AN ANALYTICAL STUDY OF REGULATION QUALITY IN BRAZIL: ELECTRICITY AND OIL AND GAS SECTORS

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INTRODUCTION

The literature on institutional design assumes that a good regulatory policy stimulates efficiency. The manner in which the political and social institutions of a country interact with the regulatory process influences economic conditions, directly affecting investors' confidence and the performance of the regulated sectors. OECD (2004) defines regulatory quality as a framework in which regulations and regulatory regimes are **e**fficient in terms of cost, effective in terms of having a clear regulatory and policy purpose, transparent, and accountable.

Between 1996 and 2002, Brazil establishes independent regulatory agencies for infrastructure sectors as part of a large privatization program. This regulatory transformation reflects the profound economic and social change of the past few decades in Brazil. Since then, the creation of regulatory agencies has been the subject of intense controversy. Specifically, the level of political and administrative independence and autonomy in relationship to the executive power has been the principal point of debate.

The main goal of this paper is to evaluate the quality of regulation in the electricity and oil and gas sectors in Brazil. In addition, there will be a discussion of both qualitative and quantitative methods to measure quality of regulation in terms of the ability to satisfy standards of efficiency to attract foreign capital and provide welfare gain to the Brazilian consumers.

This paper is divided into four sections. The first section emphasizes the Brazilian economic history by exposing some main structural changes in the economic and political setting from 1950's to today. These structural transformations of the Brazilian economy are relevant to understand the evolution of the competition policy which precedes the emergence of regulatory agencies.

Section 2 there will be an overview of the Brazilian regulatory agencies, especially National Agency of Petroleum, Natural Gas and Biofuels (ANP) and Brazilian Electricity Regulatory Agency (ANEEL). This section provides a brief summary of both electricity and oil and gas sectors and its corresponding regulatory agencies.

The purpose of section 3 is to analyze the regulatory framework using a qualitative approach. Later, on this section there will be an exposure of the main problems on the current regulatory model and suggestions of instruments to measure the quality of regulation in oil and gas and electricity sectors.

Section 4 uses a quantitative methodology for capture aspects of a good regulation. Specifically, this paper will describe different forms by which literature has sought to measure the quality of the regulatory agencies. Some indexes use quantitative instruments to measure the regulation quality of the electricity and oil and gas sectors in Brazil.

1. STRUCTURAL REFORMS: BACKGROUND FOR THE EMERGENCE OF REGULATORY AGENCIES

After a long period of state intervention, Brazil experienced a move towards liberalisation and privatisation in the early 1990s. According to Oliveira and Konichi (2006), there were four main structural changes that influenced the institutional changes Brazil. These changes were trade liberalization, privatization, regulation and stabilization. Additionally, the Real Plan created a favourable environment for regulatory reform with greater economic openness, institutional reforms, stable inflation and a modern competition framework (OECD, 2008).

Hudson (1997) study on the Brazilian economy states that on the 1950's the government adopted an explicit policy of import-substitution industrialization to change the structure of the Brazilian economy. Under the import-substitution model, the Brazilian government intervened in several economic sectors in order to induce industrialization. This model was characterized as a closed economy, which produces for the domestic market.

As a consequence, the Brazilian economy showed high growth rates that were sustained until the mid-seventies. However, after the oil shock this model presented several limitations due to lack of external funds and a fiscal crisis of the Brazilian state.

By the eighties, inflation had already soared to triple digits and Brazil experienced hyperinflation. These factors, combined with falling productivity in the state sector, led to major changes in the policy regime.

The emergence of competition and regulatory agencies had not been a consequence of the natural evolution of a market economy. But, an attempt to correct state sector inefficiencies and to disseminate market institutions after years of import-substitution policy during which the state played a predominant role in the market.

The first structural change was the trade liberalization. The policy adopted eliminated special import regimes and reduced non-tariff barriers. The result of this change was a drop of the maximum tariff from over 100% to 38.1% in 1998.

The second change (privatization) reduced the state intervention in the market. In the first phase, the enterprises privatized had been acquired by the state owing to financial difficulties, and their privatization simply meant resale to the private sector. During the 90's decade, the program focused on privatizing enterprises in steel, petrochemicals and fertilizers that did not require major regulatory changes. In the third phase, under the first Cardoso administration (1995-98), the program comprised the sale of the state-owned enterprises most directly active in infrastructure sectors such as telecommunications, electricity and railroads.(Oliveira and Konichi, 2006)

In all, the privatization program represented gains of US$ 86.9 billion; of which US$ 70.3 billion corresponded to actual revenue from sales (Chart 1).

Chart 1: Brazil - privatization program data (1991-1998)

Sector	Number of companies	Assets sold	Debt Transferred	Total
Federal companies	81	46581	11326	57907
Steel	*8*	*5562*	*2625*	*8187*
Petrochemicals	*27*	*2698*	*1003*	*3701*
Electricity	*3*	*3907*	*1670*	*5577*
Railroads	*6*	*1697*	*-*	*1697*
Mineral extraction	*2*	*3305*	*3559*	*6864*
Telecommunications	*21*	*26970*	*2125*	*29095*
Others	*14*	*2442*	*344*	*2786*
State-government firms	26	23724	5311	29035
Total	107	70305	16637	86942

Source: Pinheiro and Giambiagi (1997)

Due to the importance of this policy and the elements of natural monopoly involved in many economic sectors, the regulatory issues became the central debate of the public policy agenda.

As part of the infrastructure was privatized, it became clear that the state would have to design specific regulatory frameworks. Note that in the U.S. many regulatory agencies preceded the antitrust authorities. In contrast, in Brazil they were created after a competition law was in place. Antitrust bodies were the ones with certain expertise to deal with the vertical and horizontal problems which typically arise in regulated industries (Oliveira and Konichi, 2006). And the Brazilian initiative was mainly federal instead of subnational governments. Recently, there were some significant efforts by some states as well (e.g. Sao Paulo, Rio Grande do Sul, and Bahia).

The fourth change was the stabilization plan focus to control inflation in Brazil. Facing imminent hyperinflation and a virtually bankrupt public sector, the government introduced several stabilization plans to promote fiscal and monetary stability. But only in 1994, with the Real Plan, the inflation was controlled and Brazil started to attract foreign investments again. In this stage of the twentieth century, the Brazilian economy became a more open market.

In sum, the objectives of regulatory reform and privatization were to facilitate the environment for attracting new private investment, including from abroad, to increase efficiency and reduce the public debt.

2. CREATION AND FUNCTIONING OF THE BRAZILIAN REGULATORY AGENCIES

Besides economic liberalization and deregulation of industrial sectors to increase the space for market based development, the economic reforms in Brazil have also focused on development of infrastructure services. This is understandable since poor quality of infrastructure services not only hampers the economic growth but also has serious impact on the standard of living, particularly of the poorer and rural population. Although the government of Brazil has encouraged development of competitive markets in the infrastructure services, their institutional structure and the necessary information and analytical capabilities to support policy and decision making in the area have not yet developed fully.

The Brazilian regulation policy is a reflection of structural and institutional changes mentioned in last section. Although it seems obvious that Brazil needs regulatory agencies and more competition to improve economic efficiency, there were

several challenges and peculiarities to implement competition policy and regulatory agencies in developing countries.

The general characteristics of the institutional environment posed in the previous section show certain specificities depending on the sector that is regulated. Although most elements of institutional endowments are common to all sectors within a same country, regulatory design can vary across sectors. Empirical data show that there are a wide variety of government choices for regulatory design, producing different outcomes across sectors. As a general consequence, currently prospects for private participation in infrastructure are not optimistic, and perception among private investors of regulatory risk appears to have augmented.

