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Booms and collapses of the hydro carbons industry in Bolivia

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Booms and Collapses of the Hydro Carbons Industry in Bolivia

by:

Luis Carlos Jemio

December 2008

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Instituto de Estudios Superiores de Administración

BOOMS AND COLLAPSES OF THE HYDROCARBONS INDUSTRY IN BOLIVIA

Author: Luis Carlos Jemio

Research Project

Determinants of the Evolution of the Hydrocarbons Sector in LAC

BOOMS AND COLLAPSES OF THE HYDROCARBONS INDUSTRY IN BOLIVIA

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I. Introduction

This paper analyses the performance of the hydrocarbons sector in Bolivia over the last 46 years. The analysis focuses on the factors that have determined the sector's behavior overtime. First, there is the institutional framework that regulates the sector's activities, which can play an important role in promoting investment flows, and thus endorse a much faster sector development. The institutional framework comprises several factors, being the most important the existing tax system and the nature of the contractual relationship between the state and the oil company. The stability of the institutional framework is also of paramount importance.

Second, favorable market conditions and the existence of export markets are also crucial factors in order to promote investment and the sector development. The existence of export contracts to large energy markets, like those of Brazil and Argentina, has promoted large investment flows and increased hydrocarbons production in Bolivia at different moments of time. Existing conditions in the world price of oil can also become an incentive for companies to invest in energy projects. However, experience shows that institutional conditions can have greater impact on the investment climate. For instance, despite the currently high oil prices prevailing in world markets, investment flows to Bolivia have not accordingly increased, due to the high institutional and political volatility existing.

Third, geography is also important in order to determine investment flows. The oil producing potential of the country territory tends to encourage investment inflows. The geology of Bolivia´s territory has demonstrated to have an important potential to produce hydrocarbons, thus it has historically been the focus of attention for potential investors. Coupled with the foregoing, the

proximity to large energy markets has also tended to promote investment flows in the hydrocarbons sector.

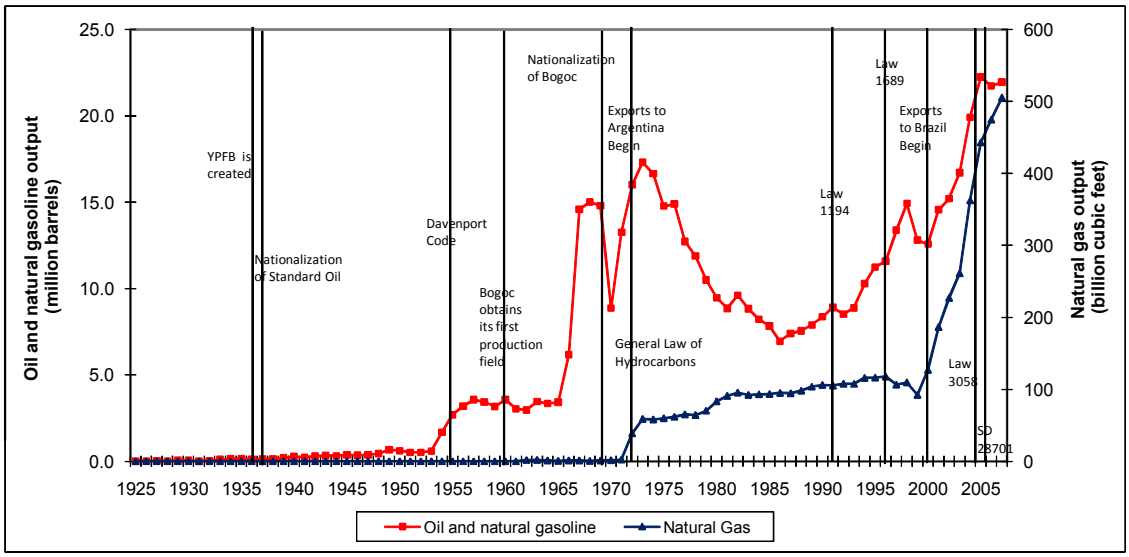
Fourth, domestic market conditions can also promote or discourage investment flows. Bolivia´s energy market however is relatively small, thus the main incentive for foreign oil companies to invest in the hydrocarbons sector in Bolivia has been the potential to access to foreign markets.

This paper analyses the role played by these factors in determining Bolivia´s hydrocarbons sector development overtime. To this end, section II analyses the historic behavior of the Bolivian hydrocarbon sector, starting from 1960. The patterns followed by hydrocarbon output, exports, and domestic consumption are analyzed in detail Section III discusses the role played by institutions in promoting the sector's development, with special focus on the role played by the various tax frameworks that were in force overtime. Section IV, focuses on the impact the different tax frameworks have had on tax revenues, investment flows and on the country's hydrocarbons reserves. Section V discusses the role domestic markets plays in the hydrocarbons sector development in Bolivia, and the impacts fuel price subsidies have in term of fiscal costs, and market distortions. Section VI analyses the role played by geography, from the point of view of the geological oil producing potential the Bolivian territory has, as well as of its proximity to large energy markets. Finally, section VII offers some concluding remarks.

II. Hydrocarbons Sector in Bolivia

Hydrocarbon sector in Bolivia has followed a cyclical pattern over time, exhibiting periods of greater private participation in the sector's activities, followed by nationalizations that increased the role of the State. This pattern has significantly conditioned the hydrocarbons sector performance which has experienced periods of booms and collapses overtime (Graph 1).

Graph 1
Total Hydrocarbons Production in Bolivia Overtime



Source: Own source based on YPFB, INE

Base on the methodology put forward by Manzano O. and Winkelried D. (2007), it is possible to identify various episodes of booms and collapses in the hydrocarbons sector in Bolivia (Table 1) during the period 1960-2007.

In the case of oil, there were export booms during the periods 1966-1968 and 2000-2005, while export collapses occurred during the periods 1961-1965 and 1975-1980. Booms were the result of the comparative advantage the country developed at certain periods, as well as of favorable market conditions. Collapses on the other hand occurred basically due to the own collapses occurred within the Bolivian oil industry.

Natural gas, which historically has been the country's main hydrocarbon export, experienced two sizable export booms: the first occurred during the 1970s, when Bolivia began its exports of gas to Argentina. That boom was mainly the result of higher prices due to the world oil crisis occurred at that time. The second boom occurred in the 2000-2007 period, when exports of gas to Brazil started. Between these two export booms, the country experienced a prolonged collapse in its natural gas exports which lasted from 1986 until 1999.

Table 1
Booms and Collapses of Hydrocarbons Exports in Bolivia

OIL				
	Dates	**1**	**2**	**3**
Booms				
	1966-1968	Q	CA	147.6
	2000-2005	X	CA-FM	54.0
Collapses				
	1961-1965	Q	OC	-24.3
	1975-1980	Q	OC	-56.0
NATURAL GAS				
	Dates	**1**	**2**	**3**
Booms				
	1975-1982	P	CA-FM	36.9
	2000-2007	X	CA-FM	49.0
Collapses				
	1986-1999	X	OC-MC	-15.7

Source: Own estimates based on Manzano O. & Winkelried D. (2007)
1 P= price effect dominates, Q= quantity effect dominate, X = both effects are important
2 For booms: CA=Comparative Advantage, FM=Favorable Market
For collapses: OC=Own Collapse, MC=Market Collapse
3 For booms (and collapses), average annual rate of growth (decrease) of the export value

The institutional volatility the country exhibited overtime is a key factor in explaining the booms and collapses discussed above. According to Miranda (1999), Bolivia has given a complete turnaround to its oil legislation and practice overtime: first, a complete open up of the oil industry to private investment in 1921; then the reversion of licenses and the confiscation of assets belonging to the Standard Oil Company comprised the first nationalization, conducting to a de facto state monopoly, with the creation of the oil state enterprise YPFB (Yacimientos Petrolíferos Fiscales Bolivianos) in 1936; the approval of the Oil Code of 1955 tried to attain the coexistence of YPFB and private oil companies; in 1969 the Bolivian Gulf Oil Company (Bogoc) was nationalized; the General Law of Hydrocarbons of 1972 represented the transition towards a flexible state monopoly that restricted private investment to exploration and production activities; the 1996 Hydrocarbons Law allowed private investment to participate

in all activities of the industry; and finally; in 2005, Law 3058 and the Nationalization Decree of 2006 reestablished YPFB control over all activities of the oil industry.

The fist oil licenses in Bolivia were granted in 1865, but with no significant outcomes (Miranda 1999). In 1921, the Government of Bautista Saavedra sanctioned the organic Law of Oil, the first legal body devoted to the industry that comprised modern concepts, such as the state over-sighting of the industry, the obligation to construct oil refineries by companies in order to process production, given priority to the supplying of domestic markets; the creation of a royalty for the State, a net income tax, and the obligation to return 20% of the licensed area to the State, when the commercial production started.

The Standard Oil Company

In 1924, the Bolivian Standard Oil started its operations in Bolivia, between 1924 and 1929 discovered several oil fields, such as Bermejo (1924), Sanandita (1926), Camiri (1927), Camatindi (1929), which increased the country's production and export potential. In 1931, the company built two basic oil refineries. The company exerted pressures on the Bolivian government to undertake the construction of an export pipeline through the Chaco region, which at that time was under dispute between Bolivia and Paraguay. The imminent war between these two countries led the company to undertake some actions that were considered hostiles to the country and eventually led to the nationalization of the oil company and its expulsion from Bolivia. In 1931, the company begun to withdraw equipment and machinery from the country. One year later, the company declared itself as neutral in the conflict, and thus refused to contribute with funds to the Bolivian State. Furthermore, it refused to supply with fuels to the Bolivian Army, causing the State to intervene the companies' oil fields in Camiri, resulting in an increase in production. After the war ended, the legal problems with the company continued. Eventually, in 1937,

the government declared the caducity of all licenses and concessions granted to the company, and the confiscation of the company´s assets, arguing that the Oil firm had violated the contracts and had betrayed Bolivia during the war. By 1937, Bolivia's total oil production amounted to 127 thousand barrels per year.

YPFB and the State Monopoly

The state oil enterprise YPFB had been created in 1936. With the nationalization of the Standard Oil, all concession and assets belonging to the transnational company were transferred to YPFB. Between 1936 and 1943 oil production increased from 104 thousand barrels per year up to 334 thousand bpy, based on the infrastructure left by the Standard Oil.

In the following years, successive governments attempted to strengthen the institutional capacity of YPFB, in terms of capital, technology and human resources, which permitted the company to grow and develop very rapidly and became very influential in the national oil policy. The state company carried-out an aggressive exploration and drilling program, resulting in the discovery of new oil fields and an increase in production. Oil production rose from 313 thousand bpy in 1944 to 525 thousand bpy in 1952.

Starting from 1953, the Government of the MNR, gave an additional boost to the development of YPFB and of the hydrocarbons sector, through additional investments in capital and technology. Between 1953 and 1960, oil production increased from 600 thousand bpy up to 3,574 thousand bpy. representing an almost six fold increase. Besides, five pipelines were constructed, linking oil production with domestic and export markets.

The Oil Code, better known as the Davenport Code, was passed in 1955. The Code legally opened up the oil sector to foreign companies, thus ending a period of exclusivity for the State in the exploitation of oil, initiated in 1937.

The Bolivian Gulf Oil Company (Bogoc)

During the 1960s, the hydrocarbon sector activity in Bolivia was mainly controlled by the Bolivian Gulf Oil Company (BOGOC). Between 1960 and 1962, BOGOC exploration activities resulted in the discovery of various rich hydrocarbon fields that increased the production potential of the company. Starting from 1966, oil production rose significantly, increasing from 3.4 million barrels a year in 1965 to 6.2 million barrels in 1966, and to an average output level of 15 million barrels a year during 1966-1969 (Graph 1). Output growth however, was not matched by an equivalent increases in tax revenues for the Bolivian State.

