Liberalization of the Gas Sector in Latin America:

The Experience of Three Countries

Paulina Beato
Carmen Fuente

Inter-American Development Bank

Washington, D. C.

Sustainable Development Department
Best Practices Series

Cataloging-in-Publication provided by
Inter-American Development Bank
Felipe Herrera Library

Beato, Paulina.
Liberalization of the gas sector in Latin America : the experience of three countries / Paulina Beato, Carmen Fuente.
.
p. cm. (Sustainable Development Dept. Best practices series ; IFM-124)
Includes bibliographical references.

1. Gas companies- -Latin America. 2. Gas distribution- -Latin America. 3. Gas companies—Rates—Latin America. 4. Gas companies—Argentina—Case studies. 5. Gas companies—Colombia—Case studies. 6. Gas companies—Mexico—Case studies. I. Fuente, Carmen. II.Inter-American Development Bank. Sustainable Development Dept. Infrastructure and Financial Markets Division. III. Title. IV. Series.

363.63 B3692--dc21

Paulina Beato is Principal Economist and Carmen Fuente is a consultant in the Infrastructure and Financial Markets Division of the Sustainable Development Department. The authors appreciate the comments and suggestions made on an earlier draft of this paper by F. Cuevas and M. A. Fernández Ordóñez.

June 2000

This publication (Reference No. IFM-124 can be obtained from:

IFM Publications
Infrastructure and Financial Markets Division
Mail Stop W-0508
Inter-American Development Bank
1300 New York Avenue, N.W.
Washington, D.C. 20577

E-mail: sds/ifm@iadb.org
Fax: 202-623-2157
Web Site: *http:www.iadb.org/sds/ifm*

Foreword

Beginning in the early 1990s, renewed economic growth, market liberalization and environmental concerns led to an increase in the demand for natural gas. While the region is self-sufficient in this fuel, significant increases in infrastructure investments were necessary to meet the new demand. To this end, governments promoted regulatory reforms to move from a monopolistic model to a competitive one, paving the way for private participation in the sector.

To achieve this goal, reforms had to be structured to meet the needs of each segment of the energy sector; namely, production, transportation and distribution. Privatization, free entry and deregulation of the wellhead price are the core reforms necessary to bring competition to the production of natural gas. Free entry, the full separation of transportation and supply and freedom to sell transport rights are essential to increased competition in the transportation segment. Open access to the distribution network and regulations that prevent price discrimination are vital for introducing retail competition.

In keeping with the Department's mission of gathering and disseminating information, this best practices study examines the scope, outcomes and shortcomings of the reforms, using the experiences of Argentina, Colombia and Mexico as examples. Research of this type is vital to ensuring that the experiences gained and the lessons learned can be effectively applied to the implementation of future projects.

Pietro Masci
Chief
Infrastructure and Financial Markets Division

CONTENTS

Liberalization of the Gas Sector in Latin America

Natural gas was not a significant energy input in Latin America until the last decade. Lack of transportation and distribution infrastructure, unsound industrial development and the recession of the 1980s explain the low level of natural gas use in the past. However, in the early 1990s, natural gas began playing a major role in the region's energy profile. Significant reserves existing in several countries and discovery of major new gas fields have taken the volume of reserves to unprecedented levels.

Renewed economic growth and liberalization of the region's market drove this shift.[1] Since 1990, economic expansion has been behind the sizeable increase in energy demand. Rapid growth in the demand for energy and environmental concerns have led to the development of a natural gas infrastructure intended, initially, to cater to industry and power generation. Significant increases in investment were necessary to meet the rising demand for natural gas. As a consequence, governments promoted regulatory reforms aimed at paving the way for private sector participation and the attraction of foreign capital. Gas producing countries have progressively opened their markets in order to attract private capital and achieve greater efficiency and competitiveness. Thus, the gas industry underwent a process of deregulation and restructuring resulting in the development of new markets and new ownership patterns. Although private sector interest was initially concentrated on natural gas use as an input in power generation (by means of combined cycle gas turbine plants that offer great efficiency and a quick return on investment), natural gas has know become important to the transportation, commercial and residential sectors as well.

Gas Production and Consumption: 1998

	Production Billion m^3	Consumption Billion m^3
Latin America	**118.7**	**119.7**
Argentina	29.3	29.7
Colombia	7.8	6.1
Mexico	32.6	33.6
Venezuela	27.3	27.3

[1] Although an exact evaluation of the role of environmental protection in increased natural gas consumption is difficult to make, environmental regulations are also, in part, responsible.

At present, the region is self-sufficient in natural gas. Argentina, Mexico and Venezuela account for roughly 75 percent of total natural gas production. Production in Bolivia and Colombia amounts to a sizeable portion of the remaining 25 percent. All of these countries, with the exception of Venezuela, have implemented reforms aimed at introducing competition and obtaining the funds needed for the expansion of the natural gas infrastructure.

This paper is devoted to examining the scope, outcomes and shortcomings of reforms aimed at introducing competition in the production, transport, distribution and retail segments of the gas industry. The experiences of Argentina, Colombia and Mexico are used as examples. The paper is organized into eight sections as follows: Section 2 describes the features of a monopolistic model. Section 3 analyzes a model with competition at each sector segment. Section 4 looks at the different structures of wholesale gas markets. Section 5 focuses on transportation issues. Section 6 discusses distribution and retail competition schemes. Section 7 discusses some regulatory issues. Section 8 includes some lessons learned. A description of the main features of the gas sector in Argentina, Mexico and Colombia is presented in Annexes 1, 2 and 3.

The Monopolist Model

Although the structures and regulations of the gas sector before and after the reforms are not uniform across countries, two stylized models—the monopolistic model and the competitive model—will be used to describe two extreme sector structures. The monopolistic model describes schemes in the United States[2] and in most Latin American countries before the reforms. Gas sectors in countries such as Spain and France, which have yet to undertake reforms, are close to the monopolistic model. The competitive model describes the gas current structre of sector in the United Kingdom and the United States. In Latin America, Argentina and Colombia have gas sectors akin to the competitive model, while Mexico's gas sector remains close to the monopolistic model despite the reforms of 1996.

The main features of a monopolistic model may be summarized as follows: gas exploration, production, transportation and distribution are partially vertically integrated and fully regulated. The industry's development is fully planned, with no room for market forces to operate. Prices serve as cost-recovery devices at each industry segment. As a consequence, rates are set by economic authorities, regulators or public companies on the basis and with the aim of covering costs.

Such an environment hampers economic decision-making by gas producers or consumers. Ignorance of market realities has led to all sorts of evils in the form of shortages, outages and the lack of customer choice, investment incentives, cost cutting and innovation. Although gas consumption increased in the 1970s as a result of higher oil prices, regulation (in the form of capped prices) kept the industry from accommodating that increase in demand and resulted in an increasingly unbridgeable gap between demand and production.

A monopolistic model may work efficiently in theory; however, in practice, regulators' lack of information about market conditions and producers' lack of incentives for minimizing costs doom it to inefficiency. The monopolistic model seems appropriate when the costs of these inefficiencies are offset by the economies of scale of concentrating services.

Production and Transportation Segment

Although exploration and production take place before transportation in the provision of natural gas, discussing transportation first makes it easier to understand how the organization of production and the interaction between the two segments results in a fully regulated model with no room for markets.

Transportation of gas has always been considered a natural monopoly. Regulation of this activity has historically been justified on natural monopoly grounds and its corollary that economies of scale and heavy sunk costs may discourage investment in the presence of free entry. Limits on market entry were supposed to lower total and average pipeline costs by reducing risks and ensuring that they were put to heavy use. Cost-based price regulation would protect

[2] This model was determined by reserve localization, the length of the pipelines and associated political risks and lack of appropriate financial tools for risk diversification.

consumers and service regulation would maintain adequate quality standards. Therefore, traditional transport regulation was supposed to create a social contract benefiting pipelines and their customers (Ellig and Kalt, 1996). This notion leads to a monopolistic structure of the transportation segment with only one state-owned company controlling the entire network in many countries. In others, one or several private companies own the pipelines. However, these companies enjoy franchise protection that prevents free entry and consolidates monopolistic control in the corresponding areas. The monopolistic character of the transportation segment permeates the production segment, and prevents market forces from operating even in the presence of a large number of potential competitors within the exploration and production segment.

There are two main patterns in exploration and production activities: one single company controls exploration and production, or several companies make up these segments without any one of them holding individual monopoly power. In spite of the fact that these seem to be two different models, market control of the transportation company makes the resource allocation mechanism similar in both cases.

The first pattern (one company controlling production and exploration) results when exploration and production are considered strategic activities which should be owned and controlled by the public sector. The company also owns the transportation pipelines, but it does not own the distribution network. The company is the sole seller of gas to the distribution companies and may set prices over marginal cost. The company should be regulated to avoid this behavior. However, in many cases, the functions of regulation and service provision are the responsibility of the same institution. Since the production and transportation segments are integrated, the rate of return of the monopoly can be controlled by fixing a unique price, the price of a bundle of transportation services and gas supply. Under that scheme, regulators do not need reliable information about transportation costs; they only need aggregated information about production and transportation costs.

The second pattern does not consider exploration and production to be strategic activities. As a result, the market is made up of many private firms, leaving room for market forces to drive production and exploration. However, lack of competition in transportation and the practice of bundling transportation and gas supply transform the transportation company into a two-sided monopoly: a demand and supply monopoly (see figure 1). The transportation company is also the sole buyer of gas from independent producers and the sole seller of gas to the distribution companies and, thus, provides transportation services bundled with gas supply. Under that pattern, regulation has to set wellhead prices and prices at the city-gate in order to reduce the monopolistic power of the transportation company. The aim of regulation is to establish a fair rate of return for independent producers and providers of transportation services. Therefore, regulators need reliable and separate information about transportation and production costs.