Creation of regulatory agencies accompanied the process of opening infrastructure sector markets to the private sector, either through total privatization (telecommunications and rail transport), or through partial privatization (electricity), or by means of a mere permission for private organizations to enter the market without privatizing the state enterprise. For instance, although the privatization program was one of the largest in the world in absolute terms, many state companies still have maintained dominant position in various markets, such as postal services, water and sewage and oil.

Chart 2 shows, in chronological order, the regulatory agencies created in Brazil in the second half of the nineties.

Chart 2: Brazil - Regulatory Agencies

Regulatory agency	Sector	Law
ANEEL	Electricity	Law No. 9427, 1996
ANATEL	Telecommunications	Law No. 9472, 1997.
ANP	Petroleum and Gas	Law No. 9478, 1997.
ANVISA	Health	Law No. 9782, 1999.
ANS	Health	Law No. 9961, 2000.
ANA	Water	Law No. 9984, 2000.
ANTT	Transport	Law No. 10233, 2001.
ANTAQ	Transport	Law No. 10233, 2001.

Source: Machado et al. (2004)

The "New Regulatory State" was defined by the country's Constitutional Amendments 5, 6, 7, and 8. These established the legal regime of natural gas

exploitation by the states; research and extraction of mineral resources; air, aquatic and terrestrial transportation; and telecommunications services. Amendment 9 abolished the legal oil and natural gas monopolies and created the regulatory agency for the oil and gas sector (OECD, 2008).

A common characteristic among these agencies is that they promote concessions for the use of public resources or they engage in the provision of services. Precise delineation of the functions of regulatory agencies is provided by the rules determining the ministerial connection of the agency, its attributes and the influence of other institutions in the decision making process. Ministerial connections of agencies were conceived on the lines of a legal form of a quasi-independent government agency under a special regime, connected to a Ministry, but not hierarchically subordinated to it.

The creation of regulatory agencies as quasi-independent agencies under a special regime was important to ensure financial and structural independence, and avoid subordination to any particular Ministry. This enabled these agencies to enjoy political and decision making independence and to take decisions on the basis of technical rather than political criteria, as is frequently the case in bodies subordinated to Ministries.

In the Brazilian case, the role of regulatory agencies, as corporate entities under public law, involves supervising, regulating, rule making and implementing policies drafted by ministries. At times, agencies also perform arbitration and mediation. In the next subsections, the characteristics related to both petroleum and electricity agencies are closely specified.

A. NATIONAL AGENCY OF PETROLEUM, NATURAL GAS AND BIOFUELS (ANP): EMERGENCE AND CHALLENGES

The Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP) is the federal government agency linked to the Ministry of Mines and Energy responsible for the regulation of the oil sector. Additionally, ANP has jurisdiction to authorize and control activities related to production, import, export, storage, distribution, sale and marketing of biofuels. The focus of this report will be only in oil and gas sectors.

In 1995, a Constitutional Amendment determined the end of Petrobrás' oil monopoly in Brazil. The decision opened the opportunity to the private-owned

companies to explore oil in the country. Petrobrás[1] maintained an exclusive exploration, exploitation, refining, maritime, and pipeline transportation monopoly over petroleum, oil and natural gas.

Constitutional Amendment no. 9/95 opened the petroleum sector to private company contracting while Law no. 9.478/97, in addition to creating the ANP and the National Energy Policy Council (CNPE), become Petrobrás a mixed economy corporation under majority shareholder state control competing in its oil, gas and petroleum-related activities with private enterprise as a concessionaire. Under this new institutional environmental, Petrobrás is first granted exploration and production areas after which the other concessionaires are awarded concession contracts through a bidding process and on the basis of ANP approval of proposed development and production plans.

Pinto Jr. and Fiani (2002) observes that the ANP's regulatory responsibilities are defined in Law 9.748 as follows:

> *"1. to implement an oil & gas national policy; 2. to control directly or via agreement all activities of the oil industry; 3. to promote bidding for oil fields, in order to consolidate the entry process of new companies; 4. to structure and to control royalties and other governmental participations; 5. to establish the criteria for transportation and commercialization of oil & gas; 6. to establish the regulation regarding the access to oilducts; 7. to make sure that good practices are employed to promote the rational use of oil & gas and to protect the environment; 8. to support a data base and to diffuse geologic information; 9. to guarantee the offer of derivatives to all parts of the country; 10. to protect the consumers' interests related to price, quality and availability."*

Chart 3 summarized regulatory changes in petroleum industry after ANP creation.

Chart 3: Regulatory Change in Petroleum Industry

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[1] Petrobrás is Brazil's largest company in terms of profits and revenues, and the 14th largest international oil company.

Activity			Before 1997	After 1997
Upstream (*)	E&P		Petrobras	Competitive Market
	Geological Survey		Petrobras	- Proprietary surveys - Spec surveys
	Geological and Geophysical Databank		Petrobras	ANP´s E&P Shared National Databank
Midstream (*)	Refining		Petrobras	Competitive Market under ANP authorization
	Transportation		Petrobras	- Open access - New agents
	Imports and Exports		Petrobras	Free under ANP approval: oil, natural gas, and oil products (**)
Oil Products and CNG Downstream	Wholesale		208 distributors	280 distributors under ANP authorization
	Retail		"Brand fidelity" 23.900 service stations	"Independent retailers" under ANP authorization 31.434 service stations

* Union monopoly: concession and authorization granted by the State   ** Except for gasoline and gasoil (2002)

Source: ANP (2009)

Theoretically, ANP has both financial and decision-making autonomies. However, in reality Petrobrás continues to dominate the oil market in Brazil, due to the its high degree of verticalization carried out, despite the efforts made to liberalize it. Traditionally, the oil sector can be divided into three production stages: upstream (exploration and production), middle stream (transportation and refine) and downstream (distribution and sales). Petrobrás is definitely the largest oil producer in Brazil. Furthermore, it dominates the middle stream. It manages all the infrastructure of the oil terminals and plumbing systems. In the case of imported oil, by third enterprises, they need to use Petrobrás' installations. It also largely dominated the refining phase and it controls the largest gas distribution company in Brazil. (Paula and Avelar, 2008)

In conclusion, ANP was founded in a consolidated market, but dominated by Petrobrás, which makes it difficult for the state to create a regulatory system focused on the increase of competition and number of players. The private sector had entered the market, but Petrobrás remains dominant upstream, owning nearly all the proved gas reserves and controlling 93% of the high-pressure pipelines through a subsidiary.

In addition, from 2003, uncertainties and difficulties to construct the regulatory agency model to the petroleum sector and the political valorization of the state enterprises at Lula's term, created a negative credibility status for ANP.

In relation to the natural gas sector, Paula and Avelar (2008) consider that the natural gas segment is still in its early stages. Natural gas consumption is a small part of the Brazil's overall energy mix, constituting only 7 percent of total energy consumption in 2006. Petrobrás is the largest producer of natural gas in Brazil. The company reportedly controls over 90 percent of Brazil's natural gas reserves. Nevertheless, Petrobrás controls all segments of the productive chain, except for the downstream segment, in which the local state companies, several with equity participation of Petrobrás, exercise a regional monopoly.