The Petroleum Code was in force during the 1960s and created very favorable conditions for private investors. The aim was to attract large amounts of foreign investment inflows necessary for the development of the hydrocarbon industry. Besides, natural gas production did not generate any tax revenues to the State. The Code established that royalty payments only applied to marketed natural gas output. At that time however, natural gas production was not exported and the domestic market was very small, thus natural gas production, which by that time had became increasingly important, had to be aired, burned or re-injected into the hydrocarbon fields.

The perception that the Hydrocarbon Code was creating extremely favorable conditions for BOGOC, benefiting from large profit margins, and leaving small revenues to the Bolivian State, caused politicians and national authorities to consider the idea of nationalization attractive. In 1967 BOGOC made things even worst by unilaterally signing a contract with Argentina for the export of natural gas that only included BOGOC's own production. This move brought about a strong reaction from YPFB, causing the government to reverse the export concession granted to BOGOC. A new consortium (YABOG) was eventually formed, comprising YPFB and BOGOC that was in charge of complying the gas export contract with Argentina, in which YPFB was now able

to participate with its own production. The pipeline was constructed in 1969. That year, following a change of administration, the new military government of General Alfredo Ovando revoked the Hydrocarbon Code and approved the nationalization of BOGOC, expropriating all the company's infrastructure and exploitation licenses, transferring them to YPFB.

The reaction of Gulf Oil to the nationalization was tough, declaring a total embargo of Bolivian oil exports. Besides, a World Bank credit for the construction of the gas pipeline to Argentina was cancelled, and the company exerted pressure on the Bolivian Government, through the Government of the United States, to obtain a satisfactory compensation. The immediate consequence was a complete paralysis in oil production of those fields that had been under BOGOC control. In 1970, oil production decreases from 14.8 million barrels in 1969 to 8.9 million barrels that year.

Eventually, Bolivia became isolated and the Government agreed to compensate the Gulf Oil Company with a $ 101 million indemnity, which in net terms amounted to $61 millions.

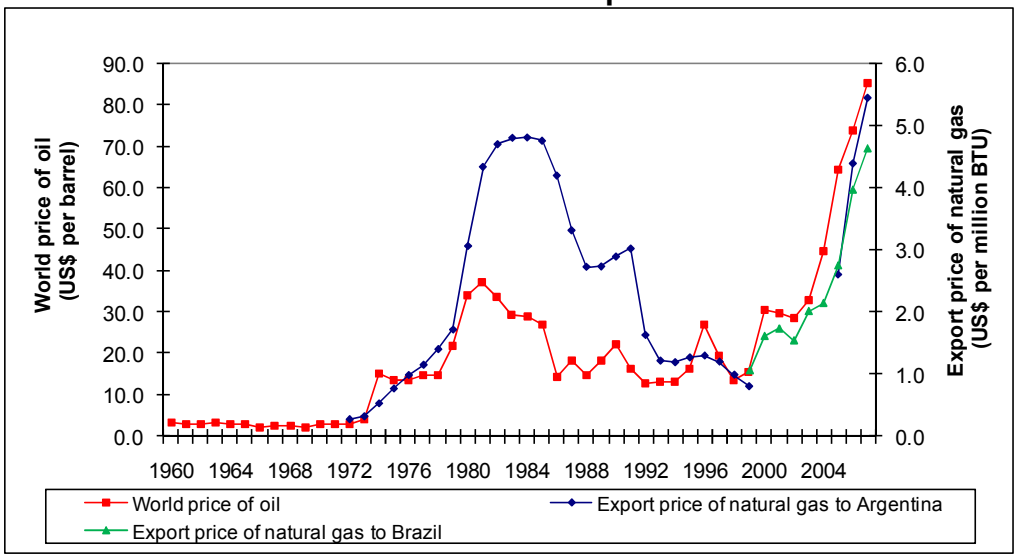
General Hydrocarbons Law and the Flexible Monopoly

The 1970s presented as a very positive decade for the development of the hydrocarbon sector. The sharp increases in oil prices in the international markets occurred in 1974 (graph 2), coupled with the substantial oil production capacity and the reserves seized by YPFB through the nationalization of BOGOC, caused the government to place great expectations on the sector as a substantial source of revenues.

Besides, the high oil prices, coupled with the uncertainty attached to the supply of oil from Middle East countries, caused oil companies to search for other regions of the world as alternative oil supply sources. At that time, oil

companies had accumulated large amounts of financial resources, as a result of the sizable price increases.

Graph 2
World Prices of Oil and Contractual Export Prices of Natural Gas



Source: Own source based on YPFB, INE, EIA

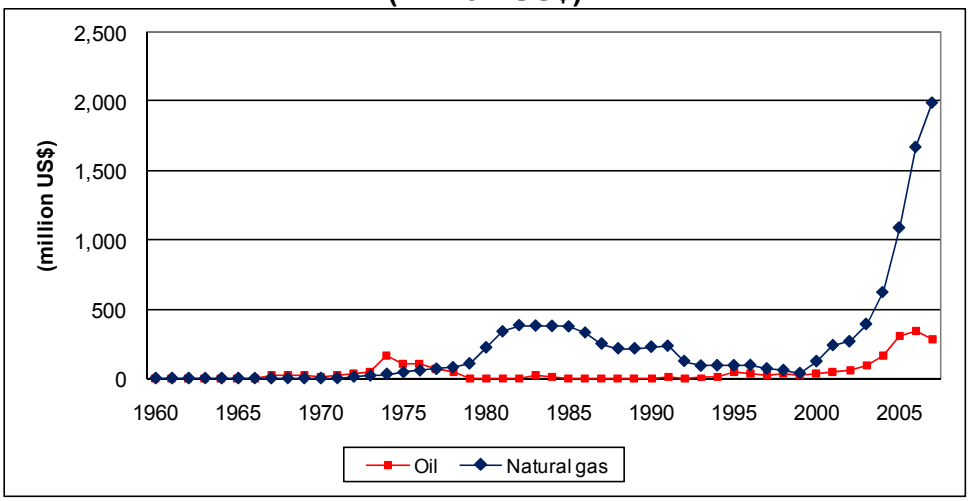
In 1972, the military government of Colonel Hugo Banzer passed a new General Law of Hydrocarbons. Under this new Law, the Bolivian State retained the ownership of all hydrocarbon fields, and was responsible for the exploitation and production of hydrocarbons in all the national territory. Private investment had to be carried-out through operation contracts between YPFB and the private investor, who assumed all the risks involved in the operation. According the new Law, hydrocarbon production was equally divided (50/50) between the operator and the State. YPFB paid royalties on total production and the state enterprise was granted the monopoly in transport, refinery and commercialization activities.

That year, Bolivia started exporting natural gas to Argentina, bringing about a sharp rise in natural gas net production, which jumped from 2.6 billion c.f. in 1971 to 92.9 billion c.f. in 1984 (graph 3). The contract included a clause that indexed the export price of natural gas to the world price of oil, thus the former tended to increase as well following the jump in the world price of oil (graph 2).

The average export price of gas went up from US$ 0.28 per thousand cubic feet in 1972 up to US$ 4.81 in 1984. Thus, during that period, export revenues increased from US$ 9.9 million in 1972 to US$376 million in 1984.

The export contract with Argentina was extended in 1991for another 8 years. The new contract however, comprised lower prices and reduced export volumes. The export price of natural gas to Argentina had been reduced since 1985, following the trend observed in world prices of oil. By 1991, the average export price of gas was US$ 3.02 per thousand c.f., and as a result of the extended contract was further reduced to US$ 1.64 in 1992, reaching in 1999 an average level of US$ 0.81 per thousand c.f.. As a consequence of those reductions, natural gas export revenues to Argentina decreased to only US$ 36.7 million in 1999. However, the total volume of gas exported to Argentina during the 28 year life time period of the contract, amounted to 1.88 trillion c.f., generating about US$ 4.6 billion in export revenues to the country.

Graph 3
Hydrocarbons Exports
(million US$)



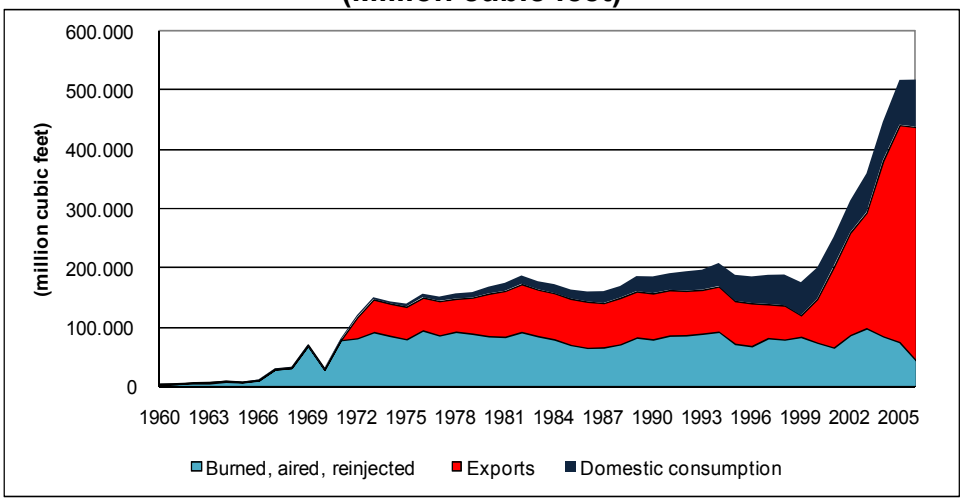
Source: Own source based on YPFB, INE

Domestic consumption of natural gas also exhibited significant increases starting from 1966. This trend continued throughout the whole decade, bringing domestic consumption from 3.4 billion c.f. of natural gas in 1972 (8.7% of total

net output of gas) to 38.3 billion c.f. in 1991 (26.9% of net output), and to 55.7 billion c.f. in 1999 (60.4% of net output) (graph 4).

Oil production also presented a positive trend during the first half of the decade. In 1970, the year immediately after the nationalization of BAGOC, oil production fell sharply due to the commercial blockade imposed by the Gulf Oil Company in the international oil markets, causing YPFB to reduce oil production (graph 5). Starting from 1971 however, oil production recovered quickly reaching in 1973 a level of 17.3 million barrels, which up to now represents the highest level of oil output ever produced by the country. At that time, 68% of total production was aimed at export markets.

Graph 4
Natural Gas Production, Exports and Domestic Consumption
(Million cubic feet)



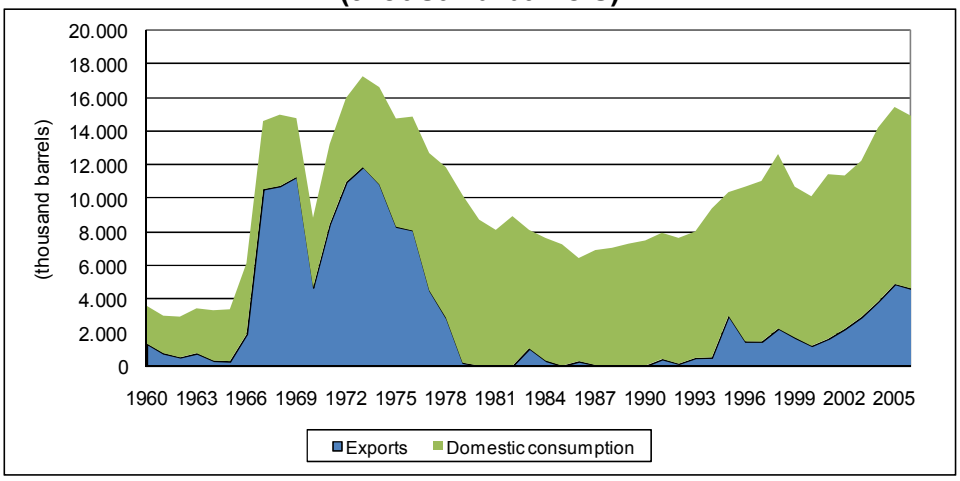
Source: Own source based on YPFB, INE

Starting from 1974, oil output began to decrease due to the depletion of wells and insufficient investment in exploration and development of new fields. Staring from 1975, YPFB began transferring to the State increasingly larger amounts of resources, leaving reduced funds to be invested in the company. Coupled with the foregoing, domestic consumption of oil exhibited an increasing trend, causing exports to reduce to almost negligible levels at the end of the 1970s.