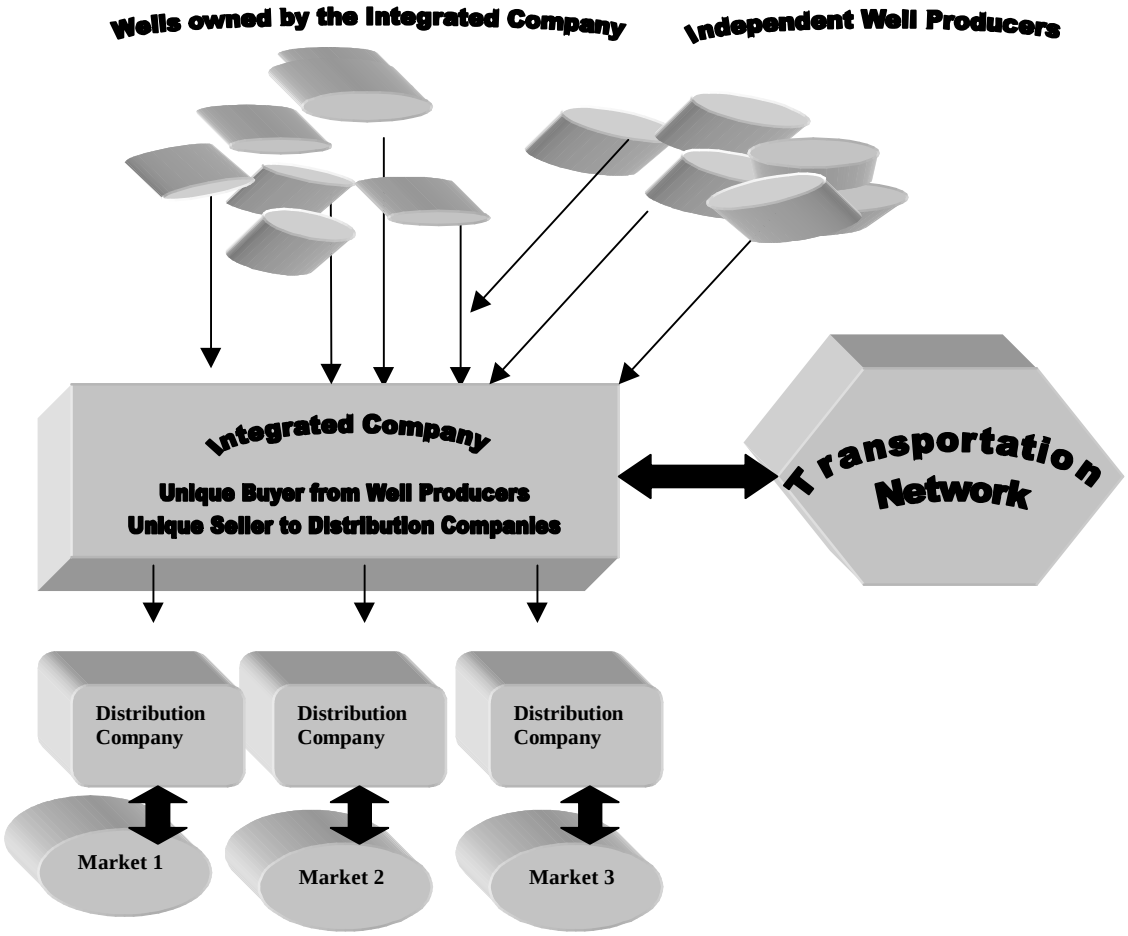
Distribution Segment

Similarly, distribution has traditionally been considered a regulated activity. Regulation of distribution has historically been justified on natural monopoly grounds and its corollary that economies of scale and heavy sunk costs may discourage investment in the presence of free entry. As a consequence, only one enterprise owns the distribution network in a geographic area and holds a franchise for supplying and distributing gas to all consumers in that area. The municipality often owns the distribution company. Alternatively, they can be private firms or

subsidiaries of the monopoly that produces and transports gas. In all cases, the local distribution company offers a bundle of services related to gas provision, such as transportation within the city, gas supply or metering

Given the monopolistic character of the distribution company, regulation is required. Yet, regulations do not distinguish between gas supply and its transport from the city-gate to households. Therefore, the regulators set a global price for a bundle of services. The distribution margin, the difference between prices at the city-gate and consumer prices, is set to provide distribution companies with a fair rate of return.

Figure 1
Gas Monopolistc and Regulated Model



The Competitive Model

The natural gas industry has changed radically over the last two decades as a consequence of economic and regulatory factors. The core elements for transforming a fully regulated monopolistic gas sector into a modern and competitive one differ among sector segments. Privatization, free entry and wellhead price deregulation are the core competitive reforms in the production segment. Free entry, full separation of transportation and supply and the ability to freely sell transportation rights are the forces pushing the transportation segment toward greater competition. The introduction of retail competition requires open access to distribution networks and regulations to avoid price discrimination.

Markets for gas and transportation should result from implementation of these reforms. However, the degree of market competitiveness depends on the sector structure and the behavior of market participants. The main features of the natural gas market are the following:

- Trading takes place by means of decentralized bilateral transactions among producers, marketers, local distribution companies and end users.
- Deregulation of the gas industry has permitted the separation of physical and financial trading.
- Participants in the natural gas market manage supply risks by means of short- and long-term supply contracts and may enter into financial risk management contracts in order to counteract price risk.
- Buyers purchase gas and transportation services from different suppliers.
- Pipeline transport prices remain fully or partially regulated in the primary market, but competition operates in the secondary market for pipeline capacity.

The competitive model features incentives for reducing costs. In addition, the information that each market participant requires to make decisions is decentralized and the allocation of resources that results from a competitive model is, in theory, efficient. In practice, however, some flaws may become apparent. The most important is the tendency of producers to increase their market share in an attempt to take advantage of increasing returns in most segment services, in particular, in transportation. This means that some producers could gain control of the market and hamper efficiency. In situations such as these, antitrust regulation and laws governing competition are a must.

Production Segment: Free Entry And Wellhead Price Deregulation

Free entry at the exploration[3] and production stages and price deregulation at the wellhead lead to increased competition and improved price signals, thus transforming the supply environment from one of shortages to one with adequate gas supply. When production is concentrated in one state-owned enterprise, free entry is not possible because the

[3] Without a market to facilitate the sale of reserve and exploration rights, it will not be possible for new participants to enter the sector. If no reserves are available, free entry will not increase the number of market participants.

existing company wields sufficient market power to prevent other participants from entering the market. In order to remedy the situation, three additional measures are needed: 1) a reduction in the market share of the company, 2) privatization, and 3) the separation of production and transportation activities.

The size of the monopolistic company has to be reduced in order to diminish its market power and allow for the entry of new firms. Privatization is required in order to ensure a level playing field for all market participants.[4] It is recommended that the company be restructured before it is privatized in order to avoid conflicts between the government and the new private shareholders. However, governments are reluctant to undertake such actions because the market value of a company with monopolistic control is higher than the market value of several companies with the same market share but without individual market power. Separation of activities, as discussed below, allows competition in gas supply even when a few firms control the transportation segment.

Transportation Segment: Free Entry and Unbundling

Capacity and transportation services are traded in natural gas transportation markets. The supply side of the market consists of pipeline companies, while the demand side is made up of producers, suppliers, local distribution companies and retailers or large end users. Transactions take place by means of contracts that define the conditions under which natural gas will be transported and delivered. Two markets, a primary and a secondary market, may arise in this segment. In the primary market, pipeline companies sell transportation contracts to marketers, local distribution companies or end users. The primary market is often regulated to avoid market control by pipeline companies. In the secondary market, pipeline companies and holders of transportation contracts resell unused capacity in an environment of free negotiation with no threat of market control by pipeline companies (see figure 2).

Although the introduction of open access means restricting the scope of utility regulation and leaving room for other agents to participate, it is not sufficient to promote competitive gas markets. Free entry and unbundling of transportation and gas supply services are the two key requirements of competitive markets. When market participants are able to resell their transportation rights, the efficiency of transportation markets increases.[5]

Liberalization of entry for agents willing to assume financial risks represents the first major step toward an open gas transport system. In a liberalized environment, pipelines are neither protected from competitors nor awarded franchise privileges. By the same token, most gas transport rates are negotiated. Rates for large customers, retailers and distribution companies are negotiated in a competitive market. However, no real world gas transportation sector has yet arrived at that stage, even in countries where free entry prevails. The reason centers on large sunk costs. This means that the number of participants is small, and each one maintains a certain degree of market power. Therefore, other reforms need to be introduced in order to avoid monopolistic behavior and to promote competition.

[4] Although the rules governing state-owned enterprises may be similar to those governing private businesses, in most cases stated-owned enterprises enjoy more government protection than private ones.

[5] Secondary markets mitigate inefficiencies in the allocation of resources when the regulations of primary markets provoke imbalances between the supply of and the demand for transportation services (see Juris, 1998, pp. 40-43).

The second element, unbundling gas supply and pipeline transportation, reduces the scope of market control by pipeline owners because even if the companies control transportation services, they cannot control gas supply. Thus, if regulations are necessary, they only have to cover transportation. In some countries, such as the United States, unbundling was introduced when large users began to profit in the face of decreasing wellhead prices by purchasing their own gas and using the pipelines just for transport, thus breaking the pipeline monopoly over gas sales. Nevertheless, regulators also play an important role establishing open access and revoking take or pay contracts. In other countries, such as Argentina, unbundling of transportation and gas sale was introduced by the regulatory authorities, without pressures from large consumers. In Colombia, transport unbundling is a main feature of a wider reform process. When pipeline companies do not offer supply services, the regulator does not require common carriage or contract carriage. In that context, some service terms can be freely negotiated and tailored to the needs of pipelines, shippers and users. Some cases require rules for distributing capacity among users, leading to the establishment of price caps for transportation services.

These regulatory measures are needed because the small number of distribution companies that participate in the sector are able to acquire market power.

Competition is also fostered when holders of transportation capacity contracts are permitted to sell them in secondary markets[6] to market participants expecting more benefit from using that capacity. The interaction between regulation in primary markets and competition in secondary markets dilutes the market power of pipeline companies and reduces regulatory distortions.

Distribution Segment: Open Access

In spite of similarities between the transportation and distribution of natural gas, the key elements of reform in each market segment are very different. While free entry and full unbundling are key in transportation, the same is not true in distribution. Two reasons help explain the different roles played by free entry in each segment. First, economies of scale are larger in distribution than in transportation. Second, technical and urban restrictions make it difficult to develop a new distribution network in urban areas. Measures other than free entry are necessary to enhance competition in distribution. This is achieved by allowing consumers, suppliers and retailers open access to distribution networks and by unbundling gas distribution activities, retailing and supply. Open access allows some consumers to enter into separate contracts with suppliers and distributors. When distribution companies provide both transportation and retail services, they may have an incentive to charge higher prices to those consumers entitled to choose a retailer other than the distribution company. However, no country has established a separation of ownership between distribution and retail activities similar to the unbundling established between transportation and supply activities. In the United Kingdom, where consumers may choose their suppliers, distribution companies provide both transportation and retail services. Given that ownership separation does not seem to be a real option, regulations should be established in order to avoid discriminatory behavior.

If open access for all consumers and nondiscriminatory treatment are established, price regulations do not need to cover gas supply, but only the rates for transporting the gas from the city-gates to consumers' homes.

[6] Transportation companies should not participate in secondary markets to avoid monopolistic behavior.

The reason is that all consumers may buy gas in competitive markets with a large number of participants, but they can only buy transportation services in the city from the distribution company. However, gas retail competition has not yet arrived at the stage where most small consumers bypass the distribution company, currently they are not allowed or are not willing to do so. For that reason, in most countries, the regulation of distribution prices covers gas supply as well as distribution services.