Recently, oil and gas field discoveries in the offshore Campos and Santos Basins, holding out the potential to turn Brazil into a major energy export power. Technical difficulties in exploiting those fields remain serious, but since the late 1990s oil production has nearly doubled and is approaching the level of Venezuela, the regional leader.

The discovery of "pre-sal", a deep petroleum extraction area with a estimate of around 50-100 billions of barrels (similar to OPEP countries level), approximately 6000m of depth and 250-300km from the coast of São Paulo and Rio de Janeiro, has given rise to a debate about the possible uncertainty on how this discovery may influence the current agency model. In 2009 a new regulatory for the oil and gas industry was presented to the Brazilian Congress. As expected, the proposal does not affect prior concessions and includes the creation of a new government entity (Petrosal), the increased attributions of CNPE, and the change from a concession regime to a production sharing agreement scheme in which Petrobrás would become the operator of every field in the pre-salt layers as well as other strategic areas to be defined by the CNPE with a minimum 30% participation.

There are divergent points of views about the effects of this new model on ANP. According to some researchers, there will be some conflicts around the functions of the ANP, which promotes the auctions, and the Petrosal, which has power of to vote and cancel projects. The main question is that the pre-sal project may create retrocession of the actual regulation model. Also, it may increase the potential of rent-seeking opportunities from the state and waste resources with drop on productivity. In sum, these researchers believe that this project will create uncertainties, decrease investments and delay the countries' development process.

There is another point of view that states that there won't be conflicts of the ANP and Petrosal functions, since Petrobrás is an open capital company and Petrosal

deals with interests of the population and of the government. In this case, Petrosal will deal with the social welfare and also the public finance. Besides, the ANP has only the function of regulation and control of the current enterprises.

Both points of view do agree that this new public enterprise will create some uncertainties and risks that will be taken into consideration when foreign and national players plan to invest.

B. BRAZILIAN ELECTRICITY REGULATORY AGENCY (ANEEL): EMERGENCE AND CHALLENGES

The electricity generation base in Brazil is predominantly hydroelectric (85%), with thermal generation playing a complementary role within the system at peak times (Chart 4). An important characteristic of electrical generation within Brazil is the coordination of the operation of hydroelectric plants to optimize the utilization of installed capacity, since the majority of such plants have reservoirs with storage capacity, and since there are wide differences in rainfall between the various river basins.

Chart 4: Brazilian Electricity Generations
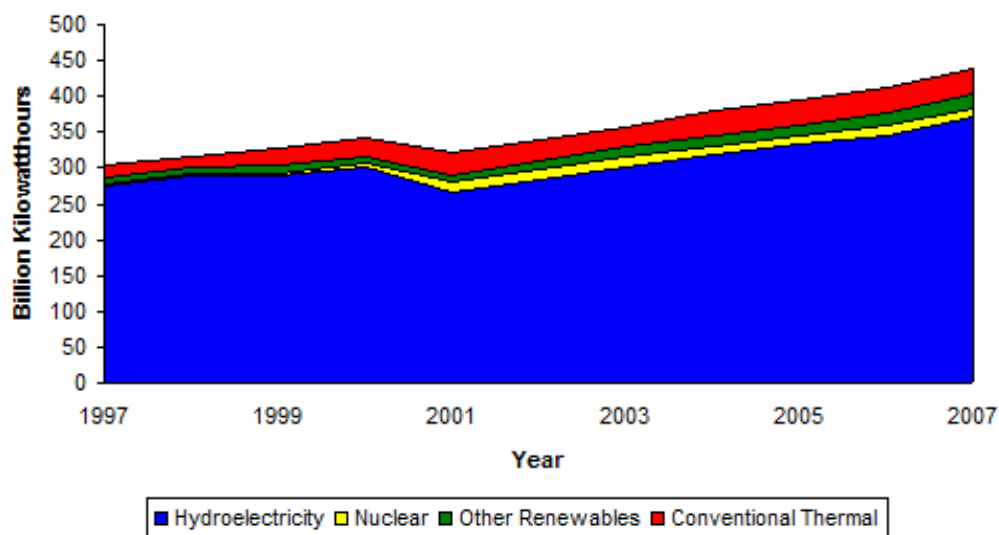
During almost 50 years, the state was the main regulator of the energy sector in Brazil. The state had four functions: financial, operation, regulation and coordination of this sector. On the one hand, the simultaneous operation of these functions allowed economies of scale, rapid decision about technologies and caption of financial resources. On the other hand, the operation by the state was often unclear.

During this period, the Brazilian electricity sector registered high rates of expansion of supply, based on the availability of internal funding through real tariffs, financing by the federal government and funding from abroad (Pires, 1998)

In the 1980s, the Brazilian government systematically decreased prices on electricity in an effort to control inflation. Low prices and low-rated international credit reportedly led to significantly reduced public financing for investment in electricity. The risk of electricity shortages associated with inadequate capacity investment motivated reform of the sector and its regulatory framework. (U.S. International Trade Commission, 2000)

In 1993, the Brazilian electric sector initiated a restructuring process by unbundling the generation, transmission, and distribution components of the existing companies. This ultimately led to the privatization of most distribution assets and some of the generation assets. Prior to 1995, the Brazilian electrical system was characterized by over 99 percent government ownership, no competition among generators, and no choice of electricity supply among retailers or final consumers.

A new institutional framework was established by creation of National Electricity Regulatory Agency (ANEEL) in 1996 to regulate all operations of the power sector. It was inspired by international experience, especially the North American institutional model of independent regulatory agencies. The main characterizes of this reform is shown in Chart 5.

Chart 5: Brazilian Electricity Sector Pre and Post Reform

Pre-Reform	Post-Reform
A few state-owned companies	Privatization and a large number of agents
Vertically bundled industry	Vertical unbundling of the industry
Regional/state monopolies for generation, transmission and distribution	Competitive generation and distribution regulated monopolies on transmission systems and shared distribution
Ban on foreign investors	Restrictions on foreign investors lifted
Centralized planning	Indicative planning
Equalization of tariffs	Regulated prices and tariffs
Captive market	Gradual easing of restrictions on consumers

Source: Goldemberg and Rovere and Coelho (2004)

The main objective for creation of ANEEL was to provide favorable conditions for the electric energy market to develop in an environment of balance among industry players and to the benefit of society. This regulatory agency was established as part of a State reform process to perform the role of the regulatory and inspection body in the electricity sector.

Chart 6 shows some indicators, comparing the condition of Brazilian consumers in 1994 (before the reform) and in 2000 (after the reform). It shows that the most outstanding change is the increase in the average electricity tariff, which more than doubled in this period. According to data collected by Brazilian Institute for the Defense of the Consumer, prices have risen faster than inflation since 1999.

Chart 6: Brazilian Electricity Indicators

| Indicator	1994 - Pre-reform	2000 - Post-reform
National electrification (%)		
Total electrification	92	95
-- rural areas	68	74
-- urban areas	98,5	99,2
Residential electricity consumption per capita (kWh/year)		
National average	442	499
Rural population	390	440
Urban population	560	576
Electricity tariffs		
Average residential tariff (US$/kWh)	0.098	0.179
Connection fees & charges (US$/connection)	810	970 (2002)

Source: Goldemberg and Rovere and Coelho (2004)

The available data suggests that regulatory reform and privatization have succeeded in improving quality and efficiency (lowering losses in the distribution network and reducing overstaffing) and in raising investment, although mostly geared to the rehabilitation of the existing network (Pinheiro, 2003).