The reforms of the 1990s

During the 1980s, the hydrocarbon sector in Bolivia was characterized by decreasing output of oil, predominance of YPFB in the sector's productive chain, reduced investment levels, and the existence of large transfers of resources to the National Treasury by the state company. YPFB had to resort to external debt in order to finance its exploration activities. In 1985 there were only four foreign oil companies, besides YPFB, that were carrying out drilling operations in the national territory. Oil output barely covered domestic demand.

Graph 5
Crude oil Production, Exports and Domestic Consumption
(thousand barrels)



Source: Own source based on YPFB, INE

In 1990, the government of Jaime Paz Zamora tried to give another boost to the hydrocarbon industry, revoking the General Hydrocarbon Law of 1972, and passing a new Law (Law # 1194) that introduced more flexibility to the sector's regulation. The new Law envisaged the constitution of joint ventures between YPFB and foreign companies in upstream as well as in other downstream operations.

The changes introduced by the new Law brought about an increase in exploration activities, causing twenty new companies to start their operations in

the country. Until 1996, 147 wells were drilled resulting in the discovery of 14 new hydrocarbon fields, with the potential to produce oil and natural gas. Oil production increased from 7.5 million barrels a year in 1990 to 12.6 million barrels in 1998.

Following the general elections of 1993, the new administration of Gonzalo Sanchez de Lozada undertook a deep process of structural reform in the hydrocarbon sector and in other sectors of the economy. The reform strategy comprised three main pillars, i.e. a new hydrocarbon law, the capitalization (partial privatization) of YPFB, and the contract to export natural gas to Brazil, which comprised the construction of an export pipeline between the two countries.

The new hydrocarbons law, passed by Congress in 1996, better known as Law 1689, established the mechanisms to regulate the processes of investment, production and commercialization of hydrocarbons in the country. Law 1689 was different from the previously existing Law in two main aspects. First, it created a new tax system for the sector, comprising regional and national royalties, with the latest varying depending on whether they were applied to new or existing hydrocarbon fields, a tax on corporate net profits and profit remittances, and an additional tax (surtax) applied to extraordinary profits. Second, it created a regulatory and supervisory framework, aimed at regulating and supervising the hydrocarbon sector activities, and the relationship between the state, consumers and private investors.

The capitalization of YPFB consisted in a partial transferring of the state enterprise to private strategic investors. To this end, YPFB was divided in three separate companies, two comprising upstream activities of exploration and exploitation, and a third comprising the transportation of hydrocarbons. Enron-Shell purchased the transportation branch of YPFB (Transredes). The two exploitation units, Empresa Petrolera Andina and Empresa Petrolera Chaco were sold to YPF Pérez Compano-Pluspetrol Bolivia and Amoco Petroleum

Company respectively. The three capitalized sectors of YPFB had a joint book value of $ 382.8 million, and the strategic shares were sold for $ 834.9 million, raising the total value of the firm to over $1.2 billion.

Finally, the 20 year take-or-pay contract to export natural gas to Brazil, comprised the construction of a pipeline between Bolivia and Brazil, named as Gasbol. The Gasbol pipeline, that connects the cities of Santa Cruz in Bolivia with Sao Paulo and Porto Alegre in Brazil, was constructed in 1998 and began its operations the year after. The pipeline is 3,150 kilometers long, of which 557Km are in the Bolivian territory, and has a capacity to pump 30 million cubic meters of natural gas per day. The contract establishes that export prices of natural gas are indexed to the international price of a given basket of fuels.

The reform program produced remarkable results, bringing about substantial increases in the levels of investment, production and exports of hydrocarbons. Between 1996 and 2004, investment flows to the sector amounted $3.3 billion. This in turn brought about a significant increase in the country's hydrocarbon reserves. Crude oil reserves increased from 200.9 million barrels in 1997 to 956.9 million barrels in 2003, of which 486.1 million were proven reserves and 470.8 million probable reserves. As a result, production went up from 10.3 million barrels (28.3 thousand barrels per day) in 1995 to 15.4 million barrels in 2005 (42.2 thousand barrels per day). This increase in production permitted the country to increase its crude oil exports from 0.5 million barrels in 1994 to 4.9 million barrels in 2005.

The biggest impact of the hydrocarbons reform was felt in the natural gas industry. The large inflows of foreign direct investment resulted in the discoveries of several important natural gas fields in recent years, many containing reserves (proven, probable, and possible) in excess of 10 Trillion cubic feet (Tcf). The most important fields discovered include Margarita (13.4 Tcf), Ipati (12.0 Tcf), San Alberto (11.8 Tcf), and Sabalo (10.8 Tcf), all located in the Southern region of Tarija. Natural gas reserves have increased from 5.7 Tcf in 1997 to 54.9 Tcf in 2003, converting Bolivia in the second country with the

largest natural gas reserves in South America, and with the potential to become an energy hub in the continent.

The discovery of large natural gas reserves and the contract to export natural gas to Brazil brought about a significant increase in natural gas production and exports. Net output went up from 116.4 billion cf in 1995 to 474.4 billion c.f. in 2005. Likewise, exports rose from 72.5 billion cf in 1995 to 394.8 billion cf in 2006. Domestic consumption has also tended to rise in recent years, causing a decrease in the volume of gas that had to be burned, aired or re-injected.

Natural gas exports to Brazil started in 1999 under a 20-year contract which established a maximum of 30 million of cubic meters/day. Under the long-term contract, the pricing of Bolivian gas exported to Brazil is based on the cost of a basket of alternative fuels, which is adjusted periodically. Under the contractual rules, the gas export price increased gradually, from US$1.7 to US$3.9 per thousand cubic feet since 2001.

Law 3058 and the Nationalization Decree (S.D. 28701)

At the end of the 1990s, Bolivia had a great potential to become a major player in the region´s energy business. There were several large energy projects that were considered at that time, such as the export of liquefied natural gas (LNG) to United States and Mexico and the construction of a second pipeline to export additional volumes of gas to Brazil.

However, the development of Bolivia's natural gas reserves created profound political controversies within the country. Two issues lied at the heart of the controversy. First, there were questions surrounding the proposed export paths for liquefied natural gas (LNG), since Bolivia is landlocked. In 2001, Repsol-YPF led a consortium to develop the Pacific LNG project, which included a natural gas pipeline connecting an LNG export terminal at a port in Chile. The plan presented political problems due to a land dispute between Bolivia and Chile

dating to a war the two countries fought in the 19th century. In 2003, the Bolivian government decided to move forward with the Pacific LNG project, sparking a wave of protests throughout the country and leading to the resignation of President Sanchez de Lozada. Eventually, the Pacific LNG project was cancelled.

Second, since 2003 many groups in Bolivia had called for the re-nationalization of Bolivia's natural gas resources. In 2004, Bolivia overwhelmingly approved a referendum that called for the renationalization of the formerly state-owned Andina and Chaco oil and natural gas operators. The referendum also called for a sizable increase in taxes on foreign hydrocarbon producers. In May 2005, Bolivia's Congress approved a new Hydrocarbons Law that codified the results of the 2004 referendum. The law established an additional 32 % tax on oil and gas production at the wellhead, on top of the existing 18 percent royalty.

On May 2006, the newly elected government of President Evo Morales declared a decree re-nationalizing the entire natural gas sector. Under the terms of the decree and the new contracts signed with foreign companies, the latest are not allowed to own natural gas reserves and YPFB takes a majority stake in all natural gas projects. In addition, private companies have assumed a new role under an operating service agreement structure, producing natural gas on behalf of YPFB.

The main effects of the new legislation have been: (a) a "migration" of the existing contracts with foreign companies operating in Bolivia, from risk-sharing contracts to an arrangement whereby all production is surrendered to the state energy company YPFB, which has been made the country's sole exporter of natural gas; (b) a permanent increase in natural gas royalties, from 18 percent to 50 percent of turnover; and (c) a requirement that YPFB regain control over the five hydrocarbons companies that were privatized in the 1990s. While the transition to new service contracts has recently been completed, only one of the five companies targeted for nationalization (i.e., the company in charge of the

country's two oil refineries, formerly owned by Brazil's Petrobras) has thus far returned to YPFB control.

The effects of Law 3058 and S.D. 28701 on the hydrocarbons sector development in Bolivia have yet to be seen. As stated earlier, the most noticeable short term effect has been the considerable increase in government revenues that permitted the reversal of the fiscal deficit. However, the costs of these policies are beginning to be felt, in the form of much reduced investment inflows to the sector, and a much slower growth in total output. Natural gas production capacity, due to the reduced investment flows, is currently 10 million cubic meters per day (cm/d) below Bolivia´s current contractual commitments. ,

Considering the new commitments recently contracted by the Bolivian State, like the increased export volumes committed to Argentina equivalent to 27.7 million cubic meters per day (cm/d) starting from 2010, and the supply of other 8 million cm/d committed to the metallurgic project of El Mutún starting from 2011, the output deficit would rise to 37.6 million cm/d (López C.A. 2007). Furthermore, if these commitments effectively materialize, Bolivia wouldn't have the necessary proven natural gas reserves to fulfill them.

III. Institutional Frameworks and Hydrocarbons Taxation

The analysis above shows that the institutional framework that regulates the hydrocarbon sector activities in Bolivia has been very volatile, experiencing several changes over time, thus introducing great uncertainty and instability to the sector development. Very often, the Bolivian State has tried to maximize its share in the hydrocarbons rent by substantially changing the rules of the game, undertaking policy measures that varied from large tax increases, aimed at increasing the government take, to nationalization of assets owned by private (normally foreign) oil enterprises.

As discussed earlier, these policies have tended to produce short term benefits, mainly in the form of increased government revenues. However, despite the short term gains obtained, these policies have invariably produced in the middle to long term, a drop in investment flows and output, and have caused the hydrocarbon sector to remain stagnated during a most of the period analyzed in this research paper.

In other opportunities, especially when oil investment was scarce and hydrocarbon output was insufficient to satisfy domestic and export demand, the Bolivian government pursued policies that were more favorable to private investors. These policies succeeded some times in bringing about large increases in investment inflows, like those occurred at the end of the 1990s. However, experience has demonstrated that every time Bolivia has embarked in a nationalization strategy or other policies that substantially alters the institutional stability, the investment climate gets badly damaged, and it takes considerable time to regain foreign investors' credibility before they decide to invest in the country again.

In what follows, this section analyses the different legal and institutional frameworks that were in force overtime in Bolivia, aimed at regulating the hydrocarbons sector activities, with special emphasis on the assessment of the different tax systems they embedded, as well as on assessing the resulting government-take. Normally, hydrocarbon tax systems in Bolivia have relied on "blind taxes", such as royalties, that are calculated as a percentage of total output, regardless the operation or investment costs incurred by oil companies. Only sporadically, as occurred after the approval of Law 1689, the hydrocarbons tax system has relied on net income taxes that do take into account operation and investment costs.

