretary of Finance (1988-1994)	5/13/2009
Baker, George	International oil industry expert	2/11/2009
Balliker, Ken	Deputy-director, PMI Houston office	2/9/2009
Barnés de Castro, Francisco	Former Mexican Petroleum Institute director-general; Commissioner, Energy Regulatory Commission	7/8/2008
Barros, João Carlos	Petroleum Manager, Petrobras America	7/6/2009
Bazán, Gerardo	Advisor to Pemex CEO	6/11/2009
Boué, Juan Carlos	Former Pemex International manager; PDVSA advisor; Former member, Citgo Board of Directors	8/1/2008
Braga, Carlos	Consultant, Petrobras (Corporate Strategy)	5/25/2010
Cano, José Luis	IMP Researcher	4/11/2008
Chapela, Gustavo	Former Mexican Petroleum Institute director-general	7/15/2008
De la Garza, Bernardo	Former PMI crude oil director; Deputy- director, Pemex-Refining	4/7/2008
De Régules, Carlos	Pemex manager for environmental protection	7/10/2008
Domínguez, José	Pemex E&P, regional headquarters manager	6/24/2008
Donato, Marcos	Researcher, Petrobras	5/27/2010
Espinasa, Ramón	Former chief economist, PDVSA	5/19/2009 8/4/2009
Estrada, Ernesto	Former head of PMI in Houston; former deputy-director, Pemex-Gas	1/12/2010 7/4/2010
García, Efrén	Former director of communications, Pemex	4/3/2008
García, Gilberto	Advisor to Pemex CEO	4/7/2008 7/10/2008

García Sainz, Ricardo	Former Secretary of Planning and Budget; former chair, appropriations committee, Chamber of Deputies	7/17/2008
Gómez, Leopoldo	IMP Researcher	4/15/2008
Gómez Cabrera, José Angel	UNAM Petroleum Engineering Professor; former PEP manager	4/16/2008
Gómez Urquiza, José Antonio	Pemex Refining top-level manager	6/12/2008
Grajales, Manuel	IMP Researcher	4/11/2008
Guardado, Lincoln	Former manager, Petrobras E&P and Petrobras Internacional	5/29/2010
Guzmán, Francisco	Mexican Oil Industry Expert	4/11/2008
Haas, Pedro	Former Pemex Gas CEO; former PMI CEO	1/14/2009 6/24/2010
Hernández, Gustavo	PEP, regional headquarters manager	6/24/2008
Hernández, Ismael	Director, PMI Houston office	2/9/2009
Herrmann, Claudio	Manager, Petrobras Downstream (petrochemicals)	6/2/2010
Hinojosa, Javier	Deputy-director, PEP	6/25/2008
Lajous, Adrián	Former Pemex director-general (1994-2000)	7/7/2008 1/12/2009
Lim, Arturo	Former Mexican Petroleum Institute director-general	7/25/2008
Luna, Felipe	Former deputy-director, Pemex-Gas	6/29/2010 6/9/2008
Macías Chapa, Luis	Former PEP manager	7/16/2008
Manteca, Esteban	Former advisor to Pemex CEO	7/8/2008
Mateus, Alexandre	Economist, Petrobras Internacional	5/18/2010
Melgar, Lourdes	Former director of International Affairs, Ministry of Energy (1998-2002); international oil industry consultant	5/13/2009
Mendoza, Jorge	IMP Researcher	4/15/2008
Mereles, Marcelo	Former advisor to Pemex CEO	4/17/2008
Mesmacher, Miguel	Ministry of Finance official	2/6/2009
Muñoz Leos, Raúl	Former Pemex director-general (2000-2004)	7/30/2008
Navarrete, Carlos	Leader of PRD party, Mexican Senate	7/28/2008
Olimón, Alberto	Former PMI manager	4/17/2008



Olivares, Lorenzo	Former Pemex-Refining manager	7/18/2008
Olmata, Ángel	Former COO, Citgo Petroleum Corp	8/13/2009
Orozco, Moisés	Deputy-director, Pemex-Refining	4/9/2008
Pacheco, Luis	Former Director of Planning, PDVSA	7/1/2009
Pelayo, Elva	Pemex congressional liaison	7/1/2008
Pérez, Ana Lilia	IMP Researcher	4/14/2008
Pérez, Javier	Former advisor to Pemex CEO	7/6/2008
Pérez, Margarita	Deputy-director, Pemex-Gas	6/29/2010
Pertusier, Rafael	Consultant, Petrobras	5/18/2010
Pinelli, Marcelo	Downstream Manager, Petrobras	7/10/2009
Porres, Alma	IMP Researcher	4/8/2008
Priest, Tyler	Director of Global Studies, C.T. Bauer College of Business, University of Houston; Oil industry historian	6/18/2009
Reyes Heróles, Jesús	Former Pemex CEO (2006-2009); former Minister of Energy (1995-1997)	5/2/2008
Rodríguez Prats, José Luis	Federal deputy, PAN; former federal senator, PAN	4/9/2008
Rojas, Francisco	Former Pemex director-general (1987-1994); former federal comptroller; PRI federal deputy	7/30/2008
Romero, Juan Manuel	Former CFO of Pemex (1995-2000)	2/3/2010
Ruiz, Guillermo	Pemex deputy-director for planning	7/25/2008
Salazar, Francisco	President, Energy Regulatory Commission; former chair, energy committee, Chamber of Deputies (2003-2006)	7/2/2008
Schechtman, Rafael	Former superintendent, National Petroleum Agency, Brazil	5/19/2010
Schwartz, Lawrence	International oil industry expert	6/19/2009
Sears, Richard	Former VP for deepwater E&P, Shell	5/14/2009 8/27/2009
Senne, Rodrigo	Staff, CERA Brazil office	5/28/2010
Sidaoui, José Julián	Vicegovernor of the Bank of Mexico	1/15/2010
Silva, Pedro	Pemex E&P, regional director	6/25/2008
Suro, Vinicio	Pemex E&P top-level manager	6/21/2008 7/11/2008
Szabo, Juan	Former VP for E&P, PDVSA and former member of the Citgo Board of Directors	8/12/2009
Téllez, Luis	Secretary of Energy (1997-2000)	6/26/2009

Vianna, Antonio Luiz	Financial Planning Manager, Petrobras (Corporate)	5/17/2010
Zambrano, Rosendo	Former PMI director-general	6/12/2008
Zapata, Cuauhtémoc	IMP Researcher	4/11/2008

**Note: The list excludes those participants who requested anonymity as well as informal and casual conversations with Pemex staff members.**

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