The benefits of regulatory reform and privatization in the electric energy sector have been much less substantial than other sector, notably regarding the expansion of generation capacity. Between 1990 and 2000, electricity demand increased by 45% while the installed capacity expanded only 28%. The insufficient expansion in generation capacity was partially compensated by the depletion of water reservoirs. However, in 2001 a very dry summer contributed to put the reservoirs to a critical level. Energy authorities were forced to adopt a rationing program.

A number of factors contributed to the modest outcomes of reforms in the electricity sector. Rigolon (1997), Pires and Goldstein (2001), Salgado (2003) and Pinheiro (2003) have the same opinion that a major problem was the fact that the government did not establish the regulatory rules before the beginning of the privatization process. While a new regulatory model was being discussed, privatization proceeded at full-blast: nine electricity companies were privatized by local state governments in 1997 and another five in 1998, attesting to the serious problems in the sequencing of reforms in the power sector. (Pinheiro, 2003)

The privatization model of the electricity sector adopted a gradualist approach, aims of reducing the public sector debt, improving efficiency of production and restoring the investment capacity of companies. The government had given priority to the sale of companies in the distribution segment. Chart 7 shows the market-share in electric sector by owner type.

Chart 7: Brazilian Electricity Sector: Market Share
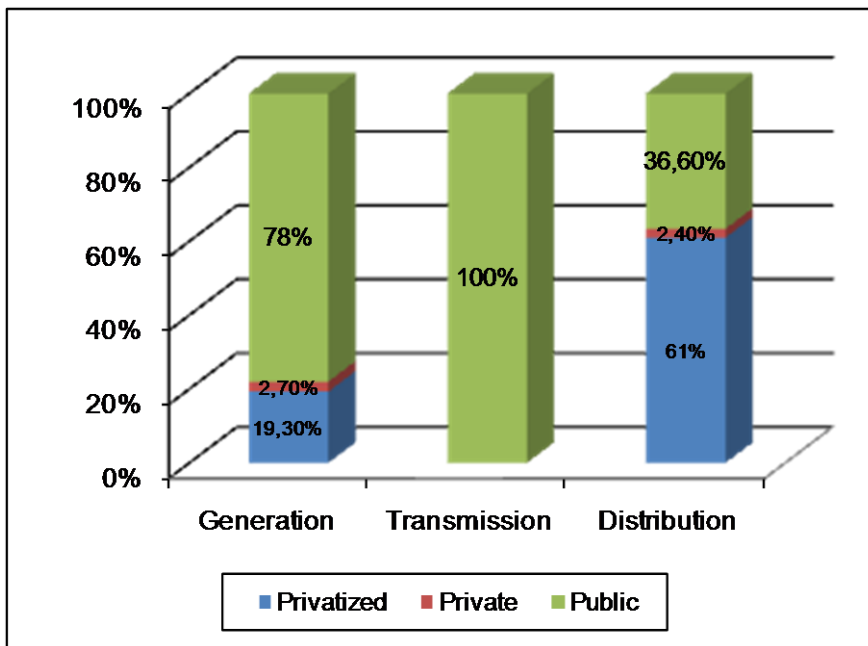
Source : Aneel (2008)

Moreover, the privatization was incomplete, due to fact that some large generation electricity companies have not been privatized. The sector is a mix of private and public ownership across the main activities of generation, transmission and distribution. It includes one very large government controlled holding company[2] for generation, transmission and distribution assets, in conjunction with a number of smaller companies. Eletrobrás controls the three largest generation plants, 38.96% of installed generation capacity and 62% of transmission lines, as well as the government-owned distribution companies. One of the principal instruments adopted in the generation segments has been the encouragement of entry by new agents for the construction of new plants, and in the status of the operators of the generating plants that are due to be privatized.

Brazil's main transmission system, the National Interconnected Grid is made up of four interconnected subsystems. System operation for the main grid is based on the ISO (Independent System Operator) model. There are significant efficiency gains from a large centralised main grid and system operation, which reduce the need for back-up and frequency control services. Distribution and supply is in the hands of more than one hundred companies that are mainly privately owned. (OECD, 2008)

Despite these initial improvements on the electricity regulation, ANEEL still had great challenges as an electricity agency. Some of them were related to the financial and administrative autonomy, clear definition of external controls, qualified and properly paid in-house staff and dissemination of regulation culture. However, the current challenge of this regulatory agency has to do with the increase demand growth in Brazil during these recent years. As it is show on the Chart 8.

Chart 8: Estimated Electricity Demand in Brazil

Year	2004	2005	2006	2007	2008
GWh/year	383.355	402.592	420.760	441.206	469.027
Growth Rate	4.8	5.0	4.5	4.9	6.3

Source: ANEEL (2004)

To deal with these challenges, ANEEL created a new model rule-making. This new model separated the generation, transmission, distribution and consumers into two contracts environment: regulated and free. The main aspects of this institutional change

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[2] Eletrobrás, the ex-monopoly incumbent, is organised as a holding company of the largest generation and transmission group in Brazil.

are that the expansion plan is now determinative, including electricity generation, the regulator and system operator roles are both preserved, grid access rules were maintained and generation sector is now regulated.

Brazil's regulatory framework for the power sector was adopted in 2004 against the background of the 2001 supply crisis. It replaced an earlier model that had emphasized privatization, reflecting the necessity to stimulate new private investment, especially in generation. This new model rule-making has played an important role at bringing transparency and efficiency of ANEEL. Started in 2005, the process of increasing generating capacity while reducing the country's dependence on hydropower began with the introduction of on-line auctions for new capacity to be delivered in either three or five years, which rules out new hydropower projects. While the amount of new capacity installed each year is dependent on the amount of capacity being auctioned, a number of new independent power producers are launched each year. Chart 9 shows the evolution of the energy infra-structure from 2002 to 2007.

Chart 9: Estimated Electricity Supply in Brazil

ELECTRIC ENERGY	2002	2003	2004	2005	2006	2007
Installed capacity generation (GW)/ forecast ANEEL	82,46	86,51	90,73	93,16	96,63	100,45
Hydraulical Energy	65,31	67,79	69	70,86	73,43	76,87
Nuclear Energy	2,01	2,01	2,01	2,01	2,01	2,01

Source: Pezco (2009)

Although the privatization and restructuring process is well underway, private investors continue to encounter uncertainty when trying to enter Brazil's electricity market. With the objective of encouraging investments ANEEL had established a Strategic Challenges Agenda for 2006-2008, whose goal is to stabilize the regulated market so as to secure a positive climate for investment and establish a coherent regulatory framework, with effective tariffs, transparency, and dialogue with society. Additionally, ANEEL had implemented the Programme for a Quality Electric Service, whose the goal is to establish the conditions for a quality electric system, as defined by indicators of duration and interruption of service.

3. MEASURES OF QUALITY OF REGULATION: QUALITATIVE INDICATORS

According to Viscusi (1995, p. 302), regulation is a limitation that is imposed upon the discretionary decisions of the economic agents, which is assured by the power of sanction. This limitation is necessary in situations with market failures as in the case of public goods, market power, externalities or asymmetric information. In infrastructure sectors such market failures are frequently present albeit in different degrees, indicating the need for regulation.

The way a country's political and social institutions interact with regulatory processes and economic conditions influence the confidence of investors and the performance of privatized utilities.