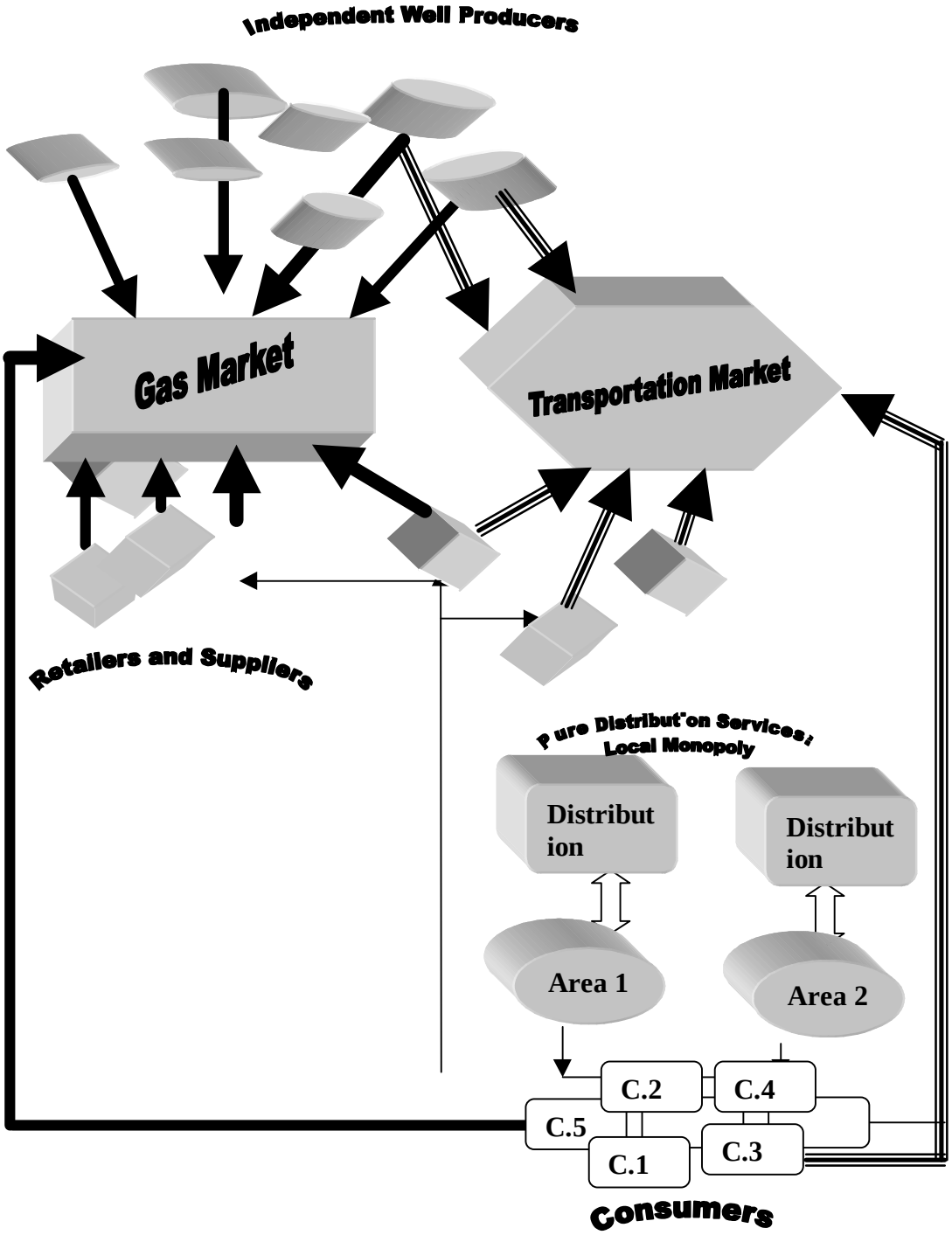
The Role of International Trade

Multinational pipelines and free trade complete the competitive model. International transactions increase the scope of choice for consumers, marketers and distributors, but they are limited by the availability of pipelines with open access. Multinational as well as domestic pipelines require regulations to establish access conditions and prices because competition is poor among pipelines joining two countries and monopolistic behavior may easily arise. While open access is a must for national pipelines in competitive models, the regulations of countries with a competitive environment do not require open access to multinational pipelines. Nevertheless, countries with competitive economic environments do impose restrictions on companies or economic groups that participate in production and transportation activities.

Retail Competition in the United Kingdom

Full retail competition has been in effect in the United Kingdom since 1998. All consumers, regardless of size, may buy bundled gas services from distribution companies or unbundled services from retailers or suppliers. Since the process started in 1986, gas competition has encouraged more than 60 suppliers to join the market and has led to an average decline in prices of 53 percent over the past five years. Of the 17 million domestic consumers, 27 percent have already chosen to switch supplier (there are 26 such suppliers catering to the domestic market) over the last twelve moths, at an average of 32,000 every week. Around three million of the five million who switched are on “dual fuel” contracts, whereby the same company supplies both gas and electricity. The regulatory commission, Ofgam, monitors the behavior of incumbent distributors in the domestic gas market to ensure effective competition. Ofgam has proposed a £14 average annual reduction in the typical bill. Price controls will be lifted starting in April 2000.

Figure 2
Competitive Model



Gas Production and Wholesale Markets in the Countries Reviewed

Sector Structure

The structure of the production sector in the countries studied is characterized by significant market control by a few participants. This is a consequence of nationalization policies pursued across the region during the 1950s, 1960s and 1970s due to the strategic character attributed to energy resources. Although reforms in Argentina and Colombia allowed the entry of new production companies, control of the market remained in the hands of a few large companies. Public sector companies control over 50 percent of the gas produced in Colombia. In Argentina, more than 50 percent of the market is controlled by a former state-owned enterprise that was privatized. In Mexico, no entry into the production sector is allowed. These concentrated sector structures do not favor competition; they result in monopolistic prices that require regulation.

Argentina privatized its oil and gas industry in 1993, becoming the first country in the region to do so. Although the formerly state-owned company, Yacimientos Petrolíferos Fiscales (YPF), still controls more than one third of gas production and over two thirds of the wholesale market, more than one hundred other firms now operate in the market. Moreover, transactions for distributors and large consumers were liberalized and prices are now set, in principle, through the interaction of supply and demand. However, wellhead gas prices do not seem to reflect competition. Action should be taken to remedy that lack of competitive drive among wellheads by gradually reducing YPF's market share.

In Colombia, in spite of reforms, Ecopetrol still holds close to 50 percent of the upstream market share. The development of gas reserves by private companies in Colombia has been hampered by the country's tough association contract terms. Unusually high tax levels, royalties and Ecopetrol's 50 percent mandatory stake in all successful exploration contracts act as a deterrent to foreign investment. A recent reduction in the mandatory share of Ecopetrol in exploration activities apparently prompted a sizeable number of private firms to enter the market.[7]

In Mexico, Pemex still controls close to 100 percent of domestic gas production. Liberalized imports, amounting to ten percent of total supply, represent the only opportunity for introducing competition into an otherwise highly monopolistic upstream segment. That narrow opportunity is further limited by Pemex control of pipelines and its capacity to sell commercial services to large consumers. Pemex's dominant position in the wholesale market determines the need for some sort of price regulation.

Market concentration, as we have seen, is the main stumbling block in the way to effective wholesale competition in the three countries under review. In Argentina, the foundations for progress lie in the YPF announcement in September 1999 that it would take measures aimed at reducing its market share to 35 percent by May 2003. In Colombia, the path to liberalization is clearly established by regulation and it

[7] According to Ecopetrol, twelve new association contracts with foreign and Colombian private firms were signed in January 2000.

seems that the process will be completed in the next three to five years. In Mexico, no competitive scenario can be envisaged.

Wholesale Gas Prices

Production prices in Argentina are set competitively by various producers. However, YPF (which was recently acquired by Spain's Repsol), sells more than 60 percent of the gas produced, thus hampering the effective development of competition. Since 1993, prices at the wellhead have increased by about 17 percent in real terms, an increase that can be explained either as a natural competitive development (Urbiztondo, August and Basañes, 1999) or as a consequence of dominant position abuse by YPF.[8]

In 1996, the Colombian government established regulations that will lead to fully deregulated natural gas wholesale prices by 2005. Once deregulation is complete, regulators will set a maximum reference price and producers, industry, distribution companies and electric utilities will be free to negotiate wholesale prices. At present, prices are partially regulated. Some producers may sell at regulated prices according to a formula, while others may sell their output at negotiated prices. So far, producers choosing to sell at the formula-determined regulated price have obtained lower prices than those selling at market prices.

Although Pemex still holds it's a dominant market position, wholesale prices (or "first hand sales prices") are set in a maximum price system. The regulatory commission has established a methodology to calculate prices that uses 1996 as a reference point.

The adjustment mechanism is based on indicators that reflect gas prices in the United States and transport prices from the border to Pemex City. In order to ascertain compliance with maximum price regulations, Pemex has to disclose the difference between gas sales prices and transportation costs. The Competition Commission can eliminate the regulatory mechanism when effective competition is judged to be working.[9]

[8] ENARGAS is considering presenting the case before the Competition Commission.

[9] The regulatory commission issued new regulation to determine these prices in January 2000.

The Transportation Segment in the Countries Reviewed

Free Entry

All three of the countries studied allow private sector participation in gas transport. Participation is implemented through concession agreements that may or may not entail exclusive rights. This means that entry of new transportation companies is controlled and limited by the government through its concession-granting ability. In Argentina, the government grants transportation licenses with exclusive rights for 35 years (renewable for 10 additional years). Only two gas transportation companies operate in Argentina.

While Pemex controls the greater part (10,000 kilometers) of Mexico's gas transport facilities, private participation has been allowed since 1995. Private participation is conferred by a direct award that does not bestow exclusivity. Recent government approval of the construction of 2000 additional kilometers of pipeline boosted private participation (yet it remains small).

The Colombian concession regime does not grant exclusive rights and allows for the maximum degree of free entry of the countries studied. Several pipelines were built and financed with private foreign capital through BOMT concessions awarded for a 15- and a 20-year term. As a result, two of the country's main pipelines (with a length of 1510 kilometers) represent 30 percent of the total network and are in private hands.

Unbundling

Transportation services and gas supply are fully unbundled in Argentina and Colombia, but not in Mexico, where only an accounting separation between the two activities is required.

In Argentina, the gas industry was vertically separated in order to favor the development of competition wherever it was economically and technically feasible. However, restrictions were imposed on the ownership of gas transport, production and distribution: no owner may control more than a 20 percent market share.

Colombian regulation considers unbundling a must for guaranteeing open access to the transport system. Gas transport has to be performed independently from gas distribution, supply or retail. Production, distribution and retailing firms are not permitted to hold more than a 25 percent interest in transportation firms.

Given that unbundling is not required in Mexico, Pemex engages in supply and transportation activities despite the fact that it controls a large portion of the pipelines.

Open Access

While open access regulations may seem unnecessary in an environment with free entry and full separation of transportation from retail and supply activities, most countries do include it.

Argentina’s regulatory framework prohibits transporters from engaging in acts involving unfair competition or abuses of controlling market positions. Transporters are also required to allow access to transport facilities to other market participants as long as this

does not endanger their ability to meet contracted commitments. Colombian regulations require transporters to allow access to their networks and storage facilities to any supplier, retailer, or distributor and, in general to any user applying for access. In addition, owners of existing networks must permit the building of new pipeline connections in compliance with technical codes and regulatory commission rules. Third party access to existing networks (whenever there is available capacity) is established by law in Mexico. Concessionaires are, therefore, required to provide equal treatment on demand to all users.

Sale of Transportation Rights

Argentina's regulators have recently established a resale market for unused transportation capacity. Although so far only a small number of operations have taken place, the proper working of this market will prove instrumental in further enhancing competition.

Colombian regulations permit suppliers, retailers, large users and distributors to resell unused contracted capacity to third parties, subject to nondiscrimination. The regulation requires that advanced notice be provided to the transporter and other interested users of the availability of unused capacity volume and dates. Notice must be published in a public venue so that all interested parties can be informed simultaneously and be able to present their bids to the assignor. Regulatory bodies guarantee fair competition throughout the process.

Mexico's gas transportation regulations also establish the possibility for the transfer of surplus capacity. However, lack of information exists in secondary markets.

Transportation Prices

Price cap mechanisms prevail in the three countries under review. This means that the regulating authorities set maximum prices and transportation companies may negotiate a price with customers subject to the cap.

In Argentina, the regulatory commission, ENARGAS, determines transportation tariffs on the basis of the cost of providing service plus a reasonable rate of return on assets, taking into account the efficiency levels of concessionaires. Cross-subsidies are not allowed. ENARGAS sets price caps, which are adjusted for inflation semiannually and every five years, to take into consideration improvements in efficiency and additional investments. The efficiency adjustment factor allows for efficiency gains to be shared between consumers and producers. The investment factor is intended to compensate shippers for investments planned for the subsequent five-year period. Transport companies are free to charge rates lower than cap levels. Transportation companies can make inflationary adjustments to their rates every six months, using changes in the U.S. Producer Price Index for industrial commodities as a reference.

Colombian transportation is divided into three systems (integrated, Atlantic and interior) with different rates. The regulatory commission sets the rates for the integrated system. Producers and consumers pay according to their location in the network, regardless of contracts between consumers and producers within each market. In the interior system, entry charges are calculated as a function of the cost of transporting gas from the production fields to a reference node. Exit charges are given by the cost of transporting gas from the reference node to exit nodes. Entry and exit charges consist of two components: a capacity charge, which is

applied on contracted capacity and a use charge, which is applied on the volume of gas transported. To enter Atlantic Coast pipelines shippers pay a stamp fee regardless of the distance traveled.