The Oil Code of 1955

During the 1960s, the norm that regulated the hydrocarbon sector activities was the Oil Code, also known as the Davenport Code because it had been written with the close advice of Davenport-Shuster, an American firm of lawyers.

The Code established three tax categories that had to be paid by private license holders:

i. A 11% regional royalty on total oil production
ii. An annual operation license per licensed hectare that varied depending on the geographic zone the operation license was granted in and on the period of time the license lasted.
iii. A 30% tax on corporate profits.

The Code established very favorable tax conditions for private investors. For instance, the Code envisaged that license payments could be made creditable to royalty payments and that total tax payments by private companies, including royalties, licenses and profit taxes, could not exceed 50% of the company's net profits in any given year. Finally, the Code also included a declination factor clause, which permitted companies to deduct from their profits, an amount that depended on the depletion or declination of wells, causing tax payments by companies to be even smaller.

General Law of Hydrocarbons of 1972

The General Law of Hydrocarbons approved in 1972, determined that the Bolivian State retained the ownership of all hydrocarbon fields, and was responsible for the exploitation and production of hydrocarbons in all the national territory. All private investments had to be carried-out through operation contracts signed between YPFB and the private investor, assuming the latest all the risks involved in the operation. According to the Law,

contractors carried out exploitation operations on behalf of YPFB. Thus, the State Enterprise owned the total volume produced by any oil company. YPFB retained the percentage of production needed to pay all taxes and royalties, given to the contractor his corresponding share in production, previously agreed in the contract. The average share received by the contractor was customary of 50% of total hydrocarbon output.

The royalty and tax payments made by YPFB comprised:

i. An 11% regional royalty on total gross output received by the producer region.
ii. A 19% national tax on gross output paid to the National Treasury.

Thus, YPFB net share amounted to 20% of total hydrocarbons output at the wellhead.

Law 1194 of 1990

In 1990, the government of Jaime Paz Zamora, trying to give an additional boost to the hydrocarbon industry, revoked the General Hydrocarbon Law of 1972, and passed a new Law (Law No. 1194) which introduced more flexibility to the sectoral regulation. The new Law introduced the possibility to constitute joint ventures between YPFB and foreign companies in upstream as well as in downstream activities.

In joint venture contracts, according to Law 1194, the contractor (private company) carried out, with its own resources, at its own risk and on behalf of YPFB, all exploration and exploitation operations within the area established in the contract. Under this legal scheme, YPFB had no obligation to undertake any investment on its own. In the case the oil company succeeded in finding a producing hydrocarbons field, YPFB had a contractual share in total output.

The Law established the following tax categories for upstream operations in the case the field was operated by YPFB, by private companies or by both.

i. A regional royalty comprising 11% of total production for the producer region.
ii. A compensatory royalty of 1% of total gross production for Beni and Pando regions.
iii. A national tax of 19% of total gross production.
iv. A 40% corporate profit tax.
v. YPFB was entitled to participate with a share of total output produced by the oil company, equal to 19% of total production on average.

The first four tax categories were calculated as a percentage of total wellhead gross production. The Ministry of Energy and Hydrocarbons was in charge of determining the methodology to calculate the transfer prices for the payment of these tax duties. Furthermore, the Law established that royalty and national tax payments could be made creditable to corporate profit tax payments, thus making the latest nonexistent (Muller 2003 and Medinaceli 2007).

Law 1689 of 1996

Law 1689, passed by Congress on April 1996, differentiated between new and old hydrocarbon fields for the payment of royalties, taxes on corporate profit, remittances and national taxes. Hydrocarbons fields classified as old, also known as “existing”, were those comprising proven reserves that were producing hydrocarbons at the time the new Law was passed by Congress. Conversely, new hydrocarbons fields were all those that were not classified as “existing”.

The new tax framework created by Law 1689 introduced a less distortionary tax system and a more balanced distribution of taxes between upstream and

downstream parts of the sector. Among the reform objectives were the introduction of downstream levies (excises on fuel products) that would compensate for any fall in upstream revenues (mainly royalties) and promote a more efficient consumption of fuel products. The reform was also designed to reduce the dependence on production taxes, which are easier to collect, and move towards profit-based taxation, which does not distort investment decisions (Gillingham and Medas, 2004).

The tax framework established by the 1996 Law consisted of the following tax categories:

For old (existing) fields:

i. A regional royalty of 11% of total gas production for the producer region.
ii. A compensatory royalty of 1% of total gross production for Beni and Pando regions.
iii. A 6% royalty of total production for the National Treasury and YPFB.
iv. A 13% complementary national royalty of total production for the National Treasury.
v. A 19% national participatory tax of total output for the National Treasury.
vi. A 25% surtax on extraordinary windfall profits.

In order to assure that “existing” fields’ would pay no more than 50% of total output at the wellhead, article 83 of Law 1689 determined that payments due to the complementary national royalty, could be made creditable to tax payments due to corporate profits and profit remittances, thus making the two latest nonexistent.

For new fields:

i. A regional royalty of 11% of total gas production for the producer region.

ii. A compensatory royalty of 1% of total gross production for Beni and Pando regions.
iii. A 6% royalty on total production for the National Treasury.
iv. A 25% tax on corporate profits.
v. A 12.5% tax on profit remittances.
vi. A 25% surtax tax on extraordinary windfall profits.

Prices utilized to calculate tax and royalty payments, in the case of natural gas production, were the weighted average of both, domestic and export prices taken separately. In the case of oil and other liquid hydrocarbons, the prices taken were the effective sale price or the average international price of a basket of crude oils.

The Law established that for corporate profit tax payments, companies were allowed to make the following additional deductions to their net incomes: royalties and other shares in output taken by the State, depreciation of investments and losses incurred the year immediately before. Furthermore, Law 1689 permitted companies to accelerate the depreciation of their investments within a period of 6 only years. Given the large amounts invested by companies starting from 1997, coupled with the accelerated depreciation method utilized, caused the depreciation value to be sizable, thus making corporate profit tax payments very reduced during the years immediately after the investments had been undertaken. The Law envisaged that, after companies had depreciated the full amount of their investments, profit tax payments would increase considerably, thus compensating the revenues lost due to the reduced levels of royalties.

Law 3058 of 2005

On May 2005, Congress passed Law No 3058, which substituted Law No 1689. This new law introduced the following modification to the previous Law.

i. Creates the Direct Tax on Hydrocarbons (IDH), equivalent to 32% of total gross hydrocarbon output measured at the wellhead. The IDH, together with the 18% royalty, caused the Bolivian State to participate with 50% of the total hydrocarbon gross production at the wellhead, regardless the operation and investment costs incurred by the oil company.

ii. Besides, the new Law establishes the share of IDH received by each of the 9 departments (regions) comprising the country, i.e. 4% of total regional production for each of the respective producer region; 2% of total national production for each of the non-producer regions; and the remaining 18% for the National Treasury and other beneficiaries.

vii. The Law eliminates the distinction between old and new hydrocarbons fields of Law No.1689, establishing the payment by both, new and old hydrocarbons, of the newly created IDH. This measure caused a reduction in revenues of the National Treasury, which previously received 100% of the national complementary royalty and of the national participatory tax on old hydrocarbon fields' output.

iii. Finally, the Law established that companies have to carry out their exploration and exploitation operations through Shared Production contracts and Operation and Joint Venture contracts with YPFB.

Hydrocarbons Law 3058 compels companies to relinquish their total hydrocarbons production to the Bolivian State, being the latest the owner of all hydrocarbons production at the wellhead. Furthermore, the Law established that companies are not allowed to directly commercialize their production, but through YPFB which charges a service fee. Besides, companies are compelled to satisfy domestic markets in a first place, and export surplus production only. The share of output sold domestically, is paid to companies at a "transfer" price determined by the hydrocarbons sector regulator. This "transfer" price varies within a range of US$22 and US$27.5 per barrel, which is much lower

compared to prices prevailing in world markets, representing lower revenues for oil companies. Thus, low domestic prices of fuels are basically subsidized by oil companies.

Nationalization Supreme Decree (SD No. 28701)

On May 2006, the Government approved SD 28701 that nationalized Bolivian hydrocarbons. This SD introduced the following changes to the hydrocarbons institutional setting established by Law 3058:

i. Established a six month period for the negotiation of new contracts with oil companies.
ii. Creates an additional tax of 32% of total output value to be paid to YPFB, only applicable to hydrocarbons produced by the two largest natural gas fields (San Alberto and San Antonio). This additional tax was paid only during period the renegotiation of contracts lasted, increasing the government take up to 82 % of these two fields' total output value.
iii. During the renegotiation period, the government-take on all others smaller hydrocarbons fields' output remained at 50 percent, as was established by Law 3058.

IV. Hydrocarbons Taxation, Investment Flows and Reserves

Hydrocarbons tax systems in Bolivia have mostly relied on royalties and other production taxes, which are calculated as a percentage of total output value or volume at the wellhead. Thus, operation and investment costs incurred by the oil company are not considered in the calculation of tax payments. The main advantage of this tax system, from the State's point of view, is that tax payments are easy to calculate and collect, making them more transparent. The main shortcoming of this tax system is that they do not induce an optimal exploitation of non renewable resources, precisely because investment and

operation costs are not considered. For instance, a hydrocarbons field facing high production costs and not very high market prices, will still be compelled to pay a fixed royalty on their total production, making its exploitation unprofitable and therefore unfeasible.

Conversely, net profit taxes, which take into account operation and investment costs, permit an efficient exploitation of non renewable natural resources. These tax systems enter into effect once the operation of a given field began to yield positive net profits. Besides, since these systems are widely used at the international level, tax payments made by companies in the host country can be made creditable to tax obligations companies have in their home country, making investing in the host country more attractive for oil companies. The shortcomings of net profit tax systems are that they are more difficult to control by the national tax office, given the difficulties in obtaining reliable information on the operation and investment costs incurred by the company. This fact tends to generate suspiciousness on whether companies are effectively declaring all the profits they are making. The depreciation methods utilized to calculate companies' net profits represent other source of controversy, especially if there is the perception that they are being be utilized arbitrarily and always in favor of companies. However, independently of the depreciation method adopted, when a proper discount rate is utilized, total payments of companies net profit taxes should always be the same in present value terms.

Table 2 summarizes the different tax systems for the hydrocarbons sector that were in force in Bolivia at different periods of time.