Police makers' choice of regulatory governance is constrained by the specific institutional endowment of the nations, which determines the form and the range of options for resolving them. In turn, choices about regulatory incentives are also constrained by institutional endowment and by the governance features built into the regulatory system. The government can attenuate the scope for government opportunism and reassure investors by appropriately designing the regulatory agencies. (Levy and Spiller, 1996)

Specific rules regarding the agency's budget, the process of nomination and substitution of regulators, requirements for making different types of decision, are examples of desirable characteristics of a good institutional environment as argued in Pereira and Mueller (2002). The aim of a regulatory agency is to ensure the proper functioning of regulated markets.

For the regulation to be effective, it has to be established on the basis of a regulatory framework, by setting the rules for the sector in which each institution has clearly defined functions, attributions and responsibilities. In this way, by setting clear rules to the market, the investments tend to be more attractive because this mechanism reduces uncertainties. Two bodies exert external control on the agencies in Brazil: the General Audit Office in the Executive Branch (CGU) and the Federal Court of Accounts (TCU), assisting National Congress. The CGU is in charge of defending the public patrimony and increasing administrative transparency. The TCU issues an annual report analyzing accounting, budgetary, operational and patrimonial aspects of Federal Administrative organs, including the regulatory agencies.

The objective of this section is to evaluate the regulatory quality of the two infrastructure sector in Brazil at federal levels: electricity and oil and gas. Like descript in Section 2, ANEEL and ANP are, respectively, the regulatory agencies responsible for implementing regulation in these two sectors. The two sectors were identified like imperfect market. Chart 10 summarized the occurrence or absence of one or more properties in the selected sectors.

Chart 10: Imperfect market Property: Absence or Occurrence

Property / Sector	Information Asymmetry	Externalities	Natural Monopolies	Anticompetitive Practices
Oil & Gas	X	XX	XXX	XXX
Electricity	XX	XX	XXX	X

Source: Authors   xxx:high   xx::medium   x: low

First of all, both sectors were natural monopolies in Brazil before 90´s. Both sectors can play negative or positive effects in other economics sectors. Finally, information is a valuable resource in the regulatory process. The absence of clear rules may create asymmetric information among the agents and anticompetitive practices appearance. Regulators normally lack basic information about of sector and regulated firms have little incentive to reveal it (Guasch and Spiller, 1999). Chart 11 summarizes the information about the state intervention and legal uncertainty in electricity, petroleum and natural gas sectors.

Chart 11: State intervention and legal uncertainty

Sector	Degree of State Intervention				Level of Legal Uncertainty
	Generation	Transmission Processing Transport	Distribution	Commercialization	
Electricity	XX	XX	X	-	XX
Petroleum	XXX	XXX	XX	X	XX
Natural Gas	XX	XXX	XX	XX	XXX

Source: authors   xxx::high   xx::medium   x: low

In conclusion, the regulation in both electricity and oil and gas sectors is necessary to prevent undesirable outcomes and reduce the uncertainty for agents. In the evaluating of regulatory is necessary to look the efficiency of regulatory structure in implementing rules in the sectors. This aim is accomplished by considering the following dimensions of regulatory quality: (a) financial and functional independence, (b) coordination problems arising from overlaps in domain among sector regulators and competition authorities, (c) tools for making effective decisions (legal and regulatory instruments), and (d) transparency and accountability.

A. FINANCIAL AND FUNCTIONAL INDEPENDENCE

Good governance of the regulatory agency can improve sector performance. Therefore, the existence of poor governance structures is a relevant feature to be taken into consideration in the institutional environment in Brazil. The existence of political instability demands independent institutions, and a professional and competent administration to ensure policy stability.

It is taken for granted that agency independence per se is not enough to assure good performance in the regulated sector. For example, a hostile policy environment, fragile macro environment, absence of clear rules and limited discretion all have a negative impact on sector performance. But the assumption is that agency independence is crucial for obtaining good sectorial performance. Independent agencies should have the following characteristics: (1) Autonomy in making decisions; (2) Financial autonomy; (3) Technical specialization. To evaluate these characteristics of independence it was used some elements.

In the case of decision-making autonomy, firstly a joint designation procedure favors plural representation of interests and reduces the political commitment of regulators with the Executive Power. Secondly, one must emphasize the importance of a pluripersonal decision making process, since commissions - instead of superintendencies, for example, which are more unipersonal in nature - enable greater decision making autonomy, once it is more expensive for an economic agent to influence a joint decision making process with several regulators than when a decision is a single individual's responsibility. Finally, holding secure tenure of a position means that regulators are protected from threats of dismissal as a means of bringing pressure to bear on decision taking. Secure tenure in a position may be assessed by the existence of

a fixed-term mandate, its duration and the degree of freedom of the Executive to remove regulators from their positions[3].

In relation to financial autonomy, having their own funding lessens the degree of subordination of agencies in relation to the direct administration, which could otherwise steer decisions by threatening to alter budgets. In relation to the requirement of technical specialization, i.e. the reputation and specific knowledge of the regulators, this feature reduces risk of capture and heightens the social legitimacy of decisions.

Specifically about the ANEEL and ANP, the next subsection will examine characteristics indicating the extent of their independence.

i. Decision making autonomy

Decision-making autonomy of a regulatory agency is a mark of its independence in relation to the government. This requires security of tenure for directors, so that they can make decisions even in situations where they may disagree with government policies. In this context, the following points are worth considering for ANEEL and ANP: i) appointment procedure, ii) duration of mandates, iii) possibility of dismissal, and iv) decision-making mechanism.

In relation to the first aspect, the designation of directors is established by a centralized process, in which the President proposes regulatory agency directors, to be approved by the Senate. In relation to the second aspect, mandates are fixed and in general the period is the same or less than the term of office of the President. However, there are strong restrictions on the President's ability to dismiss agency directors. For instance, regulatory agency director mandates may be four years (ANEEL, ANP, ANTT and ANTAQ) or five years (ANATEL).

Fixed mandate for agency directors helps to prevent them from being influenced by political pressures and also helps to fulfill the objectives set by the legislation that created regulatory agencies. It is argued that the possibility of repeated mandates for directors would affect their independence, as this might be an incentive to a director to be conciliatory in relation to the government to obtain another mandate. But even with a fixed mandate, directors can be under pressure to make decisions if the government can easily dismiss them. In the case of Brazil, the grounds for dismissal of a director are

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[3] The existence of fixed-term mandates, for a reasonable period of delegation (at least as long as the presidential mandate) and where removal may take place only in situations stipulated by law, enable agencies to ensure continuity of policies in relation to alterations in the political environment.

limited and explicitly posed by law. This ensures that directors enjoy autonomy and reinforces the characteristics of the mandate.

The legislations that created regulatory agencies did not provide for a mandate for the Attorney General of each agency. Since regulatory agencies have their own corporate entity, the Attorney General heads the attorneys in each regulatory agency body. They are responsible for defending the regulatory agency in lawsuits; internally they analyze cases that are underway in the regulatory agency – from internal agency issues, such as sale processes, to issuing legal opinions on new regulations and their application to cases. Since the Attorney General has the function of being a counsel for the agency, s/he must enjoy the confidence of her/his "clients" (the agency's directors) and be attuned to their interests. Otherwise, there may be a fatal clash of aims in the agency's operations and in defending its positions.

In relation to the fourth point mentioned above, ANEEL and ANP has similar management structure. Both agencies has a collegiate regime with a board composed of a Director General am four Directors. As part of the process of establishing regulatory agencies, there was awareness of the importance of having a collegiate management body, which lends a pluripersonal character to decision making and obstructs attempts to "capture" the agency.

ii. Financial Autonomy

Even when regulatory agencies enjoy functional independence, ensured by their director's mandate granted, there must be financial independence - otherwise regulatory agencies will inevitably be subjugated to the will of the entity that controls the budget.