Transport rates in Mexico are also set in accordance with a price cap scheme or incentive based on a five-year revision mechanism. Departure prices, which are used as the basis for further revisions, are based on the cost of service. Inflation adjustments are based on an inflation index that takes into account changes in consumer prices in Mexico and the United States, as well as movements in exchange rates. An efficiency factor is also included; however, it is currently set at zero in an attempt to attract investment. Mexican transport rates include a cost factor, as well, which enables the transfer to users of costs related to taxes and the system's balance. A correction factor, applied when earned income is less than maximum income, is intended as a guarantee, or floor, on the earnings of concessionaires. Users and concessionaires can negotiate prices freely, subject to these constraints.

Distribution Segment in the Countries Reviewed

Open Access

All three countries studied have legally established open access to distribution networks for consumers and retailers. However, the scope of competition, as measured by the percentage of consumption that bypasses the distribution company, is relevant in Argentina and Colombia, but not in Mexico.[10] The scope of competition as measured by the number of small consumers that choose to buy gas directly in the wholesale market is limited in Argentina and Colombia.

Distribution companies in Argentina are assigned specific geographic zones and, in principle, any consumer may legally purchase natural gas directly from the producer or marketer and freely negotiate transaction conditions. In such cases, consumers must notify the regulatory commission and the distribution company of their intentions six months in advance, and must also finance the required metering equipment. However, the concession contracts of distribution companies limit eligibility for bypassing the distribution company to retailers and large users (that is, those who use over 10,000 cubic meter per day). In spite of this limitation, 40 percent of the gas consumed in the country is contracted for bypassing the distribution companies. This figure has increased sharply since 1993.

In Colombia, distribution concessions are awarded through a bidding process for 15-year periods. Open access of distribution networks to producers, retailers and consumers is established by law. However, only large consumers may effectively choose the gas retailer. Distribution and ancillary activities are conceptually unbundled, but distribution companies may undertake both distribution and retail activities. Nevertheless, distributors performing retail activities within their service area need to hold separate accounts for each activity in order to avoid discriminating against consumers who choose a retailer different from the distribution company.

In Mexico, distribution companies are awarded franchises by means of concession arrangements entered into through a bidding process. Mexican regulations allow all customers to freely choose their supplier and enable retailers, other than the distribution companies, to operate. However, the monopoly character of the production segment hampers putting into practice such regulations. In fact, no evidence of the existence of independent retailers has been found.

Distribution and Retail Gas Prices

A distinction should be made between retail prices of bundled gas services, including transportation, gas, distribution and retail services and retail distribution prices that refer only to charges for transporting the gas from the city-gates to consumers. In the three countries studied, regulators cap both prices, setting an upper limit on the ability of market participants to negotiate prices.

[10] About 60 percent of gas consumption in Argentina bypasses distribution companies. Official figures were not available for Colombia, but some specialists estimate that around 30 percent of gas consumption is negotiated excluding distribution companies. No effective bypass has been reported in Mexico.

Retail prices in Argentina consist of charges for gas, transportation and distribution. The regulatory commission fixes a price cap for each component and distribution companies may offer lower prices to customers. The price cap for gas charges depends upon the effective price paid by the distribution companies. However, since 1998, the regulatory commission establishes a reference price as an incentive for distribution companies to minimize their gas costs. Thus, if the price paid by distributors is higher than the reference price, only half of the difference can be transferred to final consumers through prices. Price caps may be revised on a periodic as well as an extraordinary basis. Periodic revisions take into consideration gas prices paid by the distribution companies and transportation charges.

Consumer Discounts: Argentina
(% over price cap)

Non-Bypass Customers	13.7
Power Plants	11.2
Others	9.5
Bypass Customers	17.7
Power Plants	18.5
Others	15.5
Total Customers	15.6
Power Plants	15.3
Others	12.8

Prices received by Colombian distributors and retailers are established by considering several variables. Three components make up the maximum price that distributors and retailers may charge consumers when the distributor provides gas, transportation and distribution services: the price of gas, the transport and connection price cap, and the distribution price cap. The gas price is negotiated between the distribution company and the supplier subject to the wellhead price set by the regulatory commission. (Wellhead prices will be fully deregulated after 2005.) The regulatory commission establishes price caps for connection, transportation and distribution prices. When the distributors only provide distribution services, just connection and distribution prices are collected. Similarly, charges for bundled services must fall below the relevant caps. Distributors and retailers can also offer bundles of services to large consumers at prices below the maximum. However, prices paid by large consumers have to be publicized.

In Mexico, the retail price structure is based on price caps and minimum prices. Gas prices, transport and connection charges, and charges for the distribution component are capped. Maximum cap prices apply to residential and commercial consumers, while industrial customers may negotiate the actual price of each service separately. Minimum prices are established to avoid predatory competition. Discounts offered to large consumers have yet to be analyzed because of a lack of information on bypass consumers.

Regulatory Issues

The soundness of a regulatory setting depends upon many features. However, three pivotal features can be singled out. One is the degree of separation between regulatory authorities and institutions providing services. The second refers to the capacity of regulatory commissions to make transparent and independent decisions. The third feature relates to the suitability of the regulatory framework to the sector structure. While this report refers to these issues in various paragraphs, this section undertakes a comparative analysis of these three features in the three countries under review.

Separation and differentiation between policymakers and service providers is clearly established in Argentina, where private service providers are welcome both in the monopoly and the competitive segments of the gas chain. However, energy policy-making is in the hands of the government. Colombia offers a mixed example of how functions are separated. Although there is formal separation of policy-making and service provision in Colombia, public ownership of large segments of the gas industry may prevent effective separation. Ecopetrol holds a sizeable share of production, and plans to privatize Ecogas are far from materializing. Given that the government is the sole shareholder in Ecopetrol, full separation between policy-making and service provision does not occur. Separation between service providers and the Mexican government is limited. The government controls gas production and transport through Pemex and private sector shares of natural gas production and transportation are scant, making separation even weaker than in Colombia.

The independence of the regulatory commissions is reflected in the degree of independence from political control enjoyed by board members and the commission's financial autonomy.

In Colombia, the regulatory commission includes a government representative among its members. The board is made up of the ministers of energy and finance, the director of national planning and five energy experts appointed by the president for four-year renewable terms. The commission appoints an executive director, selected from among the experts. However, there are no legally established grounds for removing a board member. The Colombian commission has a low degree of regulatory independence from policymakers. The regulatory commission in Argentina consists of five board members selected by the government from among experts with a solid professional and technical background. Provincial governors propose two candidates. A congressional commission is required to report on the proposed appointments. Board members are appointed for five years and their appointment can be renewed indefinitely. Resignations occur in an alternate manner on a yearly basis, as specified on the occasion of the first board appointment. Removals must be based on solid grounds and require government action. In Mexico, the chairman of the board of the regulatory commission and its four commissioners are appointed by the president for five year alternate terms. Reasons for removal are legally specified.

Financial autonomy varies in the three countries studied. In Argentina, regulatory commission resources include inspection fees paid by storage agents, transporters, retailers and distributors; subsidies and donations; proceeds from tickets and seizures; and interest and profits. The regulatory

commission sets its own budget annually. The budget is published before being presented to the government for approval. Once approved, it becomes part of the national budget bill. In Colombia, all regulated entities pay a special contribution which goes to fund the regulatory commission's activities The commission's budget is managed through a trust merchant contract between the Ministry of Energy and a trust entity. The regulatory commission's budget is processed through the Ministry of Finance and resources are managed in accordance with national budget by-laws. Resources to finance Mexico's regulatory commission are set by the government on an annual basis.

Operating transparency can be ascertained by means of the frequency of public hearings or other public involvement in the regulator's activities. Regulators in Argentina hold frequent public hearings, which promote the participation of interested parties in the decision-making process. Regulatory transparency is further enhanced in Argentina by legal provisions requiring that the commission's decisions (as well as the background information on which the decisions were based) be publicized. Colombia's regulatory commission holds public hearings whenever the board of commissioners deems it appropriate. The same holds true for publicizing decisions made by the board. In Mexico, the Energy Regulatory Commission Law establishes that general administrative provisions, such as general criteria and methodological matters linked with regulated activities, can be dispatched through public hearing procedures. In principle, the measure seems to shrink the scope of public hearings as a source of transparency. That law also requires that records of the commission's resolutions on regulated activities be kept for purposes of making the information public.

Compatibility between the regulatory framework and the structure of the sector is instrumental for effective reforms. The stated aim of the regulatory frameworks of the three countries under study is to promote a competitive environment. However, competitive markets are not achieved by legally imposing free entry, in particular, when incumbent firms hold sizeable market shares and bear large sunk costs. Under these circumstances, entry threats are not credible and incumbent firms may continue to behave in a monopolistic manner. Authorities have three options: one is restructuring the gas sector and reducing the market power of large incumbent firms. The second option consists in recognizing the lack of competition and making the regulatory framework coherent with such an environment.

The third option is maintaining regulations designed for a competitive environment. Some lack of compatibility between the regulatory framework and the sector structure can be found in all three countries studied. For example, wellhead prices in Argentina are fully unregulated, while the market power of some production companies is large. However, in the transportation sector, the regulatory framework recognizes the lack of competition in this segment and regulates it accordingly by setting maximum prices and establishing rules for assigning capacity. In Colombia, Ecopetrol and Ecogas control over 50 percent of the production and transportation segments. The regulatory framework recognizes that poor competition exists and has established a deregulation plan. In the meantime, regulators set maximum prices. The lack of compatibility between the regulatory framework and the structure of the sector seems to be wider in Mexico than in the other two countries. Although free entry is allowed in the transportation segment in order to foster some degree of competition, competition is difficult because Pemex controls the production segment and, although imports are allowed, they remain insignificant and have no impact on the monopoly environment.

Lessons Learned

The gas sectors of the countries under review have undergone profound changes as a result of regulatory and structural reforms begun during the last decade. The reforms were part of overall economic restructuring programs aimed at improving economic efficiency and increasing investment through greater reliance on market forces and the participation of private capital. Argentina, Colombia and, to a lesser extent, Mexico enacted reforms to increase competition in the gas sector. The reforms reviewed in this report yield the lessons discussed below.

First, a common feature of the reforms is unbundling of the different segments involved in the process of providing gas. The separation of production and exploration, transportation, distribution and retail is implemented in the three countries by identifying and regulating them as different activities. However, Argentina established restrictions on the participation of a firm or an economic group in production and transportation. In Colombia, one firm cannot participate in both production and transportation activities. However, the separation is more formal than real, given that Ecopetrol and Ecogas, two state-owned enterprises, are involved in production and transportation activities respectively. In Mexico, there are no restrictions for undertaking production and transportation activities. In fact, Pemex participates in both. Moreover, gas production and exploration are legal monopolies.

Second, a common feature of the three countries is the stated objective of making the wholesale gas market competitive in the presence of firms with large market shares. Nevertheless, the degree of compatibility between the aims of reform and sector structure differs in the three countries. In Argentina, competition in the wholesale market is partially limited by the large share of production controlled by one privatized firm. Although that private firm has proposed some measures to reduce its own market power, they may not be sufficient for more participants to enter the production segment and promote competition in the wholesale market. In Colombia, Ecopetrol, a state-owned enterprise, controls a large share of the production segment, but gas production by other private firms is growing. In Mexico, gas imports are the open window to wholesale competition, since production is a legal monopoly.

Third, the experience of Argentina seems to show that measures to reduce market control of firms after privatization have to be adopted with extreme caution in order to avoid eroding the credibility of the regulatory framework.

Fourth, the ownership of transportation pipelines is concentrated in a few firms. A legal framework that prevents free entry in the segment in Argentina and establishes free entry in that segment in Colombia and Mexico supports this concentration. Nevertheless, the three regulatory frameworks acknowledge lack of effective competition in the transportation segment and include measures to improve efficiency. Thus, the monopolistic power of the transportation companies is reduced by forcing them to give open access and nondiscriminatory treatment to all market participants. In Colombia and Argentina, these measures are strengthened by separating transportation

activities from production and retailing activities.