Table 2
Comparative tax systems for the hydrocarbons sector

	Oil Code (Davenport Code) Oct. 1955	General Law of Hydrocarbons Mar. 1972	Hidrocarbons Law Law 1194 Nov. 1990	Law 1689 Apr. 1996		Law 3058 May. 2005	Nationalization Decree S.D. 28701 May. 2006	
				New Fields	Existing Fields		Megafields	Others
Regional Royalties	11%	11%	12%	12%	12%	12%	12%	12%
YPFB Share		20%	19%				32%	
National Trassury Share		19%	19%	6%	6%	6%	6%	6%
National Tax					32%	32%	32%	32%
Total taxes on gross production at the wellhead	**11%**	**50%**	**50%**	**18%**	**50%**	**50%**	**82%**	**50%**
Corporate Income Tax	30%	30%	40%	25%		25%	25%	25%
Tax on remittances				12,5%				
Surtax				25%	25%			
Total on gross production	11% +	50%+	50%	18% +	50% +	50% +	82% +	50% +

Source: Own source based on Medinaceli (2007), Hoz de Vila (1983)

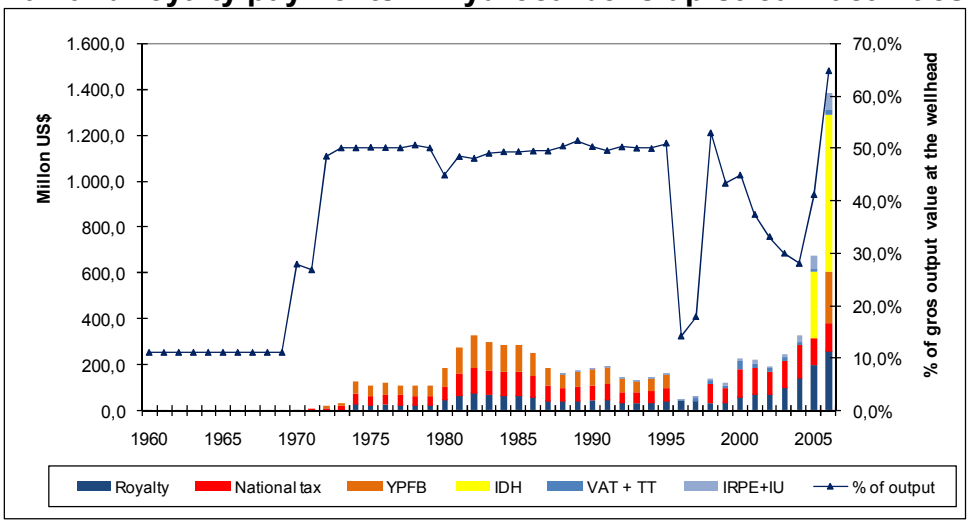
With few exceptions, the Bolivian tax system on hydrocarbons up-stream activities has basically relayed on royalties and other tax categories that are calculated as a percentage of total production. Almost invariably, the State's share in total hydrocarbons produced in up-stream activities has been of at least 50% of total output at the wellhead, including the share took by YPFB. Only during the 1960s, previous to the nationalization of hydrocarbons occurred in 1969, and during the 9 years when Law 1689 was in force (1996-2005) the State had a share in total hydrocarbons output of up-stream activities lower than 50% (Graph 6).

During the years the Oil Code (Davenport Code) was in force, the hydrocarbons tax system was very favorable to oil companies, as they paid an 11% royalty on total output and total tax payments could not exceed 50% of companies' net profits.

Under Law 1689, new hydrocarbons fields paid a royalty of 18% of total output and old fields paid 50%. Given that at the moment the Law was passed by Congress, Bolivia produced most of its hydrocarbons out of existing fields, the

average royalty paid was closer to 50% than to 18%. Over time however, this average share tended to reduce, as more hydrocarbons were produced out of new fields while old fields tended to dry up. Thus, the average royalty paid reduced over time, converging to 18% at the moment all fields classified as existing had completely dried up. Therefore, the hydrocarbons tax system, under Law 1689, was designed to depend more on net profit taxation in the long term, with royalties consisting of only 18% of total output at the wellhead. To this end, Law 1689 created a net profit tax of 25%, a tax of profit remittances of 12.5% and surtax on extraordinary profits of 25%.

Graph 6
Tax and royalty payments in hydrocarbons up-stream activities



Source: Own source based on Medinaceli (2007), Hoz de Vila (1983)

The switch to a more profit-based tax system under Law 1689, produced a drop in total tax revenues coming from up-stream activities in the hydrocarbons sector (graph 6). The drop in national royalty revenues, owed to the reduced output of existing fields, was not matched by an increase of revenues from net profit taxes, or other forms net income taxes. Law 1689 determined that companies could accelerate the depreciation of their capital investments to only 6 years, considerably increasing costs at the initial years of investments, thus reducing tax payments on net profits. However, during the transition from a production tax system to the new system that relied more on net income taxes, royalty payments were not supposed to reduce significantly, because existing

fields had to pay a 50% royalty. The idea was that by the moment existing fields dried up, and thus average royalty converged to 18%, companies had completed the depreciation of their investments, and therefore income tax payments would increase in order to compensate the reduction in royalties.

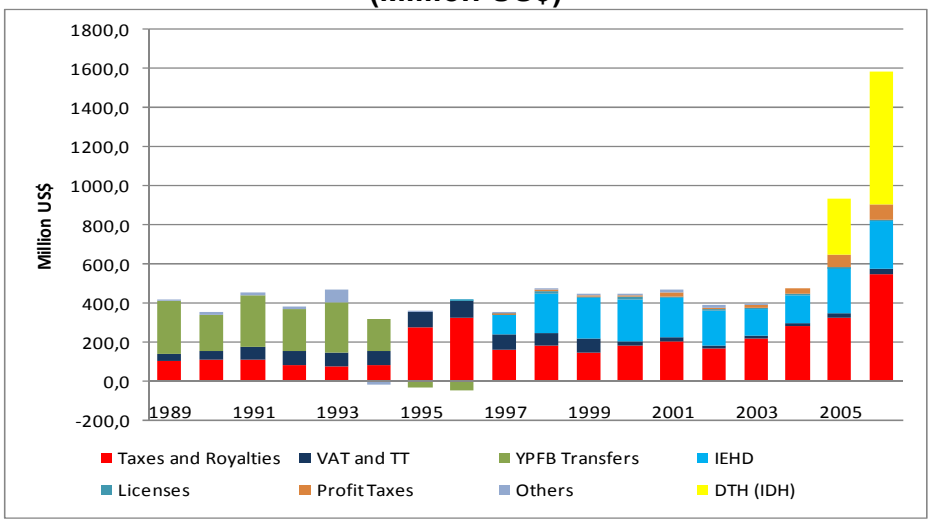
However, under Law 1689, tax collection from up-stream activities dropped from 50% of total output in 1998 to 27.9% in 2004. Thus, although the tax regime became more progressive under Law 1689, relying more on the income tax, due to accelerated depreciation, the government was not capturing the windfall. This seems to point out that is not enough that a tax regime overall is progressive, in addition it has to guarantee the government period by period a relative high share of the windfall.

The creation of the Indirect Tax on Hydrocarbons (IDH) under Law 3058, increased tax payments by hydrocarbons up-stream activities to 41% of total output in 2005. Furthermore, the Nationalization Decree of 2006 further increased hydrocarbons tax payments to 64.7% of total output, because it temporarily created an additional tax of 32% paid by fields producing more than 100 million f^3 a day, namely San Alberto and San Antonio, making these two fields pay 82% of their total output at the wellhead. This additional tax, which benefited YPFB, was in place only temporarily, during the transition period of contracts, from old contracts signed under Law 1689 to new contracts signed under Law 3058.

Tax revenues in the hydrocarbons sector also depends on down-stream activities such as refinery, transport and distribution of hydrocarbons. These activities are subject other tax categories, i.e. value added taxes, excise taxes, and net profit taxes. During the 1990s, the total hydrocarbons rent, both on up-stream and down-stream activities, accounted to around US$ 400 million a year on average, i.e. 5% of GDP (graph 7). With Law 3058, this amount experienced a 4 fold increase, rising up to US$ 1,600 million a year, owing to the creation of

the Indirect Tax on Hydrocarbons IDH) and to the much higher prices of oil in world markets, which has in turn increased export prices of natural gas.

Graph 7
Tax Payments in the Hydrocarbons Sector
Up-stream and Down-stream Activities
(Million US$)



Source: Own source based on Medinaceli (2007), Pacheco (2006)

The continuous reliance on production taxes of the Bolivian oil tax system, which are quite regressive and not conducive to an efficient exploitation of natural resources, is the result of a deeply-rooted conviction in the population and among politicians that the Bolivian State should receive at least 50% of total hydrocarbons production. In the eyes of the population, the most straightforward way to guarantee that 50% share is through a production tax. The lack of an efficient tax administration and the perception that companies would evade tax payments in a net income tax system, explain that behavior.

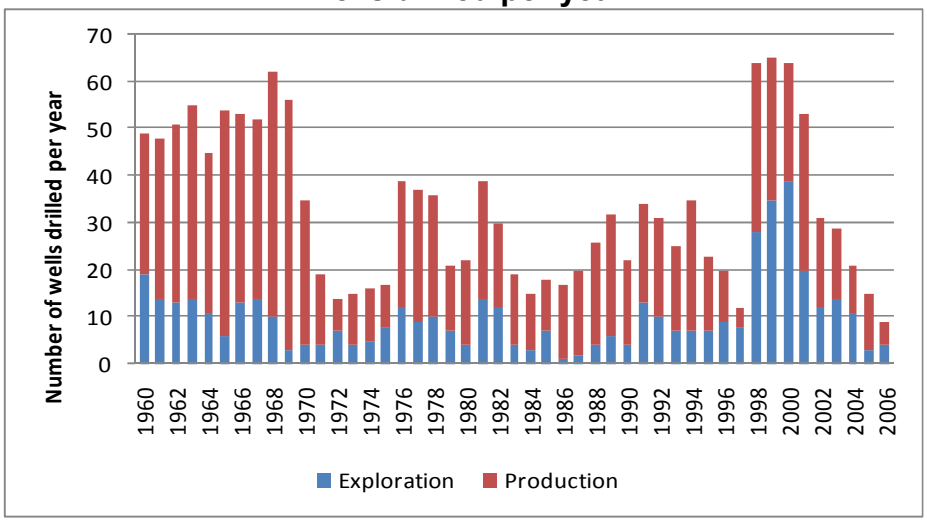
Institutional changes and investment flows

The nature of the institutional setting has played an important role in attracting foreign investment flows to the hydrocarbons sector in Bolivia. During the 60s, when the tax framework was very favorable to oil companies, there were intensive exploration and exploitation activities. The number of well drilled between 1960 and 1969 averaged about 52.5 wells per year during that

decade. With nationalization and the transfer of BOGOC's assets to YPFB, the number of well drillings reduced sharply to only 24.9 on average during the 1970s (graph 8). During the 1980s, the number of well drilled did not increase substantially, remaining at an average of 23.8 per year.

During the years previous to the structural reforms introduced in the 1990s, drilling activities remained at its customary low historic levels of only 25 wells per year. Law 1689 created the necessary legal framework to attract private investment in a period when the prospects of the hydrocarbons sector in Bolivia were uncertain and the public resources necessary for a massive investment needs were not available.

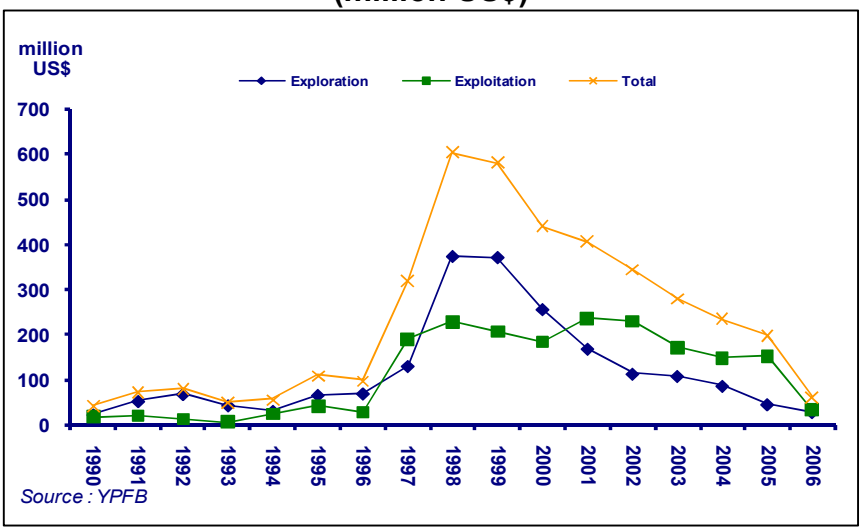
Graph 8
Wells drilled per year



Sources: Own source based on Miranda (1999), López (2007)

The sectoral reforms that were undertaken, the gas export contract signed with Brazil, the construction of the natural gas export pipeline to Brazil, and the capitalization of YPFB brought about a significant increase in drilling activities in Bolivia, jumping the number of wells drilled to an average of 61 wells per year during the period 1998-2001. The reforms brought about a significant increase in investment flows to the hydrocarbons sector, not only in drilling activities but also in the construction of transportation infrastructure, like the gas export pipeline to Brazil.