Some degree of financial autonomy is indispensable, particularly in relation to the Executive Power, otherwise the performance of an agency will be totally undermined by political motivations or it will act exclusively in response to the pressure of the lobbies.

Financial autonomy helped to increase the degree of decision-making autonomy and diluted government pressure. Financial autonomy is only feasible when the agency's revenues come from its own resources, for instance from licensing fees for concessions or fees charged for overseeing regulated companies. Thus, one important source of income comes from supervising fees and fines paid by regulated companies.

In the case of ANEEL and ANP, although the Congress may have some influence on the performance of the regulatory agencies through approval of the federal budget, the latter is strongly influenced by the Presidency. In general terms, both agencies usually enjoy certain autonomy in budgeting. However, all funds have to be previously authorized by the federal budgetary appropriations. Consequently, the entity that controls these appropriations can influence the regulatory agency policy.

For instance, ANEEL had its appropriations reduced 22% in 2002 and 50% in 2003. In 2005, six infrastructure agencies receive only 16% of appropriations for that year. (Prado, 2008)

iii. Technical specialization

Technical specialization reduces asymmetries of information between the company and the regulator, reducing the risk of capture. In that sense, technical training for agency directors is a means of reducing company pressure on the agency. Also the concern on the part of the staff with professional and academic reputation is a good incentive to keep high technical standards.

The technical specialization is a criterion of extreme importance in selecting management staff to work for the agency. Obviously, for each sector, there should be capable and skilled staffs to do technical work related to regulatory problems. In Brazil, in general, technical specialization is a priority criterion when selecting agency directors. Specifically, in ANEEL and ANP, the selection of the agency's board members has a tendency to prioritize this criterion of job expertise on the technical work.

In relation to staff, the legislation stipulates the constitution of an effective team and the recruiting of specialized technicians for a certain period, with no requirement for a bidding procedure. However, certain operational difficulties and some judicial orders have prevented the formation of a permanent staff of employees in each regulatory agency. This situation means that positions in the agencies are not attractive and high turnover of employees, which makes members of the staff even more vulnerable to capture. This prevents the development of a satisfactory memory of the regulatory agency, enabling it to regulate markets under its jurisdiction in a more appropriate manner.

B. COORDINATION ASPECTS

In relation to the coordination, less influence of other bodies of the direct administration in decision making processes (as determined by their intervention in the procedures of the agency, such as the power to bring cases before the agency, proceed to conduct investigations, make agreements, etc) heightens the agency's degree of autonomy, since it will have greater authority to mediate or arbitrate disputes. An agency's credibility is greater when, after conducting all investigations and analyses, it has the authority to apply any sanctions necessary without them being reviewed by other instances of the administration.

The action of an agency will not necessarily be connected only to the sector that it is part of. In the cases involving more than one sector, decision-making requires coordination across agencies. However, there is no overall legal provision governing the relations between agencies and other organs of the Government, in particular with the competition policy authorities.

Thus, an agency may delegate concessionary powers to another agency or work together with it in the decision making process, without constituting interference in the delineation of its functions, or in the extent of this agency independence from these other agencies. Moreover, institutional cooperation is important not only to avoid the duality of regulatory power, but also to ensure enforcement and credibility of regulation and to harmonize procedures and procedural rules as in the case of competition policy and consumer rights. This is the case of ANEEL and ANP, for example. Machado et al. (2004) was identified overlapping functions between ANEEL and ANP.

As show OECD 2008, actual the relationship between ANP and ANEEL is very distant, and the regulatory framework does not encourage dialogue even on matters that are highly relevant for both. For instance, ANEEL has jurisdiction over input for thermoelectricity but ANP is the natural gas regulator, and distribution is regulated at the sub-national level. A strong dialogue could help ensure that specific regulatory developments in each sector are mutually reinforcing and consistent regulators.

In addition, ANEEL legislation charges the agency by overseeing competition policy, making rules to curb market concentration and providing joint actions with the state agencies and the Secretariat of Economic Law. The competition policy and control of the monopoly power are of great importance within this sector. Due to the

technological characteristics, the access to the essential infrastructure is decisive for this sector to operate.

In the case of ANP, the legislation merely enjoins that the Brazilian antitrust authority (Administrative Council for Economic Defense - CADE) must be notified of the matters involving infraction against the economic order. Its work is conducted jointly with that of CADE and the Consumer Defense Commission.

Finally, Brazilian government is setting up a Programme for the Strengthening of the Institutional Capacity for Regulatory Management (PRO-REG). The main of PRO-REG is to increase the quality of regulatory system at introducing new mechanisms for accountability, participation and monitoring from civil society and boost coordination among the institutions that participate in the regulatory process. This Programme has been developed with the support of the Inter-American Development Bank (IADB) with the purpose of contributing to the improvement of the regulatory system and co-ordination among the institutions that participate in the regulatory process.

C. DECISIONS TOOLS

According Correa et al. (2006) *"Regulators need not only the right to request information but also the effective legal power to implement the request, which usually requires the capacity to issue warnings and impose fines"*

Regulatory tools include methodologies for tariff setting and instruments for monitoring quality. The purpose of the tariff setting must take into account technical standards and targets, which includes:

- o ensuring low prices and high levels of production,
- o inducing utilization of installed capacity with maximum revenue at the least cost, and
- o minimizing strains between allocative, distributive and productive efficiencies.

In the infrastructure sectors, the optimum price from the point of view of allocative efficiency (price equal to marginal cost) merely remunerates variable costs, prejudices productive efficiency and limits revenue available for investments.

On the basis of these aims, there are three rules for the tariff policy. The first is based on the internal rate of return for firms. Although it seeks monopoly rent, this rule

does not encourage cost minimization, since investments result in guaranteed remuneration. The second is the price cap geared to a consumer price index minus a productivity factor. The aim is to encourage productivity and efficiency while avoiding the use of controls, which requires costly information. Finally, the yardstick competition sets standards for assessing performance used in analyzing costs and prices - this mechanism is used to compare companies in the same sector that are natural monopolies on the regional level.

The remuneration of a company is defined comparatively in relation to the performance of other companies in these same sectors. The objective is to reduce inter-company costs, reduce asymmetries of information and encourage economic efficiency. In ANEEL tariffs for the distribution and transmission segments, which are still monopolies, are regulated by the *price cap* criterion. In the case of distribution, the tariff reduction factor, which determines the extent to which productivity gains are passed on to consumers, was null in the initial periods of the contracts. In relation to transmission, investments in transmission lines were remunerated on the basis of benchmarks for network usage and connection cost charges.

In the oil and natural gas sector, a period (until August 2000) was set for liberation of prices of all basic byproducts for refineries and processing units. In the piped gas sector, privatized companies are subject to price-caps, obtained by grouping several items included in the cost of the service. These prices are subject to variations in the wholesale prices indicator and to review procedures every five years. However, price adjustments in the Brazilian oil sector are influenced by the Ministry of Finance.

The second decision tool for regulators is the monitoring system. The monitoring concession of contracts is necessary to oversee service quality, execution of investment plans and service targets. The advantage is that it assists the regulator in reviewing and setting tariffs, although this involves high regulatory costs. In this process, fines and penalties must be set for possible flaws on the provision of services and for non-execution of targets as stipulated.