Fifth, in all three countries, the distribution sector is made up of companies that enjoy a distribution monopoly within a geographic area. In order to increase efficiency and introduce some competition in the distribution sector, consumers have the right to choose a gas supplier different from the distribution company. However, consumer choice is limited in practice. For instance, in Argentina, distribution concession contracts state that only large consumers (those consuming more than 10,000 cubic meters/day) have the effective capacity for choosing a retailer. In Mexico, no instances of consumers buying gas directly from independent retailers have been found.

Sixth, reforms in the three countries place great value on the political independence of the regulatory commissions and transparency in the decision-making process. However, in all cases, board members are government appointed. To enhance political independence, the countries rely on fixed terms of office for the commissioners and limits on the reasons for their removal from office. Transparency is increased by means of public hearings and by publicizing regulatory decisions.

Finally, although it is too early to evaluate the role of transnational pipelines on competitiveness, they are expected to push competition and efficiency. However, transnational pipelines may also be a way for restoring some vertical integration in the gas industry. This may happen to the extent that production companies own transnational pipelines, even though restrictions to participate in production and transportation within a country may exist. Promoting transnational pipelines without giving attention to regulatory and market structure issues should be avoided. Restructuring ownership of international pipelines already constructed and in operation would be a difficult task and would likely erode the credibility of any government proposing such measures.

References

Asociación Colombiana de Gas Natural. 1999. *El gas natural en Colombia.* Bogotá: Naturgas.

Ellig, J. and J. P. Kalt. 1996. *New Horizons in Natural Gas Deregulation.* Westport, Connecticut: Praeger Publishers.

Fernández-Ordóñez, M. A. 1999a. El gas natural en Argentina. Washington, D.C. Inter-American Development Bank. Mimeo.

Fernandez-Ordóñez, M. A. 1999b. El gas natural en México. Washington, D.C.*:* Inter-American Development Bank. Mimeo.

Juris, A. 1998. *Development of Natural Gas and Pipeline Capacity Markets in the United States*. Private Sector Development Department, Private Participation in Infrastructure Group. Washington, D.C.: The World Bank.

Juris, A. 1998. *The Emergence of Markets in the Natural Gas Industry*. Private Sector Development Department, Private Participation in Infrastructure Group. Washington, D.C.: The World Bank.

Juris, A.1999. *Natural Gas: Private Sector Participation and Market Developments.* Finance, Private Sector, and Infrastructure Network. International Bank for Reconstruction and Development. Washington, D.C.: The World Bank.

Urbiztondo, S., S. August and F. Basañes. 1999. Access Arrangements in Argentina´s Public Utilities: Electricity, Natural Gas and Telecommunications.Washington, D.C.: Inter-American Development Bank. Mimeo.

Annex 1*
The Gas Sector in Argentina

During the nineties, Argentina's natural gas sector underwent profound structural and regulatory changes to introduce competition and attract private investment.

Argentina produces 102.8 million m^3 of natural gas per day and imports 4.8 million m^3. Daily industrial consumption of natural gas is 27 million m^3, while power plants consume 23 million m^3 per day, daily residential consumption reaches 16 million m^3 and exports total 5.2 million m^3. The structure of consumption has changed markedly since the 1992 reform. Total average growth since then was 24 percent, but the rate of growth of power plant consumption reached 43 percent, while industrial consumption rose by 27 percent and residential consumption increased by only 4 percent. Exports accounted for more than 5 million m^3 per day in 1998, 7.7 percent of total demand, a figure that is expected to increase with the construction of the pipeline that will connect Argentina with Chile and Brazil.

Sector Structure

The 1992 law vertically separated the industry to foster competition. The legislation also imposed cross-ownership restrictions on gas production, transport, retail, marketing and distribution companies. Companies in one segment of the gas industry are not allowed to own more than 20 percent of the equity of a company in another segment.

Production Segment

Argentina accounts for 1.5 percent of total world production of natural gas. In 1998, production was close to 30 billion m^3, ranking Argentina as the region's second largest producer. Argentina's production potential is enormous: in 1998, gas reserves totaled 23 years, three times higher than in the United States, whose gas reserves are 8 years.

The most important production area is the Neuquen basin, which produces more than 20 million m^3 per day and has the largest reserves in the country, 341 billion m^3. The Austral area ranks second in production, with near 8 million m^3 per day and estimates of 155 billion m^3 in reserves. The third in importance is the northwest, which produces 3.5 billion m^3 per day and has an estimated 174 billion m^3 in reserves.

Despite the fact that free entry is allowed in the exploration and production segments of the sector, activity is concentrated in only a few companies. YPF accounts for 35 percent of total gas production and CNPC/Astra accounts for 11 percent. Wholesale activity is even more concentrated because YPF purchases around 25 percent of the gas it sells from other producers and,

* Based on Fernández-Ordóñez, MA (1999a).

therefore, accounts for about 60 percent of total sales. Imports of natural gas from Bolivia account for less than 5 percent of production and are smaller than exports.

Wholesale Gas Transactions: Argentina

(Producer Shares)

Producer	%	Producer	%
YPF	59.1	Plusp./Tecpetrol/Astra	1.4
Astra/Bridas	2.4	ROCH	0.7
Chauvco	0.8	OEA	0.7
Bridas/Chauvco	5.0	PCR	0.6
Pluspetrol	1.7	Santa Fe	4.0
CNPC/Astra	11.2	CGC	1.2
Glacco	0.7	Tecp./Ampolex/CGC	1.7
Quintana/CGC	2.6	Capex	2.9
Total/Bridas/Deminex	3.1	Others	0.2

Transportation Segment

Argentina's regulated transportation segment has four basic features. First, the government grants pipeline transport rights by means of concessions. Second, concessionaires hold exclusive rights over a given geographic area but must give access to the pipelines to consumers, retailers, producers and distribution companies. Third, the price mechanism incorporates a price cap, but shippers may negotiate rates freely up to the cap. To avoid discrimination, the regulation requires the disclosure of prices and discounts. Fourth, transportation users may resell their transportation rights in the secondary markets free of limitations to negotiate prices.

Transportation is organized around two large companies: *Transportadora de Gas del Norte* and *Transportadora de Gas del Sur*. *Transportadora de Gas del Norte* covers the northern part of the country and controls 4,900 km of pipelines which have access to the areas of Cuyo and Neuquen, as well as imports from Bolivia. These pipelines are connected to the following distribution companies: Cuyana, Litoral, Centro, Noroeste, Buenos Aires Norte and part of the Pampeana. The Canadian company, Nova Corporation, operates *Transportadora de Gas del Norte* and controls 20 percent of Transportadora del Norte's capital. Other shareholders are Trancopas, Inversoras Catalinas and Petronas Argentina. *Transportadora de Gas del Sur* covers the southern part of the country and controls 6,000 km of pipeline. This company transports gas from the Austral area and also from Neuquen, and serves the southern distribution companies. The operator is the U.S. company Enron, which controls 37 percent of the equity. There are two important shareholders, each with 25 percent of the equity.

In the past few years international interconnection has increased significantly. The extension of several pipelines was authorized in 1998 and new pipelines connecting with Brazil, Chile and Uruguay are currently being studied. Regional integration projects are important for Argentina's natural gas industry because they increase the size of the market and introduce more competition.

Distribution Segment

The distribution segment is also organized geographically into eight areas. Each area is assigned to a distribution company that has exclusive rights to develop the distribution network. Concession contracts establish investment requirements for the distribution companies. The investments fall under three categories: compulsory investments related to the security and integrity of the system, noncompulsory investments related to expected increases in demand and noncompulsory investments to increase the efficiency of the system.

Distribution Network Expansion by Concessionaire: Argentina

Concessionaire	Pipeline Stock December 1998	Increase 1992 to 1998	
	Km	Km.	(%)
Metrogas	13,951	2,760	24.7
BAN	18,821	4,879	35.0
Pampeana	19,470	6,513	50.3
Litoral	7,862	3,115	65.6
Sur	11,920	3,822	47.2
Centro	10,161	4,106	67.8
Cuyana	7,978	2,648	49.7
Gasnor	6,025	1,580	35.5
Nea	591	591	N/A
Country Total	96,779	30,014	45

Metrogas, which covers most of the Buenos Aires metropolitan area, is one of the top three companies, distributing more than 13 billion m^3 per day. Metrogas and Gas Pampeana, another one of the top three distribution companies, are operated by Camuzzi, an Italian distributor. Gas Pampeana covers southern Buenos Aires, a considerable part of the province of Buenos Aires, Mar del Plata and the northernmost area of La Pampa up to the Colorado river. The third largest distributor is Gas Natural Ban, which covers the northern part of Buenos Aires. It is operated by Gas Natural de España and delivers 8 billion m^3 per day.

Distribution companies have exclusive rights for developing the network over a geographic area. However, the regulatory framework allows users who consume more than 10,000 m^3 per day to choose a supplier and bypass the distribution company. Nevertheless, the distribution company maintains the obligation of delivering gas from the city-gate to all consumers, even those who purchased natural gas from another supplier.

Between 1994 to 1998, the number of large gas users (mainly industries and power stations) who chose to buy gas through direct contracts with producers and shippers increased by almost 32 percent. By the end of 1998, 100 large consumers were purchasing gas directly and entering into

contracts with the distribution and transportation companies. Additionally, 14 companies chose direct connections to the transportation pipelines, bypassing the distribution network. Finally, users who are located at the wellhead are also able to sidestep the transportation and distribution companies. As a result, distribution companies negotiated roughly 60 percent of the gas sold to final consumers in 1998.

Supply Methods: Argentina

Supply Methods	1994	1998	
	%	Million m^3 per day	%
Distribution Company	84.0	43.5	58.4
Bypassing the Distribution Companies	16.0	31.0	31.6
• Commercial Bypass	6.0	19.5	26.2
• Physical Bypass	2.5	3.6	4.8
• Other	7.5	7.9	10.6
Country Total	100.0	74.5	100.0

Source: ENARGAS

Regulatory Framework

Reform legislation (*Ley 24076* enacted in 1992) established the regulatory framework for the natural gas sector and the privatization of state-owned gas companies (as well as some other temporary and complementary provisions). A decree-law (1020/95) introduced changes in prices to end users. The legislation declared that private sector companies could participate in all sector activities (exploration and production, transportation and distribution), but kept for the government the responsibility of establishing sector policies and regulations (but not service provision). An autonomous body, ENARGAS, was established to regulate transport and distribution activities. The law also separates sector activities into those that will require regulation (transportation and distribution) and those that will operate within a competitive framework (gas supply, retail and marketing). To ensure the separation of activities, transportation companies are not allowed to provide supply services and are required to provide transportation services to all clients (retailers, end users and distributors) on a nondiscriminatory basis. In the same manner, gas producers and retailers cannot control distribution or transportation companies.

The Regulatory Body: ENARGAS

ENARGAS' mandate (Article 2 of 24.076 Law of 1992) is to adequately protect consumer rights, support competition, promote efficient and reliable operation and encourage investment to ensure long-term supply. ENARGAS has regulatory and supervisory functions as well as dispute resolution powers.

The regulator sets safety rules, technical procedures and quality standards and approves rate schedules. Its supervisory tasks include inspection and auditing (ENARGAS has the capacity to request the necessary information to perform these responsibilities). Additionally, the regulatory body is authorized to issue sanctions. The regulator has decision powers related to the resolution

of conflicts and controversies among agents and between agents and third parties. Consultation and attention to users' complaints are particularly important; in 1998, ENARGAS responded to 58,000 consultations and more than 6,000 complaints.