Graph 9
Foreign Direct Investment in the Hydrocarbons Sector
(million US$)



Source: Own source based on YPFB, INE

Between 1990 and 1996 average foreign direct investment flows to the hydrocarbons sector, in exploration and exploitation activities, averaged US$ 74 million. With the structural reforms, investment flows went up to an average level of US$ 400 million a year for the period 1997-2004 (graph 9). During that period, the total amount invested in the hydrocarbons sector, in exploration and exploitation activities totaled US$ 3,216 million. Adding to this value the amount invested in transportation and compression infrastructure, increases the total amount invested in the hydrocarbons sector up to US$ 4,406 million for this period.

Due to the political volatility the country experienced from the beginning of the 2000s, investment flows to the hydrocarbon sector sharply reduced starting from 2005. Foreign investments went down from US$ 604 million in 1998 to only US$ 63.9 million in 2006. Besides, tax increases brought about by Law 3058, and the institutional changes introduced by the Nationalization Decree considerably discouraged private investors from undertaking additional investments in Bolivia. The number of drilling teams working in Bolivia has reduced from 13 in 1999 to only 3 in 2007.

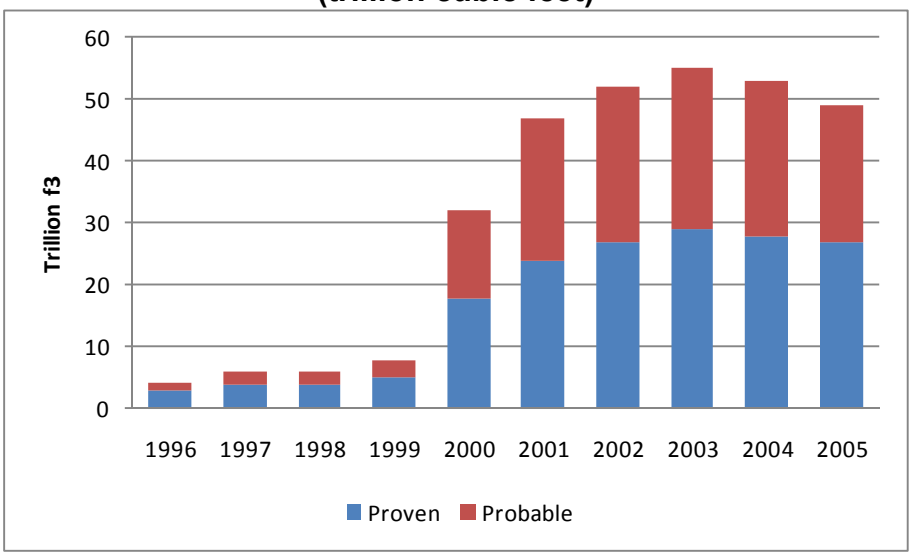
Besides, several investment and export projects have been cancelled due to the institutional and political volatility. Among the most noticeable were the natural gas export project to the United States and Mexico involving LNG technology, and the construction of a second natural gas export pipeline between Bolivia and Brazil, which had at least doubled the volumes of gas exported by Bolivia to that country.

Thus, although Bolivia has obtained significant benefits in the form of additional hydrocarbons tax revenues, as a result of tax increases approved through Law 3058 and SD 28701, the institutional volatility created by these changes have also created significant trade-offs in terms of a sharp decrease in investment flows, the cancelation of important investment projects, and eventually the lost of Bolivia's potential to become a hub in the distribution of hydrocarbons in South America. This sharp decrease in investment inflows to the hydrocarbons sector has paradoxically occurred at a moment world prices of oil are at their highest historic levels ever.

Investment flows and reserves

Hydrocarbons reserves depend very much on the patterns followed by investment flows. As a result of the large investment inflows materialized at the end of the 1990s and beginning of the 2000s, hydrocarbons reserves increased significantly. Natural gas reserves went up from 4.3 trillion cubic feet in 1996 to 55 tcf in 2003 (graph 10).

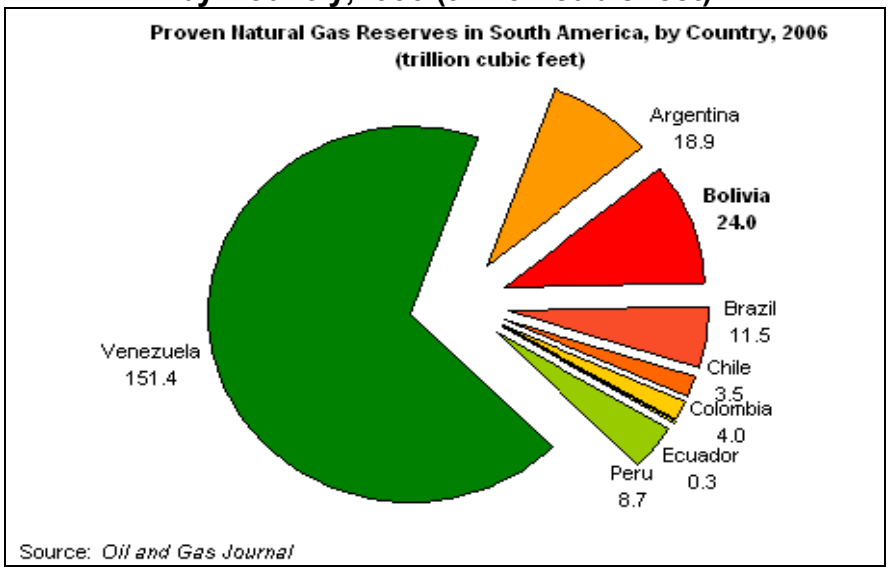
Graph 10
Bolivia's Natural Gas Reserves
(trillion cubic feet)



Source: Own source based on López (2007), INE

These large increases in reserves converted Bolivia in the second country with the largest natural gas reserves in South America, owning 10% of the proven existing reserves in the continent in 2006 (graph 11).

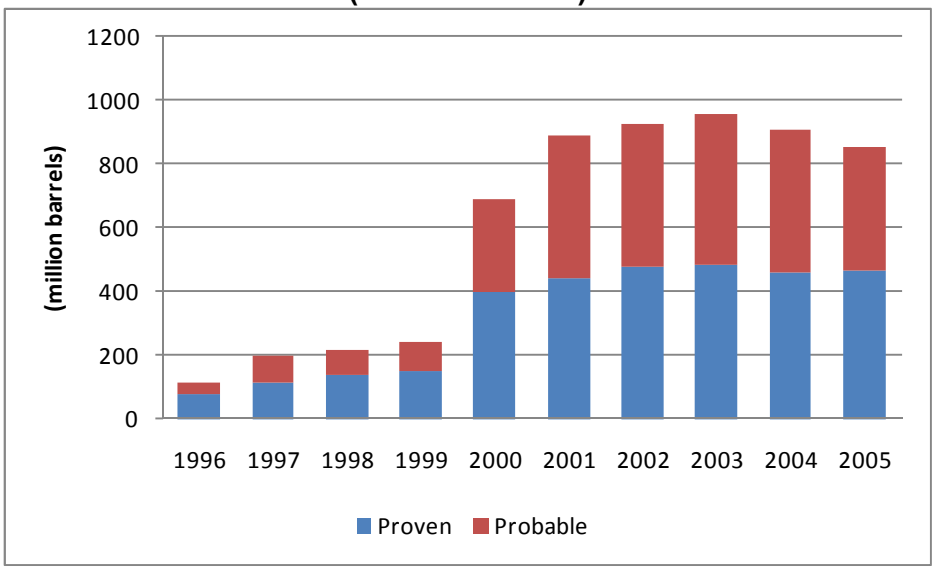
Graph 11
Proven Natural Gas Reserves in South America,
by Country,2006 (trillion cubic feet)



Conversely, the reduced investment inflows resulting from the institutional and political volatility Bolivia exhibited in the last years caused a drop in hydrocarbon reserves starting from 2004. According to López (2007), natural gas proven reserves went down from 28.7 TCF in 2002 to only 19.3 TCF in 2007.

Likewise, Bolivia's crude oil reserves have also increased sharply as a result of the large investment inflows encouraged by the structural reforms implemented during the 1990s, jumping from 118 million barrels in 1996 up to 957 million barrels in 2003. By 2005, proven reserves had reduced to 856 million barrels, and this decreasing trend has probably continued thereafter.

Graph 12
Bolivia's Crude Oil Reserves
(million barrels)



Source: Own source based on YPFB, INE

V. Subsidized Domestic Markets

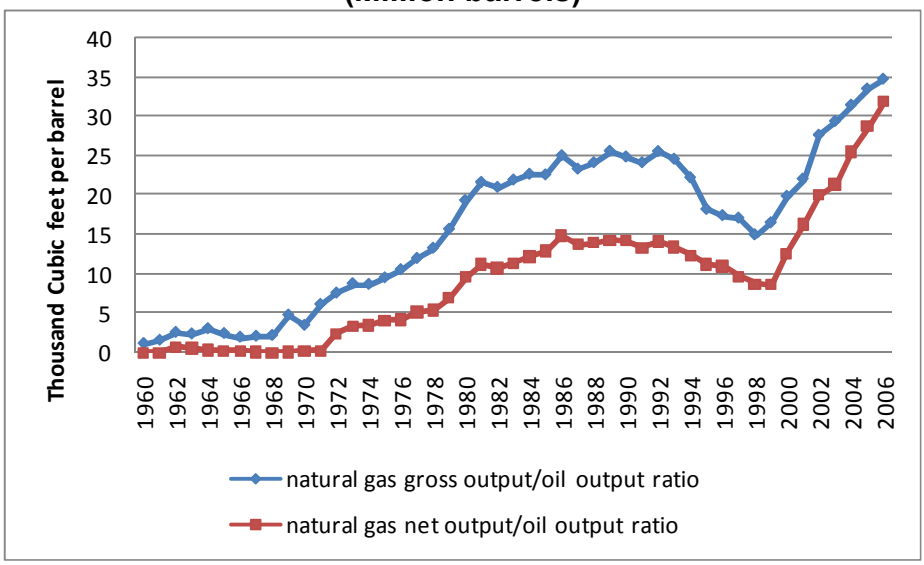
As discussed earlier, Bolivia´s domestic consumption of hydrocarbons has tended to increase overtime. The domestic consumption of oil increased at a yearly average growth rate of 3.3% over the last 46 years, from 6.2 thousand barrels a day in 1960 up to 28.2 thousand barrels a day in 2006. Domestic consumption of natural gas on the other hand, increased at an annual average

growth rate of 12.3% over the last 40 years. Natural gas domestic consumption raised from 0.1 million cubic meters a day in 1966 to 6.2 million cm/d in 2006.

Since the beginning of the 1980s, oil production has been mostly devoted at satisfying domestic markets. Exports mainly consisted of surplus output that was not absorbed by domestic markets. Conversely, natural gas production has been mainly devoted at export markets, being domestic consumption a smaller proportion when compare with export volumes. This pattern has accentuated after 1999, once Bolivia started exporting natural gas to Brazil.