In electricity sector, although not standardized, concession contracts provide fines and penalties for non-fulfillment of service quality levels. These contracts did not set universalization of targets. There were plans for construction works aimed at expansion and enlargement of the electricity system, and the difference between costing of the works and the limits for investment allowed under the duties of concession holders was to be offset by state governments.

In terms of sanction, the law provides for ANEEL to apply administrative penalties to market players. Sanctions for not delivering the agreed quantity of electricity are fairly high, and provide strong deterrents for producers and distributors. Sanctions may be given in case of inadequate maintenance or procedures.

Concession contracts for exploring and producing oil set periods for exploration and production development projects. Concession holders assumed an obligation to adopt technical standards for rationalizing output and controlling the depletion of reserves. Technical requirements for modernization and capacity enlargement were established for the activities of oil refining and natural gas processing. In the case of oil products, controls prioritize fuel quality. In the distribution of natural gas, the privatized companies' concession contracts set targets for universalization of services and quality standards, and concession holders may be penalized for non-fulfillment of contracts.

D. TRANSPARENCY AND ACCOUNTABILITY

Levy and Spiller (1996) define accountability as the mechanisms that society uses to constrain discretion and to resolve conflicts that arise in relation to those constraints. Transparency in the administration of agencies and participation of society in regulatory process are key elements of their accountability.

Transparency of the regulatory system is essential to a stable and accessible regulatory environment that promotes competition, trade and investment. These contribute to the effectiveness of regulatory agencies, by making them override different conflicting interests to protect public interest. Transparency helps to reduce the risk of regulatory capture and provides social legitimacy for their initiatives. It involves a wide range of practices, including standardized processes for making and changing regulations; consultation with interested parties; plain language in drafting; publication and codification. It requires publishing decisions and meetings by disclosing relevant information.

One important accountability device is providing effective arrangements for appealing the regulator's decision. Appeals should normally be made on the grounds of procedure (not statutory or evidentiary grounds) and should involve only the regulatory agency and the relevant judicial institutions. Another factor is that the agencies should be subjected to legislative oversight by specific legislative commissions and should be required to provide periodic reports on the effects of regulation; and agencies should

also be monitored by the public prosecutor's office and the corresponding accounting office. (Correa et al., 2006)

Chart 12 shows transparency instruments for ANEEL and ANP.

Chart 12: Instruments for Transparency and Participation

AGENCY	ORGANIZED SOCIETY PARTICIPATION	TRANSPARENCY / ACCOUNTABILITY
ANEEL	– Any decision making process that may affect the rights of the economic agents in the electricity sector or those of consumers, arising from administrative action of the Agency or from draft legislation proposed by ANEEL, will be preceded by a public hearing.	– Meetings of the agency board for the purpose of settling disputes among agents of the sector or to rule on infractions committed against the law or regulations, may be held in public, at the board's discretion, and be electronically recorded, with the interested parties having the right to obtaining transcriptions. – ANEEL management will be hired through a management contract negotiated and entered into between the Management and the Executive Power within ninety days of the appointment of the Director General, and a copy of the instrument must be forwarded for registration at the Court of Accounts, where it will be used as reference material for operational auditing.
ANP	– Initiatives concerning draft legislation or alterations of administrative rules that may affect economic agents' rights or those of consumers and users of oil industry goods and services will be preceded by a public hearing summoned and directed by ANP. – The internal regulation of ANP will rule on the procedures to be adopted to settle conflicts between economic agents and between the latter and users or consumers, with the emphasis on conciliation and arbitration.	– Deliberative sessions of the ANP board held for the purpose of settling disputes between economic agents and between the latter and consumers and users of oil industry goods and services will be held in public.

Source: Oliveira and Machado and Werneck (2004)

In practice, appeals are made in the first instance to the agency itself; if it does not result in a satisfactory solution, the judiciary is resorted to. Moreover, the General Attorney Office and General Accounting Offices do not play a significant role in the control of agencies (Correa et al., 2006).

E. PRELIMINARY COMMENTS

The main restructuration focus of both electricity and oil and gas sector was initially on privatization and on balancing the public budgets. In this moment, institutional design issues are receiving broader attention, jointly with the need to establish a government-wide regulatory policy. The deep debate around regulatory authorities in Brazil and the wide economic stakes have stimulated a number of evaluations.

The analysis of the qualitative instruments obtainable in this section shows a small variation in terms of regulatory quality both electricity and oil and gas sectors. One the on hand, significant care was taken to endowing the two agencies with mechanisms that provide independence, by formally delegating several powers (such as the right to impose fines), and by hardwiring in the enabling legislation the channels through which affected parties can participate in the regulatory process. Additionally, specific rules regarding the agency's budget, process of nomination and substitution of regulators, requirements for making different types of decision, are desirable characteristics presents in both agencies.

On the other hand, some aspects have been ignored such as the fact that the decision-making process must be formally documented. Theoretically, this fact should be balanced against the fact that jurisprudence does not considerate for the final decision, increasing the degree of arbitrariness. In addition, civil society participation still is low and the legal framework needs improvements.

Mueller and Pereira (2002) suggest that ANP has suffered less executive interference. However, that price and tariff adjustments in the Brazilian oil sector are strongly influenced by the Ministry of Finance. Although most of ANP's board decisions are preceded by technical reports, its decision-making process is considered centralized, and neither a fixed deadline nor an institutional mechanism exists to force members of the board to reach a decision.

In the field of coordination, there are some important gaps in the framework for natural gas. This is a complex issue that involves both ANP and ANEEL, but that also has implications across levels of government with state regulatory authorities. In terms of financial autonomy, alternative sources of funding do not effectively guarantee autonomy due to presidential control of the budgetary allocations process.

Moreover, Brazil has made progress in introducing transparency principles in its regulatory process, at least in a formal sense. These efforts could be complemented by establishing specific deadlines for public consultation and making available to the public the different opinions received on a particular issue.

In conclusion, although Brazilian government had established independent regulatory agencies with a several institutional attributes that guarantee its independence, such as fixed and staggered terms, congressional approval of presidential nominations and financial autonomy, it is not possible to say that the agencies are not insulated of political influence. Prado (2008) confirm this impression shows an expressive number of episodes with high level of political interference in Brazilian agencies.

There is broad consensus that the country requires changes to improve its capacities for regulatory quality. There is a growing understanding of the need to boost transparency and accountability in the regulatory framework, to introduce new tools for regulatory performance and to make necessary adjustments to the Judiciary.

4. MEASURES OF QUALITY OF REGULATION: QUANTITATIVE INDICATORS

As mentioned in last section both electricity and oil and gas sectors are imperfect markets. So, regulation is necessary to prevent undesirable outcomes. In this section will evaluate of regulatory structure using quantitative instruments. As suggested by literature, a good tool for quantitative assessment is Regulatory Impact Analysis (RIA). RIA provides a detailed and systematic method of the potential impacts of a regulation. Regulation frequently has numerous impacts that these are habitually difficult to foresee without detailed. OECD (2002) stated that "*The best practice is that a RIA system should require use of the benefit-cost principle for all regulatory decisions, but the formof analysis employed should be based on practical judgments about feasibility and cost*". RIA promotes policy coherence by helping to identify how decrease regulation policy risk.

However, many RIA analyses had performed in different countries were only qualitative. OECD (2009) justify partially this fact state that "*If the requirements for RIA are not sufficiently specific, the process may not be effective in evaluating the merits of potential regulatory and non-regulatory options; it may, in fact, simply become a justification for a predetermined decision. At the same time, it makes sense to prioritize and apply a full RIA only to regulatory instruments that impose significant costs above some threshold where the costs of the RIA exercise are proportionate and justifiable*".