ENARGAS has autonomy and independence from the government and has sufficient resources to carry out its job. The five board members are appointed by the government for five-year terms that can be renewed indefinitely. Board member terms are up on alternate years. Budgetary resources stem from the inspection and control fee paid by transporters, distributors, retailers and storage companies; subsidies, donations and legally assigned resources; revenues from fines and seizures and interest and profits accruing from its resources. This regulatory body operates through public hearings where different associations of users, service providers and others are invited to participate. The administrative decisions made by ENARGAS can be appealed. Of the 57 cases appealed up to 1998, 47 were favorable, 4 unfavorable and 6 were rejected.

Quality Control

ENARGAS is also involved in activities to improve quality standards. A resolution issued in 1998 (resolution 891/98) put into effect a provisional reference framework for the control system based on quality indicators. A penalty scheme ensures the compliance with these regulations.

Price Mechanisms

Production Segment

Transactions carried out in the gas wholesale market (that is, gas purchases from producers or marketers by distribution licensees and large users) were liberalized when the market was deregulated. Therefore, natural gas prices are determined through the interaction of supply and demand. However, YPF controls nearly 60 percent of the supply of natural gas and, as a result, wholesale competition is less robust that it could be and prices may be set above competitive levels.

In September 1999, during the public hearing organized by ENARGAS for the seasonal adjustments of rate schedules due to price variations at the wellhead, YPF announced measures to reduce prices and increase competition. YPF announced a 3 percent reduction in the wellhead price; a reduction in YPF sales to final consumers in order to eliminate them completely by 2003; removing restrictive clauses from sales contracts; and reduction in YPF's market share to 35 percent by 2003. The impact of these measures are difficult to predict.

Transportation Segment

Regulation establish that ENARGAS has to set the transportation rates on the basis of the cost of the service plus a reasonable rate of return on assets. It also has to consider the degree of efficiency that can be reached by the companies; however, cross-subsidies are not allowed. It is a *price-cap* or *incentive rate* type of system with semiannual inflation, efficiency and investment adjustments. Distribution and transportation companies can adjust their rates every six months to take inflation into consideration. The adjustment is based on changes in the U.S. Producer Price Index (PPI) for Industrial Commodities. Efficiency improvements are factored into the rates and are kept fixed for five years, serving as a mechanism for consumers and producers to share efficiency gains. The rate is also adjusted by a factor, that is also fixed for five years, to compensate companies for the investments planned for the following five years. Apart from these adjust-

ments, ENARGAS can make rate changes to reflect unusual costs such as, for example, tax changes.

Transportation companies can set their prices subject to the cap fixed by ENARGAS. However, in order to ensure transparency and nondiscriminatory treatment, companies have to disclose their rates for continuous and interrupted transportation services.

Distribution Segment

The price cap distribution system is similar to the transportation pricing system just described. Prices are adjusted every six months to take into consideration changes in inflation, efficiency and investment. Two different sets of prices need to be examined in distribution. One is the bundled gas rate paid by final consumers who are unable to choose a supplier. These customers pay a rate that includes transportation and distribution services as well as natural gas supply. The other is the distribution price paid by consumers who are able to choose supplier and pay only for the shipment of gas from the city-gate to their home or place of business.

Bundled rates are made up of three elements: the price of gas at the point it enters into the transportation system, transportation charges and distribution rates. ENARGAS determines distribution rates based on the distance from production centers, whether the service is continuous or interrupted (continuous services are more expensive) and the actual volumen of gas consumed (the cost per m^3 decreases as consumption increases). Distribution companies might provide gas at prices below caps, but they are obligated to disclose standard distribution rates for the different categories of consumers. The mechanism for transferring gas costs to consumers resulted in frequent disputes. The mechanism in use prior to 1995 incorporated actual costs paid by distributors into the consumer price cap. In order to promote the development of a short-term natural gas market, the decree that followed the reform establishes an optional regime for calculating distribution caps. The new system is based on a reference price fixed by ENARGAS. Thus, if actual prices paid by distributors are below reference prices, rate caps are not modified and distribution companies may profit from buying gas at favorable prices. This mechanism allows distributors to minimize their wholesale gas costs.

Although the system of fixing the retail price cap does not envisage cross-subsidies, it must be noted that residential users in Patagonia do enjoy relatively subsidized rates. The subsides increased until 1997 when they began to decrease.

Final Observations

The structure and regulation of Argentina's natural gas sector are close to the competitive model. The main differences are related more to the sector's structure than to the regulatory framework. Those differences can be grouped into three categories as discussed below.

Lack of Competition in the Wholesale Market Resulting from YFP's Market Power. The large share of production controlled by YPF pushes wholesale prices well above competitive prices. The measures that YPF proposed voluntarily may not be sufficient to allow additional participants to enter the production segment or promote competition in the wholesale market. Despite this shortcoming, however, any measures taken after privatization, even those intended to pro-

mote competition, have to be adopted with extreme caution in order to avoid eroding private investor credibility in the regulatory framework.

Facilitate Entry to Promote Competition in the Transportation Segment. To achieve this goal, the 30-year exclusivity rights now allowed in the concession mechanism should be modified. The capacity resale market should also be overhauled to improve competitiveness in natural gas transportation. Due consideration should be given to regulatory risk issues when devising new measures for gas transport.

Retail competition is hampered by the height of the consumption threshold for consumers to be able to bypass distribution companies. Broadening consumer freedom to choose a supplier (which is now limited to those consuming more than 10,000 cubic meters/day) would promote the appearance of retail companies capable of grouping different consumers and increasing their ability to negotiate favorable natural gas rates with producers and wholesale suppliers. It may not be easy to effectively implement consumer choice, but it increases consumer awareness of business operations and helps regulators to gather opinions that are different from those of the distributors. However, this measure is not easy to put in effect because distribution licensees could argue that it involves a change in the conditions of the concession contract. In order to move forward on this issue, it will be necessary to enter into negotiation with these companies.

Annex 2
The Gas Sector in Colombia

A program to expand the natural gas sector in Colombia was drafted in 1986. It had three main objective's: to foster the use of natural gas, to promote exploration given the shortage of existing reserves, and to offer an alternative to gas integration with Venezuela. The discovery of the large reserves of natural gas in the Cusiana field in 1989 was a major breakthrough in the history of natural gas exploration in Colombia. The development of the Cusiana reserves by Ecopetrol and BP doubled the country's gas reserves and proved instrumental in prompting the industry's expansion. That process was further reinforced by the subsequent discovery of the Guajira fields in the early 1990s. In December 1998, reserves in these two fields amounted to near 90 percent of total reserves (see table below).

Gas Reserves by Field: Colombia
(December 1998)

Field	Billion Cubic Feet	%
Guajira	2,975	44.1
Guapaje	49	0.7
Opon	46	0.7
Other Interior	313	4.6
Cusiana	2,984	44.2
Piedemonte	380	6.5
Total	6,747	100

Source: Naturgas

A new program was launched by the government in 1991, which encompassed the development of several new gas transportation pipelines, the expansion of existing distribution areas in the main cities, and an increase in distribution concessions in rural areas. These measures were aimed at developing a nationwide gas market and industry, and replacing other costlier and more polluting sources of energy. The plan involved spending US$3 billion on gas transportation and distribution pipelines, compressed natural gas stations and customer equipment conversions between 1993 and 2012. This should lead to a doubling of total gas demand in the country by 2000 and required 1,400km of trunk lines and 1,000 km of distribution lines, as well as the conversion of 900 km of oil pipelines to natural gas. Recent figures update investment plans up to 2002, showing that the lion’s share of that investment effort goes to consolidation of the pipeline network.

Gas Transport, Distribution and Retail Investments: Colombia
(US$ billion 1998)

	1999	2000	2001	2002	Total
Transportation	88.2	64.0	14.0	13.3	478.0
Distribution	16.3	19.4	14.0	1.0	80.9
Retail	61.8	56.7	64.5	43.2	283.7
Total	166.5	140.7	218.5	188.0	842.6

Source: Naturgas

Increase in Natural Consumption by Sector: Colombia
(percent)

Sector	Sector Share1998	Growth Rate 1997/96	Growth Rate 1996/95
Ecopetrol	19	7.3	- 1.3
Petrochemical	2	-4.6	-25.0
Industry	10	-3.0	4.8
Households	10	24.5	23.4
Thermoelectric	50	58.9	6.1

Source: Naturgas, using Ecopetrol data.

Sector Structure

The gas industry in Colombia is made up of a large number of companies in each industry segment (ten firms in production, nine in transport, and twenty-four in distribution and retail). Public and private ownership coexist; and ownership of the public segment is shared by the central and local governments. Foreign companies hold important positions in the sector. There are also a number of companies with cross ownership and differences in vertical integration.

Vertical and horizontal integration are restricted by various regulations. Resolution 57, enacted in 1996, provides for the unbundling of the industry's regulated and competitive activities, establishes safeguards for competition and defines economic interest. To guarantee open access to the national transportation system, gas supply, retail, and distribution activities are independent of transportation. As a consequence, transport contracts, rates, charges and related prices are negotiated independently of purchase or distribution contracts. Gas transporters are barred from being directly involved in gas production, supply, retail, or distribution activities, and from hold eco-

nomic interest in firms that perform these functions. Suppliers, distributors and retailers are excluded from performing transport functions or holding an economic interest in gas transport companies.[11] Another regulation (Resolution 71 which entered into force in May, 1998) limits the ability of gas operators to control the market by requiring that by January 2015 no single distributor will service more than 30 percent of users. Firms that hold market shares that are over 30 percent at the time the regulation went into effect, are refrained from expanding their control in existing or future firms. The regulation limits gas retailers to a 25 percent share of the market and prohibits joint retailing. Beginning on September 12, 2000, gas firms are required to provide CREG with information of a shareholder participation and controller-controlled nature.

The sector has been historically dominated by Ecopetrol, which was created in 1948 as a state industrial and commercial company attached to the Ministry of Mines and Energy. Ecopetrol's responsibilities covered exploration, extraction, processing, transportation and marketing hydrocarbon resources. Ecopetrol has since been a participant in the sector as a shareholder of producers and transporters or as a distributor in areas lacking private investors. The natural gas industry was gradually opened to private participation beginning in 1994.

Production

Although private firms may participate in production and exploration, all new entrants must enter into a contract with Ecopetrol. As a result, Ecopetrol remains the main player in the industry, owning 50 percent of all commercial production activity in Colombia. Other upstream production companies are AIPC, Amoco, BP, Shell, Texaco and Triton.

In order to create the conditions necessary for long-term self-sufficiency and solidify Colombia's position as a key player in the hemisphere's energy sector, Ecopetrol's participation in newly discovered commercial fields was reduced to 30 percent (that is, Ecopetrol will assume 30 percent of the investment and receive 30 percent of the hydrocarbons produced). The contracts between new entrants and Ecopetrol have been modified, making them more attractive to private investors.

Transportation

Natural gas transport is subject to regulations that establish rights, duties and prices. Pipeline capacity rights are granted by the government by means of concessions. Concessionaires have exclusive rights over a given geographical area but they must give consumers, retailers, producers and distributors access to the pipelines. Shippers are free to negotiate transport rates subject to a price cap; however, prices must be disclosed to avoid discrimination. Transportation rights may be resold in secondary markets with no price limitations. To avoid discrimination, regulations require that priority be given in accordance with contract terms and regulatory conditions. As a consequence, lowest priority is accorded to interruptible contracts, while firm and peak contracts have first priority for access and transport service. The transporter is responsible for ensuring that contract terms are fulfilled and guaranteeing capacity.

Colombia's natural gas transportation system (which integrates the Atlantic coast, Center, Interior and Southern transportation systems) has been managed by the *Empresa Colombiana del Gas* (Ecogas) since 1977. Ecogas is a public body within the Ministry of Mines and Energy organized as an industrial and commercial company with its own legal and financial standing. The company

[11] Economic interest is defined as ownership of 25 percent or more of another firm’s capital.

is accountable to the regulatory commission (CREG) and the public services superintendency (SSP). Its mission consists of guaranteeing natural gas shipping services to producers, distributors, power generators, industries and commercial interests in an efficient and freely accessible manner. Ecogas is charged with offering transportation services to all producers and/or consumers; operating and administering the pipeline network; developing pipeline infrastructure; organizing and operating the Center for Gas Transmission and Coordination and transportation services for contract users. Colombia's president appoints all seven members of the Ecogas board of directors.