Bolivia has difficulties to increase its oil production, and thus had problems to satisfy its domestic demand, let alone generate exportable surpluses. Hydrocarbons reserves in Bolivia have a much larger concentration of natural gas, with relatively small volumes of liquid oil associated to them. This pattern has tended to accentuate over time. In the 1960s, the ratio of natural gas *vis-à-vis* crude oil production was 2 thousand cubic feet of gas per barrel of oil. At the beginning of the 1990s the ratio had increased up to 25. Between 1993 and 1999 it decreased, due to the reduced volumes of gas exported to Argentina, reaching in 1998 a value of 15. Starting from 2000 however, the ratio tended to increase again, once exports of natural gas to Brazil started, reaching in 2006 a value of 35 (graph 13).

Graph 13
Natural Gas to Oil Output Ratio
(Million barrels)

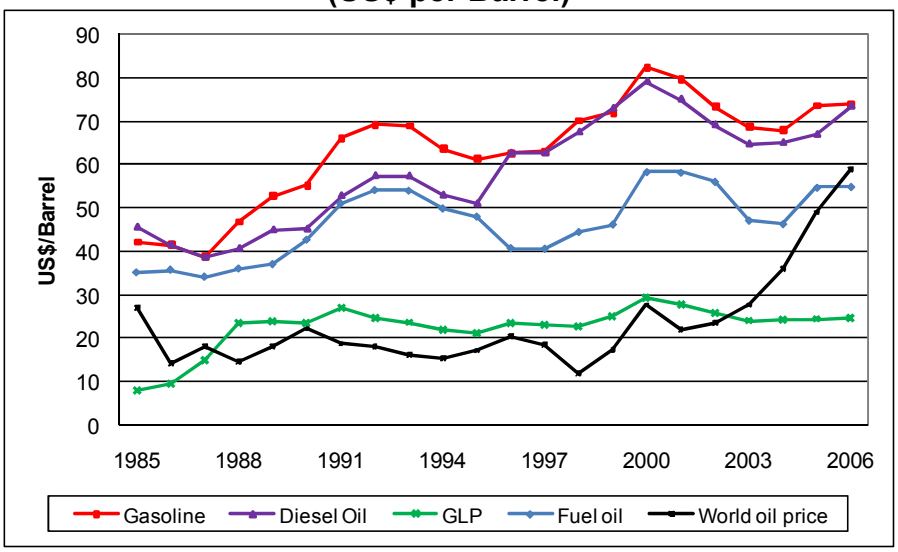


Source: Own source based on YPFB, INE

Thus, oil production capacity depends very much on natural gas production, which in turn depends on the existence of large markets for gas. Given the narrowness of domestic markets for gas, the only alternative to generate oil surpluses is by exporting increased volumes of natural gas to much larger markets, like those of Brazil or United States.

Bolivia can satisfy its domestic demand of fuels, by processing crude oil in the two oil refineries existing in the country, with a capacity to process xx barrels per day. Besides, transportation of gas, LPG, oil and oil by-products to local markets takes place through the existing system of pipelines (map 2). The main refinery by-products produced are gasoline, diesel oil, jet fuel and LPG that comprise 96% of total volume processed in the refineries. Bolivia is self sufficient in gasoline, LPG, natural gas and other fuels. However, starting form 2000, the country had to import increasing volumes of diesel oil to satisfy its domestic demand.

Graph 14
Domestic Prices of Fuels
(US$ per Barrel)

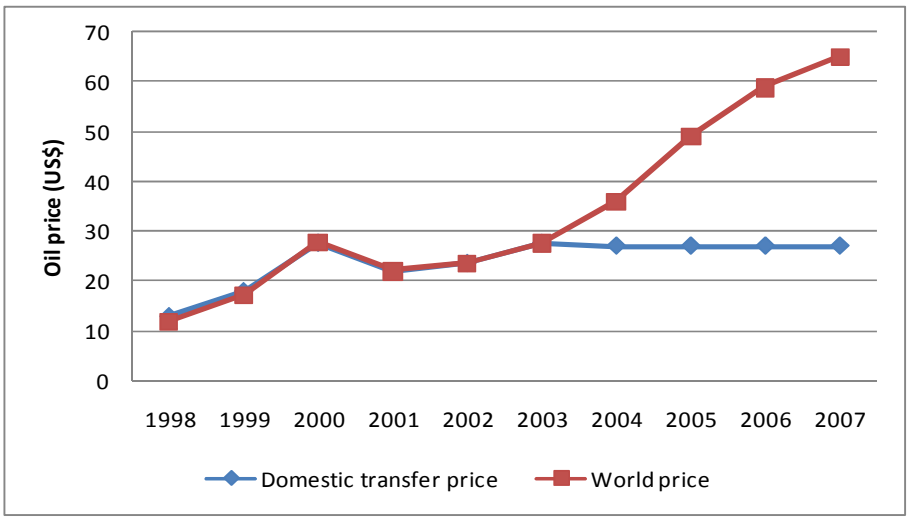


Source: Own source based on YPFB, INE

Domestic prices of fuels have been mostly administrated by the state. Staring from 1985, prices were utilized as a means to increase government revenues in order to balance the fiscal budget (graph 14). During the second half of the 1980s and 1990s, domestic prices increased despite world prices of oil remained largely stable. During the 2000s however, this trend reversed. As will be explained below, domestic fuel prices were frozen, at the time world prices of crude oil began to rise to unprecedented levels, creating large distortions in terms of production, consumption, fiscal costs, etc.

Currently, domestic fuel prices are regulated by the state, which established a detailed price chain, including the IEHD which is excise tax created in 1996. The existing legal framework: i) defines the reference prices for all hydrocarbons products; ii) sets reference prices to calculate royalties for crude oil and natural gas; and iii) defines a full price chain for refined products, starting from ex-refinery prices. Most fuel products are subject to the IEHD, with regular gasoline and diesel generating the most revenues. Liquid petroleum gas (LPG) and imported diesel, on the other hand, are directly subsidized by the budget (Gillingham and Medas, 2004).

Graph 15
Domestic and World Price of Oil
(US$ per Barrel)



Source: Own source based on EIA and Ministry of Hydrocarbons

Law 1689 established a domestic pricing system of fuels based on an automatic adjustment mechanism to external prices. As international prices have risen to historic levels, the automatic adjustment mechanism switched to a system in which domestic prices are mostly fixed, with retail prices having little relation to international prices. A SD approved in 2002 determines a ceiling for the transfer price for crude oil sold to refineries, equal to US$ 27.1 per barrel (graph 15).

The inflexibility of domestic retail prices have resulted in serious distortions and fiscal costs, leading to large explicit and implicit subsidies. Among these costs and distortions are:

i. The energy price policy has contributed significantly to increased fiscal costs. Revenues from excise taxes have fallen as a share of GDP and subsidies have risen from US$ 17.3 million in 2002 up to US$ 117.3 million in 2006.

ii. Maintaining regulated prices below market prices has created incentives for an inefficient use of energy, increased smuggling and created shortages, particularly for diesel and LPG.

iii. The reduction in reference prices for producer has resulted in implicit regulatory taxation. These reductions have shifted the burden of maintaining fixed prices from the budget to producers. Such an imposed transfer from producers to consumers leads to distortions that reduced incentives for investment and lead to smuggling.

VI. Geography and Hydrocarbons Activity

Geography has also played an important role in determining the hydrocarbons sector behavior in Bolivia. The Bolivian territory has demonstrated to have a significant potential to produce hydrocarbons. According to various authors (Montes de Oca 1997, I.E. Services 2001), about 50% of Bolivia's territory has a potential to produce hydrocarbons, comprising 535,000 Km^2. Thus far, only 8.5% of this area has been effectively explored and exploited. The areas with the greatest potential to produce hydrocarbons are the Eastern Plains (Llanura Oriental) and the Sub-Andean Strip (Franja Subandina) (see map 1). Historically, all exploration activities have been concentrated in the south-east part of the country. Table 3 shows the number of exploration wells drilled in Bolivia between 1922 and 1995, grouped by their geographic location. Ninety percent of all exploration wells drilled during that period were located in these two areas. Out of 475 exploration wells drilled in that period, more than 90% were located in the Sub-Andean Strip (141) and in the Eastern Plains (286). The success rate of exploration well drilling has been relatively low in Bolivia, since on average, only 32% of all wells drilled eventually produced hydrocarbons.

Table 3
Geographic Distribution of Exploration Drilling Activities in Bolivia
(1922-1995 period)

	Wells Drilled (Number)	Wells Drilled (percentage)	Success Ratio (percentage)	Total Cost (million US$)	Meters Drilled (meters)
Sub-Andean North	4	0,8%	0,0%	23,8	16.027
Sub-Andean Centrum	13	2,7%	38,5%	40,2	36.548
Sub-Andean South	141	29,7%	26,2%	227,6	279.306
Eastern Plains North	5	1,1%	20,0%	12,3	6.219
Eastern Plains Centrum	176	37,1%	40,3%	301,4	512.679
Eastern Plains South	110	23,2%	25,5%	228,7	355.750
Eastern Plains East	6	1,3%	0,0%	10,8	18.051
Plains Boomerang	5	1,1%	60,0%	12,3	15.686
High-Platoo North	2	0,4%	0,0%	1,7	5.777
High-Platoo South	3	0,6%	0,0%	6,8	10.266
Western Mountain Range	7	1,5%	100,0%	3,9	9.105
Madre de Dios Basin	2	0,4%	0,0%	3,6	3.237
					0
Total	475	100,0%	32,0%	876,6	1.272.777

Source: Own source based on YPFB, INE

At the end of the 1990s and beginning of the 2000s, the bulk of the increased drilling activities, resulting from the structural reforms implemented, basically took place in the Sub-Andean South and Eastern-Plains South areas. In 2004, the four largest fields, containing 84% of all proven reserves existing nowadays in the country, were located in these areas, in the southern Chaco province.

Another important geological feature of the hydrocarbon production in Bolivia is that Bolivian hydrocarbons are natural gas intensive, with liquid oil production attached to the production of gas. As stated in the previous section, this feature has tended to accentuate overtime, especially once Bolivia began exporting natural gas to Brazil in larger quantities.

Bolivia's geographic location at the heart of the South American continent, together with the significant potential to produce hydrocarbons of its territory, made the country the prospects to become a major player in the energy business in the region.

First, Bolivia has common borders with Brazil and Argentina, the largest economies in South America, with a large potential to consume and import

energy. Other countries like Chile, has large energy needs as well and could eventually become an important importer of Bolivian natural gas.

Second, Bolivia has built the infrastructure required to fulfill its current export contracts. Natural gas exports to Argentina started in 1970s, through a gas export pipeline built at the end of the 1960s (see map 2). At the end of the 1990s, the gas export pipeline to Brazil was built, with the capacity to pump 30 million cm/d. Exports of crude oil surpluses and natural gasoline are carried out through the Pacific Ocean, through the SicaSica-Arica pipeline built during the 1960s.

Third, geography could also be a problem given that Bolivia is landlocked, it means that is has to export gas and oil trough pipelines and as mentioned in the paper to develop new production, more pipelines have to be constructed. In that respect, it differs from countries that have access to the sea and can easily ship oil and LNG trough tankers. If Bolivia is able to materialize new export projects, like the LNG project or the gas export project to Argentina, it will be necessary to construct additional transport infrastructure that will require large investment inflows. Furthermore, new export projects will not only demand additional investments in infrastructure but also in the exploration and development of new hydrocarbons reserves.

Fourth, the institutional and political volatility Bolivia has exhibited recently comprises a serious jeopardy for Bolivia's prospects to materialize new export projects, and become a major player in the continent energy business.

VII. Conclusions

As stated in the introduction to this research paper, Bolivia's hydrocarbons sector behavior has exhibited significant fluctuations overtime. Various factors have tended to determine this trend. The volatility of the institutional framework that regulates the sector activities has considerably influenced investment flows.

The sector has exhibited a cyclical pattern over time, with periods of greater private participation in the hydrocarbons activities, followed by nationalizations that increased the role of the State.

Overall, the hydrocarbons sector performance in Bolivia has been driven more by institutional changes than by comparative advantages. Those changes reflect distributional conflicts between the state and producers. Historically, the most noticeable jumps in the country´s capacity to produce and export hydrocarbons have been the result of foreign companies' investments, namely the Standard Oil Company in the 1930s, Gulf Oil Company in the 1960s, and Petrobras, YPF Pérez Compano-Pluspetrol and Amoco Petroleum Company during the 1990s and 2000s. Only during the 1950s, YPFB attained a noticeable increase in production, but it was comparably much smaller than the increases attained during the periods of large foreign investment flows by companies, i.e. 1960s and 1990s. In fact, the two main export projects of natural gas in Bolivian history, i.e. to Argentina in the 1970s and to Brazil in the 2000s, only could be accomplished thanks to large investment inflows by TNCs. In both cases, it was the state that administrated the export contracts, after nationalizing investments previously undertook by foreign companies.

The discussion above fits with the arguments in Manzano-Monaldi (2007), that the government tends to change the rules of the game after high sunk costs have been deployed, significant reserves have been added, and/or prices increase and the fiscal system is not progressive enough. Over the long term however, these institutional changes tend to limit the development of the sector by creating cycles of investment and expropriation. In the Bolivian case, these policy changes were implemented as a result of all of the three following government behavioral patterns: opportunistic/shortsighted, ideological, and the product of political instability.

The changing institutional framework has introduced considerable shifts to the tax system and the contractual conditions between the state and the oil

company. Overall, the tax framework in Bolivia has relied more on production taxation, where the government take has customary been of about 50% of total production at the wellhead. Shifts to this system have resulted in a halt of investment inflows during prolonged periods. Thus, the sector remained largely stagnated during most of the period covered in the analysis. The reforms introduced during the 1990s tried to reverse this pattern, by introducing a less distortional tax system, which comprised a more balanced distribution of the tax burden between production taxes and net income taxes, as well as between upstream and downstream activities. This system proved to be very effective in bringing about large investment inflows to the sector, resulting in sizeable increases in hydrocarbons reserves and output, which permitted Bolivia to fulfill its natural gas export contract with Brazil.

Conversely, the net profit based tax system generated among the population and politicians, the perception that it unfairly favored foreign companies, in detriment of the state. Thus, it led to nationalizations and to changes in the hydrocarbons law and to a return to a production based tax system, which substantially increased government revenues in the short term, but caused a considerable drop in investment flows and reserves.

The existence of large export markets for hydrocarbons production has been another important driving force for the sector´s development, but conditioned to institutional stability and favorable tax and contractual conditions. Again, the two episodes of sizable increases in the production potential of the country were linked to the existence of export contracts of natural gas to Argentina in the 1970s and to Brazil in the 2000s. However, the institutional volatility caused the cancelation of important energy projects in the 2000s, like the LNG export project to Mexico and US, and the construction of a second export pipeline to Brazil. Therefore, the additional investment in exploration and development of new natural gas fields, that had been necessary to supply those markets, never materialized.

Thus, the discussion above shows that institutional factor has been paramount in determining the hydrocarbons sector performance in Bolivia. These factors have prevailed over external market conditions in determining the hydrocarbons sector development. Significant price increases in the world price of oil, like those occurred during the 70s and 2000s, have not been directly linked to the increased investment flows and enlarged output levels observed during those periods. During the 1970s, when world oil prices sky rocketed, hydrocarbons output increased but mainly due to the export gas contract previously signed with Argentina. Price increases occurred when exports had already begun. Likewise, the significant increase in hydrocarbons output occurred during the 2000s, was the result of structural reforms and of the export contract signed with Brazil, and not precisely due to the high prices of oil prevailing at the world markets which occurred after exports started.

Finally, institutional factors are also more important than geographic conditions in determining the hydrocarbons sector behavior. Although Bolivia´s territory has the appropriate geological conditions to produce hydrocarbons, the institutional volatility has discouraged investment flows, causing the hydrocarbons sector to remain largely stagnated overtime. The proximity to large energy markets, like those of Argentina and Brazil, also increases Bolivia's attractiveness to foreign oil companies to invest in the country. However, the institutional stability and rationality seems to be a necessary condition for companies to invest in the country.

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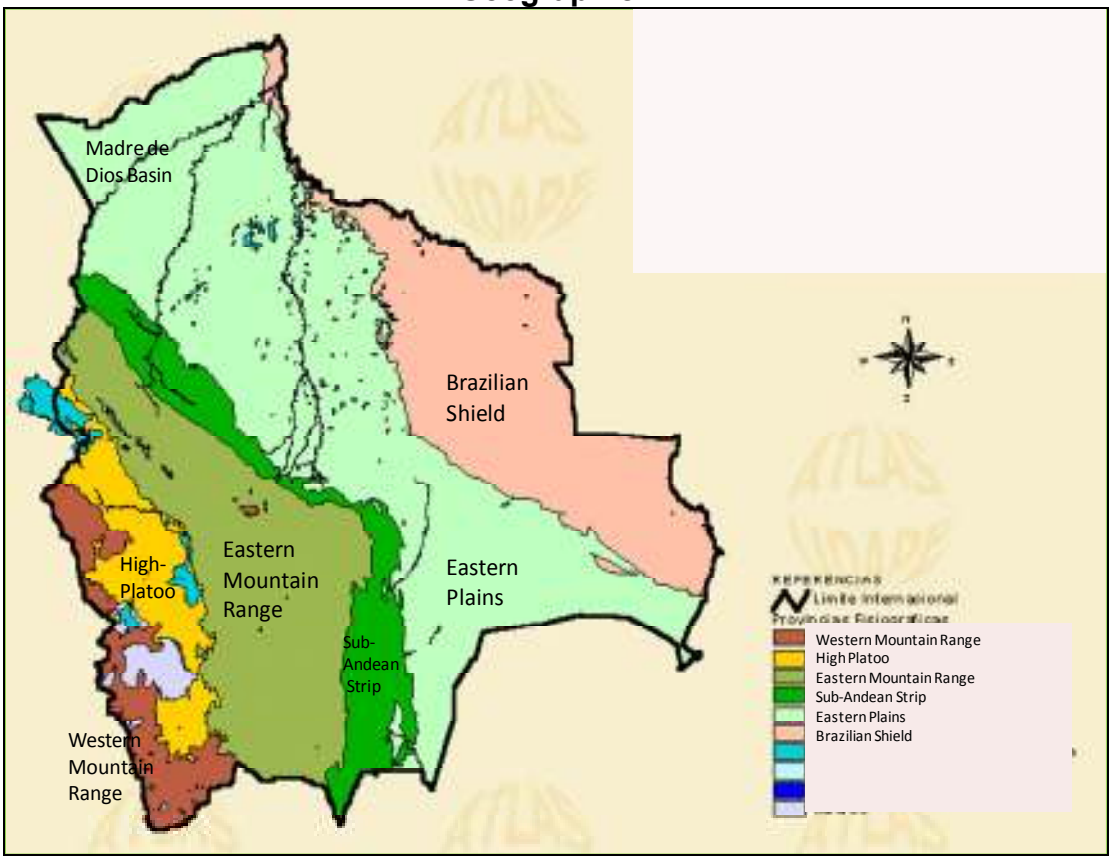
Annexes

Map 1
Geographic



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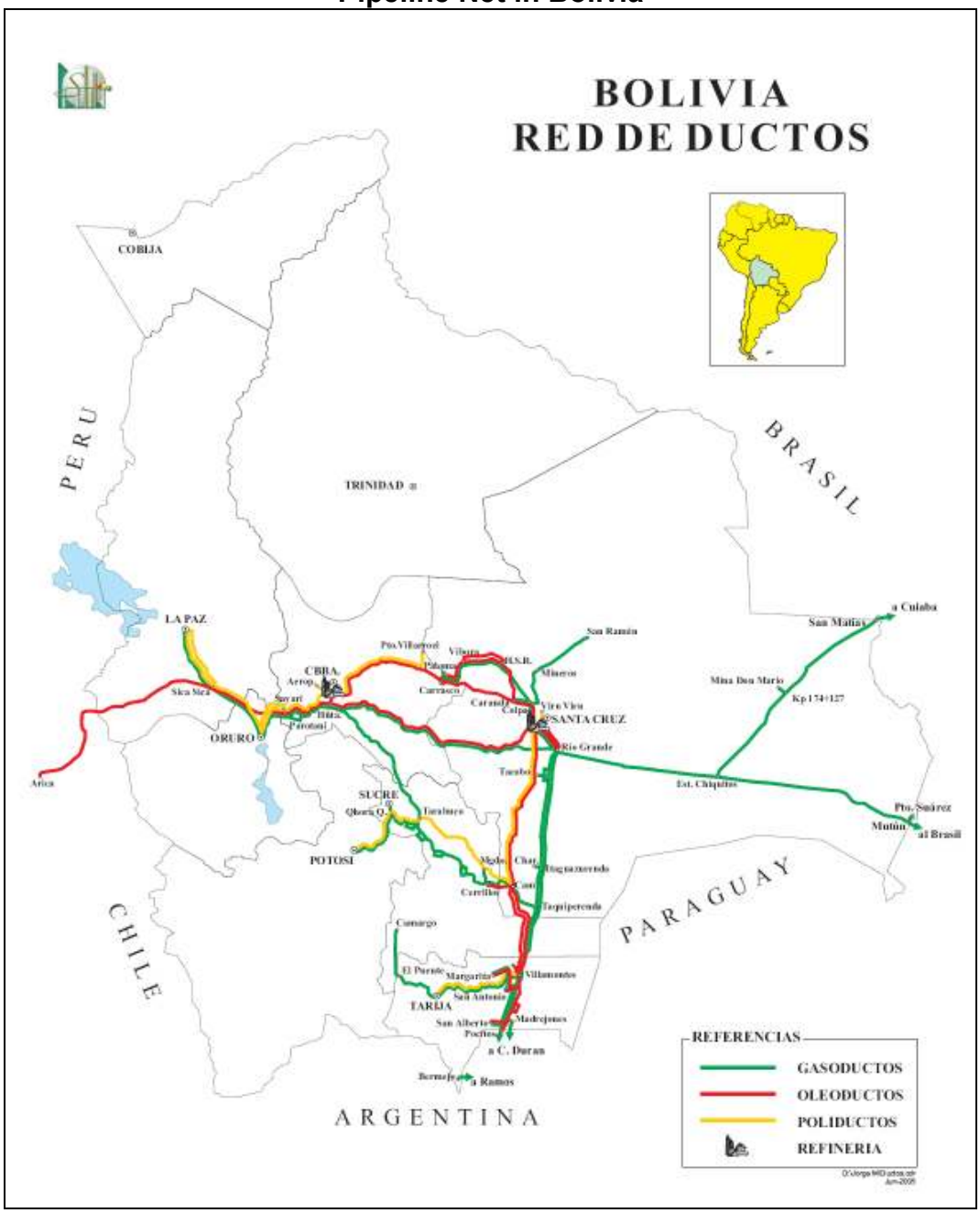
Graph 2
Pipeline Net in Bolivia