The network of pipelines operated by Ecogas is 3,233 km long and currently has a 350 mpc/d transport capacity. A large part of the network was built over existing oil pipelines, which were adapted for natural gas use. Ecogas will have the option to acquire the pipeline being built by Ecopetrol under build-operate-transfer (BOMT) arrangements. The first project developed under this scheme was the Ballena-Barrancabermeja pipeline. A 15-year BOMT contract was signed in 1994 between Ecopetrol and Centragas (owned by Enron) for a 578 km pipeline that reaches 31 towns. *Transgas de Occidente* operates the 340 km Mariquita-Cali pipeline, which caters to 48 municipalities and two electricity plants, under a similar scheme since 1998.

Promigas, based in Barranquilla, operates an independent transportation network along the Caribbean coast and owns about 25 percent of most distribution companies. In 1996, Ecopetrol sold its 39 percent participation in Promigas to Enron. The company is now privately owned and listed on the Bogota stock exchange. Its shareholders are Enron (38.9 percent) and IFC (11.8 percent); 49.4 percent is privately held.

Distribution System

In some cases, local distribution companies are granted concessions, with exclusive rights for a particular geographic area. [12] Local distributors will operate as natural monopolies until 2014, and will be regulated in a way that allows efficient distributors to achieve a reasonable rate of return.

The largest distributor is *Gas Natural de Bogotá*. Its majority public stake was auctioned in 1997 and acquired by a group led by *Gas Natural* of Spain, which manages the company. Two remaining distribution concessions north of Bogota (Tolima and Boyacá) were awarded in 1998 to a consortium led by *Gas Natural* of Spain. They cater to 25 municipalities in the department of Cundinamarca, 28 in Boyacá and 3 in Santander. Potential growth estimates for these companies indicate an expected increase in customers from 768,293 in 1998 to 1,300,000 in 2001. There are four distribution companies operating in the North Coast: *Gases de la Guajira*, *Gases del Caribe*, *Surtigas* and *Gas Natural del César*.

In 1997, concessions were awarded for 15-year periods to build and operate gas distribution facilities in the four coffee growing areas of Valle del Cauca, Quindío, Caldas and Risaralda. The area's population totals two million people and the number of potential users is estimated at 500,000. A consortium consisting of all the major gas companies operating in Colombia and Noram (Texas) as a foreign partner won all these distribution concessions. *Empresas Públicas de Medellín*, owned by the local authority, is constructing its own gas distribution network.

[12] Resolution 57 establishes that exclusive service areas for gas distribution and marketing are the exception, when large investments are required to increase gas coverage.

Consumers are free to choose a supplier and all market participants have open access to distribution networks. Regulation prevents discrimination between consumers who buy gas directly and those who bypass the distribution company.

Regulatory Framework

Liberalization of the gas sector began in the mid-1990s with the enactment of the Residential Public Services Law (*Ley 142*) in 1994 and additional regulations summarized (Resolution 057) in 1996. The relevant regulations establish the general criteria for contracting exclusive service areas for gas distribution and marketing; assert the need for using the contractual method of exclusive service areas in several zones; establish general definitions of the gas network transportation service and methodology; establish general service provisions that regulate the selling, marketing, transporting and distribution of gas through the network system; provide for open access to the transport system for any supplier, retailer, distributor or any other user; open access of the distribution networks to fuel gas producers, retailers or large users.

Residential Public Services Law

This law sets the stage for private sector participation in the provision of residential public services: electricity and gas, sewage and water, basic and mobile telephone. It defines the legal framework for residential public services provision by the state, municipal entities or private agents. The legislation establishes that firms providing these services must be incorporated as shareholding corporations or as industrial and commercial state companies. It also specifically bans practices that restrict competition, such as: charging rates that do not cover operating costs; providing services free of charge, or charging prices or rates that are insufficient to cover the cost of additional services not contemplated in the initial rate; reaching agreements with other firms to share market quotas, set rates, restrict supply or raise rates above competition levels; any agreement with competitors with the purpose of modifying the outcomes of the competitive process, and the abuse of dominant position.

Title VI of the legislation establishes the general criteria for the rate regime in terms of economic efficiency, neutrality, solidarity, redistribution, financial self-sufficiency, simplicity, and transparency. Economic efficiency means that rates should replicate competitive market prices. Neutrality means that each consumer is entitled to the same treatment as any other consumer. Solidarity and redistribution funds are created in order to enable commercial, industrial and high strata[13] users to help lower strata users pay for their basic needs. Financial sufficiency implies that rate formulas guarantee adequate cost recovery, shareholder compensation equivalent to that provided by an efficient firm operating within a sector of comparable risk, and the use technologies able to guarantee best quality services.

The law also establishes three regulatory commissions: for water and sewage, telecommunications, and CREG for energy and gas. The agency's functions are to regulate monopolies involved in the provision of gas and electricity in cases where competition is not feasible. In other cases, the commission should promote competition among public service providers in order to ensure economic efficiency, no abuses of dominant market positions and good quality services. The

[13] Municipalities shall classify residential buildings, for public services provision purposes, in a maximum of six socioeconomic strata: 1) low-low, 2) low, 3) medium-low, 4) medium, 5) medium-high, and 6) high.

regulatory body establishes rates for electricity and gas supply or delegates rate-setting authority to the distribution companies, subject to guidelines established by the regulator.

The board of the regulatory commission is made up of the ministers of mines and energy, finance and economic planning. The departmental aims and objectives of these ministries may at times conflict, giving rise to the opportunity for direct ministerial interference in the commission's work. The turnover of regulatory commission presidents, concomitant with the turnover of ministers, has accelerated during the last two years. However, regulatory attempts at conveying further capacities on technical commissioners are apparent in Resolutions 120, of December 1998 and 029 of July 1999.

Resolution 057 of 1996

This resolution summarizes and clarifies some aspects of most natural gas resolutions issued by the regulatory commission up to July 30, 1996. The main features of the sector structure established by this resolution are four. First, five categories of independent agents are identified: producers, retailers, transporters, distributors and large consumers. Limitations on market share and vertical and horizontal unbundling are established to ensure that competition is the rule for relationships among agents. Second, transport, distribution and retail prices can be negotiated, subject to the maximum prices established by Resolution 057, except when free retail prices are stipulated. Wholesale prices are either free or subject to a transition scheme, as explained below. Third, all agents have open access to distribution and transportation networks. Fourth, exclusive service areas for gas distribution and marketing are the exception, applicable when large investments are required to increase gas coverage.

Price Mechanisms

Production Prices

Producers are free to negotiate prices with their counterparts provided that equal users are awarded equal treatment, that is, industries in the same sector deserve the same treatment. Nevertheless, the regulatory commission sets maximum prices for wellhead gas. Resolution 057 of 1996 establishes the basis for a deregulated wholesale market subject to maximum prices and also determines a transition scheme.

The transition scheme gives producers the choice of negotiating prices or relying on a formula. Prices for reserves discovered in contracts signed after September 1995 are freely determined. In the case of reserves discovered in contracts signed prior to that date, producers may rely on the formula that sets gas prices as a function of fuel prices or negotiate prices. Beginning in 2005, prices will be fully deregulated with one maximum reference price. It should be pointed out that most producers opting to stick to formulas, established by the Resolution of 1983, obtained lower prices than those who chose market prices (as shown below).

Wellhead Gas Prices: Colombia

	Regulated Prices US$/MBTU	Market Prices US$/MBTU
First Semester 1996	1.04	1.30
Second Semester 1996	1.20	1.39
First Semester 1997	1.31	1.49

Resolution 057 permits different types of agreements in order to introduce a certain degree of flexibility on the maximum price setting mechanism. One type of agreement is to calculate an average weighted maximum price for a period of time lasting up to two years. This means that, at a point in time, prices or rates can exceed the established maximum provided that by the end of the period the average price or rate does not exceed the maximum. Second, Resolution 057 establishes the possibility of signing peak, interruptible, availability premium, variable prices and occasional spot contracts. Third, the resolution also allows for interruptible contracts in which the availability charge may not be linked to the whole volume supplied, but only to the non-interruptible one.

Transportation Rates

The regulator sets transportation rates for the integrated gas system. Producers and consumers pay according to their location in the network, regardless of the contracts between consumers and producers within each market. Resolution 057 establishes a new system of charges for entry in the Atlantic Coast pipelines and in the Interior system. To facilitate coordination with the Interior system, entry into the Atlantic Coast pipelines requires a unique charge or e*stampilla* regardless of the distance involved. Entry charges to the Interior system are calculated as a function of the cost of transporting gas from the producing fields to a reference node.[14] Exit charges are given by the cost of transporting gas from the reference node to exit nodes. Entry and exit charges are made up of two components, a capacity and a use charge. The c*apacity charge* is applied on effectively contracted capacity and the *use charge* is applied on the volume of gas transported.

Distribution Rates

Resolution 057 also regulates distributors, that is, agents operating urban fuel gas distribution networks. According to the resolution, distributors must present studies of costs and rates to the regulatory commission, which then establishes an average maximum distribution charge, Dt. Distribution companies must then establish a rate structure so that average charges are below Dt.

The average maximum distribution charge, Dt, is calculated, based on average long-term cost methodology, with the information presented by each firm. Accordingly, distribution costs factor in operating or projected investment in fixed assets (main pipelines, distribution networks, regulating stations and other fixed assets), operating expenses, and return on investment. Each one of the preceding items is projected for a 20-year period, discounted by an opportunity rate representing the firm's profitability at a present value. Consumption items are also discounted by the same opportunity rate. The maximum average distribution charge is calculated by dividing the

[14] The node selected as reference center is located in Vasconia.

present value of executed costs by the present values of expected consumption. Rates calculated according with this method are approved for a five-year term unless, prior to expiration, the regulator and the distribution firm agree to modify it or extend tenors, or if for other reasons specified in legislation.

Distribution companies have to set natural gas tariffs for small consumers by calculating the maximum unit average cost in dollars per cubic meter of natural gas purchases and the maximum unit average cost in dollars per cubic meter of main pipeline transport, on the basis of the agreed purchase and transport contracts, as indicated in the Resolution. Distribution companies have the obligation to inform the public about rate adjustments resulting from variations in the formula's price indexes.

Contributions and Subsidies

Law 142 of 1994 requires that the local authority establish six categories of consumers, each with a different rate. Consumers in the highest categories (5 and 6) face rates that are above long-term marginal cost, while those in categories 1 through 3 face rates that are below long-term marginal cost. A consumer category is defined by the neighborhood where the consumer lives, rather than by consumer income. The maximum contribution from consumers in categories 5 and 6 to consumers in categories 1 through 3 is 20 percent. Likewise, the maximum subsidy received by categories 1 and 2 is 50 percent and 40 percent respectively. However, Law 286 of 1996, establishes a transition period for public services firms to reach the limits established by Law 142.

Studies carried out by the regulatory commission to establish the transition period found that in 1996, the national average contribution was 60 percent for category 5 and 68 percent for category 6. The regulator, therefore, required firms to adjust the contributions of category 5 and 6 consumers and the subsidies received by category 1 and 2 consumers according to a defined path, reaching the maximum contributions and subsidies established in the law in 2001.

Final Observations

Beginning in 1994, Colombia took steps to gradually increase competition in the gas sector. This section summarizes some of the obstacles to a fully competitive industry that still remain.

The mayor obstacle to competition in the wholesale gas market is the size of Ecopetrol's production share. Competition is restricted in a market where a state-owned enterprise holds a production share larger than 50 percent because this enterprise may effectively control the market and prevent the entry of new participants. Several measures have been taken recently to reduce Ecopetrol's market control. Ecopetrol's share in the exploitation of new gas fields has been reduced. Beginning in September 2000, natural gas producers will be prohibited from jointly retailing their production with other partners in the association contract. Third, producers and/or transporters of natural gas cannot directly generate electricity with natural gas. However, they will be allowed to hold up to a 25 percent stake in a firm involved in these activities. Excepted from that rule are transporters participating in electricity generation with gas, in plants located outside their operating area.

The most important obstacle to competition in transportation seems to be lack of full unbundling that, in practice, might hamper open access since the transport company will be naturally prone to

favor its participating agents. In addition if, after 15 years in private hands, Centragas and *Gasoducto de Occidente*, are absorbed by Ecogas, competition would be set back.

In spite of the large number distributors, distribution networks and consumer retail is controlled by a few related companies. In order to reduce the degree of concentration several measures, in the areas of distribution and retailing, will be put in place, in what seems a quite distant future. Beginning in 2015, no single firm will be permitted to cater, directly or indirectly, to over 30 percent of users (this will be estimated by dividing the number of a firm's users by the total number of users in the country). Firms with market share over 30 percent in 2015 will not be permitted to expand their distribution systems by acquiring participation in other existing or future companies. In addition, no firm will be permitted to provide over 25 percent of the gas of regulated or nonregulated final users, excluding gas sold for electricity generation, petrochemical industry and producer consumption. The resolution will be reviewed after five years to assess if more than 25 percent of the national market is jointly managed.

Annex 3*
The Gas Sector in Mexico

Introduction

Mexico is the largest natural gas producer in Latin America; its 1998 production reached 32 billion cubic meters. It is estimated that Mexico's ratio of reserves to production is similar to Canada's, a country that produced 170 billion cubic meters in 1998, five times the Mexican production. However, as the table shows, production stagnated until the sector underwent a period of reform.

Natural Gas Production and Dry Gas Domestic Sales: Mexico
(Million cubic feet per day)

Year	Production (1)	Sales (2)	Share % (2/1)	Year	Production (1)	Sales (2)	Share % (2/1)
1980	3,548.0	1,373.6	38.7	1990	3,651.5	1,343.2	36.8
1981	4,060.8	1,423.4	35.1	1991	3,633.5	1,467.0	40.4
1982	4,246.4	1,430.7	33.7	1992	3,583.6	1,447.1	40.4
1983	4,053.6	1,398.7	34.5	1993	3,576.5	1,379.9	38.6
1984	3,752.6	1,314.3	35.0	1994	3,624.6	1,450.5	40.0
1985	3,603.8	1,296.9	36.0	1995	3,759.2	1,551.2	41.3
1986	3,431.1	1,170.5	34.1	1996	4,194.9	1,633.2	38.9
1987	3,498.4	1,176.5	33.6	1997	4,467.1	1,717.0	38.4
1988	3,478.3	1,142.8	32.9	1998	4,790.7	1,896.1	39.6
1989	3,571.7	1,192.7	33.4	1999	4,924.3	2,105.6	42.8

Petroleum represents 60 percent of the country's energy consumption, however, natural gas ranks second accounting for 20 percent of consumption, surpassing other sources of energy. Gas consumption in Mexico began to increase following the 1994 reform, rising 980 million m^3 per year to 1.4 billion m^3 per year in 1998. A characteristic of Mexican gas consumption is that PEMEX accounts for approximately half of total consumption. PEMEX is a leader in the petrochemical industry and also uses gas as an input in the production of oil. Industrial consumption accounts for 29 percent of total consumption, while power plants represent 18 percent and residential consumption remains insignificant at approximately 3 percent. As expected, consumption by power generation plants is the fastest growing source of demand.

* Based on Fernández-Ordóñez, MA. (1999b).

Sector Structure

The regulatory framework considers transportation, distribution and gas supply to be different activities. However, one company may undertake all these activities subject to the following limitations. First, distribution companies cannot carry out transportation services in the same geographical area, except when the regulatory commission authorizes it. Regulatory authorization takes place when vertical integration results in efficiency gains, the transportation infrastructure is lacking and no other party is interested in the transportation project. Second, transportation, storage, and distribution concessionaires are required to maintain separate accounting and financial information related to each activity.

Consumers are free to purchase natural gas from a distributor other than the one assigned to their geographic area. Distribution and gas companies must provide third parties with access to the network. Concessionaires must provide services to all customers under conditions similar to those enjoyed by their regular clients.

Production Segment

Domestic output is concentrated in PEMEX, which enjoys a monopoly in exploration, production, and wholesales supply of domestic output. Reform has led to the liberalization of imports; however, imports do not reach 10 percent of the domestic sales.

Transportation Segment

With its approximately 10,000 kilometers of pipeline, PEMEX also controls the transport of natural gas. However, the reform allows private investors to enter the market and, as a result, the construction of 500 km of pipeline for private use was authorized between 1996 and 1998. During the same period, the construction of 1,600 km for public services was also approved.

The regulatory commission grants transportation licenses and permits to individuals and companies for periods of 30 years, renewable for 15 more. However, concessions do not entail exclusive rights over a geographic area since the regulatory framework establishes open access to transportation pipelines for all consumers and suppliers. Yet, PEMEX control of production and transportation means that third party use of pipelines has not been significant.

Distribution Segment

Distribution concessions, granted through bids, give exclusivity rights over a geographic area. Coverage is expected to grow from 604,000 in 1997 to 952,000 in 2000, 1.3 million in 2001, 1.6 million in 2002, and 2 million in 2003.

Since consumers have the right to choose suppliers, both suppliers and consumers have open access to the distribution and transportation networks. However, open access and free choice have seldom been implemented.

Regulatory Framework

Basic Regulations

The most important legal and regulatory components of reform of the natural gas sector in Mexico are the following. *Ley Reglamentaria*, article 27 of the Constitution approved in May 1995 makes private participation possible in the construction and operation of natural gas transportation, storage and distribution systems, activities previously reserved to PEMEX. The regulation of natural gas was approved in November 1995. The legal framework for creating the regulatory commission was established in 1994 in the *Comisión Reguladora de Energía* (CRE) legislation. The CRE had been originally created in 1993 as a consultative body within the Energy Secretariat. In 1994 it was established as an autonomous body separate from the Energy Secretariat. The CRE has issued several norms regulating technical aspects of gas provision.[15] *Norma Medio Ambiental 085* (Environment Regulation 085) went into effect in January, 1998; although it does not refer to natural gas regulation, it introduces requirements that favor the use of natural gas on environmental grounds.

The Regulatory Body: CRE

The regulatory commission is an independent body. The chairman of the board and four commissioners are appointed by the president for five-year alternate terms. The law specifies the specific reasons for removal of the commissioners from their posts. However, the commission is financed through annual budgetary allocations. This financial dependency may reduce the autonomy of the regulatory commission.

The commission relies on public hearing procedures to attend to general administrative issues (such as criteria and methodological matters) linked with regulated activities. That measure, in principle, seems to shrink the scope of public hearings as a source of transparency. The law also requires that records of the commission's resolutions be kept and made public.

The commission's functions are broad. It is charged with regulating and supervising various aspects of gas service provision. The regulatory commission approves the methodology for calculating rates and adjustments, approves and determines the rates that concessionaires charge users, carries out rate adjustments for each concessionaire every five years, approves the methodology that distributors should use to calculate natural gas acquisition prices, and verifies natural gas acquisition prices charged by distributors to end users. The regulatory commission also grants transportation, storage and distribution permits; evaluates the technical feasibility of concessionaire proposals; defines the geographic distribution areas; organizes and carries out the procedures to issue permits in the geographic area; evaluates proposals; authorizes transfers, renovations, modifications and early termination of concessions; and revokes permits within the limits established by law.[16] The commission regulates third parties access to the network and approves the rates, conditions, rights and obligations of concessionaires and procedures for conflict resolution.

[15] Regulation 001 (NOM-001-SECRE-1997) on the quality of natural gas; Regulation 002 (NOM-002-SECRE-1997) on the system/facilities for the exploitation/better use of natural gas; Regulation 003 (NOM-003-SECRE-1997) on the distribution of natural gas; Regulation 006 (NOM-006-SECRE-1998) on gas odorización; Regulation 007 (NOM-007-SECRE-1998) on gas transportation; Regulation 008 (NOM-008-SECRE-1998) on protection for the steel pipelines for gas transportation.

[16] *Ley de Regulación de Petróleo.*

It keeps a public registry of all regulated activities and also defines the rules for separating the accounting systems of production, transportation, retail and distribution activities. It can also request information from import companies, export companies, concessionaires and PEMEX on their natural gas activities. The commission is also capable of conflict solving between different agents and establishing sanctions within the framework and limits of the law.

Price Mechanisms

Production Segment

As long as PEMEX holds a dominant position in the wholesale market, wholesale prices have to be capped through some kind of maximum price system. To that end, the regulatory framework establishes rules for determining price cap on PEMEX sales. The methodology to calculate the price cap is more a system for revising a given initial price than a product calculation cost. The initial price is PEMEX's 1996 price.[17] Adjustments are based on indicators that refer to gas prices in the United States as well as transportation price indicators from the border to city. PEMEX must disclose the sale prices of the product and the transportation components in order to avoid discriminatory treatment in the case of consumers wishing to import gas instead of buying it from PEMEX.

Transportation Segment

The regulatory commission sets a price cap for transportation services which are reviewed every five years. The initial price cap for new pipelines are determined by the proposals that new sponsors present to the regulatory agency when requesting authorization.

Distribution companies and consumers may sell their transportation rights. The secondary market that could exist as a result has yet to develop because of PEMEX's vertical control and the lack of independent suppliers.

Distribution Segment

The regulatory commission also caps final consumer prices. The price caps are reviewed every five years. The initial price is the one included in the proposal when the concession was granted. Adjustment mechanisms include several adjustment factors, among them inflation (the most important), as well as efficiency, and fiscal and concessionaire revenues. The inflation adjustment factor takes into account changes in producer prices in Mexico and the United States, as well as exchange rate fluctuations. The efficiency factor aims at stimulating and attracting investment in this initial phase, but it has not been used. The fiscal factor transfers tax costs related to users. The concessionaire factor aims to ensure a minimum income for the concessionaire. This factor, however, is only applied during the fourth and sixth year after initial prices have been set.

Additionally, to encourage network use by consumers, the regulatory commission requires that rates be broken down into two components: a capacity charge and a variable charge for use. Fixed transportation costs are included in the capacity charge and variable costs in the charge for use. Distribution costs are assigned 50 percent to capacity charges and 50 percent to use charges.

[17] A new regulation was issued in January 2000.

Final Observations

Despite recent reforms designed to increase competition in the sector, Mexico's natural gas industry remains monopolistic. Some shortcomings of the model are discussed below.

The most important impediment to the development of competitive markets in Mexico is PEMEX's controls of production and transportation. As a result of this and of the lack of adequate separation between regulated and nonregulated activities, the liberalization of imports has not had much of an impact on competition.

PEMEX's production and exploration monopoly is difficult to eliminate because it is enshrined in the Constitution. Without changing this, other reforms would only have a marginal impact on promoting competition. However, a PEMEX control of the transportation sector can be reduced through the divestiture of assets and separation of regulated and nonregulated activities. This would better facilitate competition from imports.

The distribution features of the Mexican gas sector are close to those of the competitive model. For instance, consumers may choose a supplier, transportation concessions do not grant exclusivity, and the possibility of a secondary market in transport capacity exists. Nevertheless PEMEX control over exploration, transportation and production has prevented effective competition.

Policy-making, regulation and service provision functions have been assigned, respectively, to the government, the regulatory commission, and the companies. This separation is an initial step in the right direction; however, the weight of publicly owned enterprises in the market may render this separation ineffective.