Additionally, OECD (2004) show that a large proportion of benefit-cost analysis (BCA) has data and/or analytical limitations, reflecting a gap between the theoretical guidance and its implementation. So, the usefulness of a RIA depends on the quality of the data used to evaluate the impact of a proposed or existing regulation.

Within this context, Brazil is only at the beginning of building systematic impact assessment into the policy decision-making process. PRO-REG is the government program that will introduce RIA to measure regulation quality of regulators. So, data to apply RIA methodology are not available for evaluation of Brazilian regulatory agencies.

Thus, this paper will describe different forms by which literature has sought to measure the quality of the regulatory agencies. Two works use quantitative instruments to measure the quality of regulation of the electricity and oil and gas sectors in Brazil.

A. REGULATORY GOVERNANCE INDEX (RGI)

This indicator was constructed to capture a set of attributes affecting governance. Governance and its components are not clearly quantifiable attributes. Correa et al. (2006) evaluates the regulatory governance of the infrastructure sector in Brazil at both federal and state levels by considering the following dimensions of regulatory governance: (a) autonomy, (b) decision-making processes, (c) decision tools, and (d) accountability.

Survey information was quantified according to the conceptual framework established in Correa et al. (2006). In this work, the authors yield a single number between 0 and 1, where values close to 1 indicate better governance attributes. Chart 13 shows the results for ANP and ANEEL.

Chart 13: RGI and its components

AGENCY	AUTONOMY	DECISION MAKING	DECISION TOOLS	ACCOUNTABILITY	RGI	RANK
ANP	0,6043	0,6841	0,7608	0,5962	0,6752	3
ANEEL	0,6896	0,8976	0,5160	0,5885	0,6980	2

Source: Correa et al. (2006)

ANEEL and ANP were good ranked agencies, respectively, second and third place among 21 Brazilian regulators assessed. RGI index for those three agencies was above one standard deviation from the mean, which suggests that they are the institutionally best equipped regulatory bodies in Brazil (Correa et al., 2006).

ANEEL performs well in three out of the four components of the RGI, with the result being particularly high for the decision-making attributes. On the other hand, it scores below the sample average in terms of access to decision tools. ANP performs relatively well in the decision tools component and relatively poorly in the decision-making dimension. There is not a large variability among the RGI components. However, that price and tariff adjustments in the Brazilian oil sector has suffered executive interference.

In sum, Correa et al. (2006) concludes that *"(a) the level of regulatory governance is relatively similar among the 21 Brazilian regulators surveyed, (b) there is a clear cleavage between federal and state regulatory agencies, (c) formal attributes do not always translate into effective governance (even though the data suggest that agencies improve over time), and (d) independence and accountability attributes are more developed than regulatory means and instruments (particularly qualified personnel and regulatory tools) and decision-making procedures (particularly with respect to those mechanisms that can guarantee consistency of decisions and reduce arbitrariness)"*.

B. SECTORIAL PERFORMANCE INDEX (SPI)

The design of effective regulatory agencies involves defining regulatory scope and policies. Although regulators do not act directly upon competitiveness, they influence it through their role in promoting competition. The Sector Performance Index (SPI) tries to approximate the effects of improving the competitiveness, represented by the cost reduction in the economy.

In this way, the SPI is the result of the regulators' action and reflects the success in eliminating market failures, increasing both sector productivity and consumer satisfaction. The SPI consists of a compound of quantitative indicators such as price and service supply. The idea is that lower real prices and increase in the supply of services reduce the costs in the economy.

The paper uses an adaptation of an indicator proposed by Sanchez-Robles (1998). The author considers physical units to build the index because it may offer good information about the stock of infrastructure available in a particular country. The original index tries to capture, as measured by physical units, the effect of infrastructure investment on transportation facilities, electric energy supplies and communications on growth.

An alternative procedure to build the index, indicated by the author Sanchez-Robles (1998, p. 102), is employ the variable as the rate of growth of infrastructure units, instead of just units. This alternative was employed in this paper, once we are comparing different units of services among the sectors. Sanchez-Robles (1998) had recommend yet standardizing the variables.

To build the index, it was standardized the variables like Afonso and Garcia (2001), that calculated the supply of physical units of infrastructure for transportation, electric energy and telecommunications for a large sample of countries, including Brazil. Afonso and Garcia (2001) use a similar methodology developed by the United Nations to create de Human Development Index (HDI) to propose a quantitative measure of the Infrastructure Development Index.

The construction of the SPI followed four steps. The first step is to choose both economic and social indicators to compound the sector index, representing the cost reduction in the economy. Two historical series were chosen for each regulated sector:

- o   Real Price Index (PI);
- o   Supply Index (SI).

This study took the rates of growth, from 1995 to 2003 (1995 = 100) for both series. The expected results from a competitive environment would be a lower price and a higher supply. So, it considers the growth of the supply and the inverse of the growth of the prices.

The second step is to standardize the growth rates of the two series using the HDI methodology to calculate the annual index for each sector. The minimum and maximum values of each series for are selected to calculate the annual index.

$$Index_i = (value_i - value_{min})/(value_{max} - value_{min})$$
where $0 < Index_i < 1$

An index value near 1 means the regulated sector has a good performance, with lower prices and higher supply. The next step is to combine the two series to construct one series expressed by Equation 1:

$$EI = \beta_1 * PI + \beta_2 * SI \qquad\qquad (1)$$

The next step is to estimate the parameters (β_i) weights. Afonso e Garcia (2001) suggests the "Main Component Method" (MCM) to determine the β_i. values. This statistic framework estimates the parameters by means of linear combinations of the series. For this, the method maximizes the variance of the series linear combination. The optimization problem presented above use the Equation 2 as restriction:

$$\sum_{i=1} \beta_i = 1 \qquad\qquad where \ \ i \in \{1;2\} \qquad (2)$$

With the values obtained in the optimization process for the parameters, a new series is built starting from Equation 1, that first component is denominated. Calculated the first component, the objective is to obtain the second component. A new restriction is then imposed to the optimization problem: the vector of parameters of the second component should be orthogonal to the vector of parameters of the first component. This way, the new objective becomes to obtain parameters that maximize the variance of the linear combination that are not correlated to the parameters of the first component. This procedure is repeated successively up to the number of series used in the maximization (two in the present case).

In general, investment data is considered strategic by firms and, therefore, of restricted access. The adopted procedure chose a group of proxy variables that allow inferring investment behavior over time. Chart 14 indicates the data source used in the SPI estimation.

Chart 14: DATA SERIES (1995-2003)

| Sector	Price	Investment
Eletricity	Residential Price Index	Installed Capacity
Petroleum	Fuel Price Index	Brazil Oil Production

 * IGP-DI (FGV)   ** IPCA (IBGE)
Source: Authors

Empirical data comes from the Brazilian Institute of Geography and Statistics (IBGE), regulatory agencies and consumer protection agencies. These proxies represent good indicators of the investment accomplished in infrastructure, supplying a measure of the readiness of the service offered in the segment. The time interval of the sample embraces the period between 1995 and 2003. Using the methodology latter, the SPSS software was utilized to calculate the components weights. After this, the SPI was estimated using the weights obtained after two iterations. Chart 15 indicates the annual SPI estimation for the two agencies.

Chart 15: DATA SERIES (2000-2008)
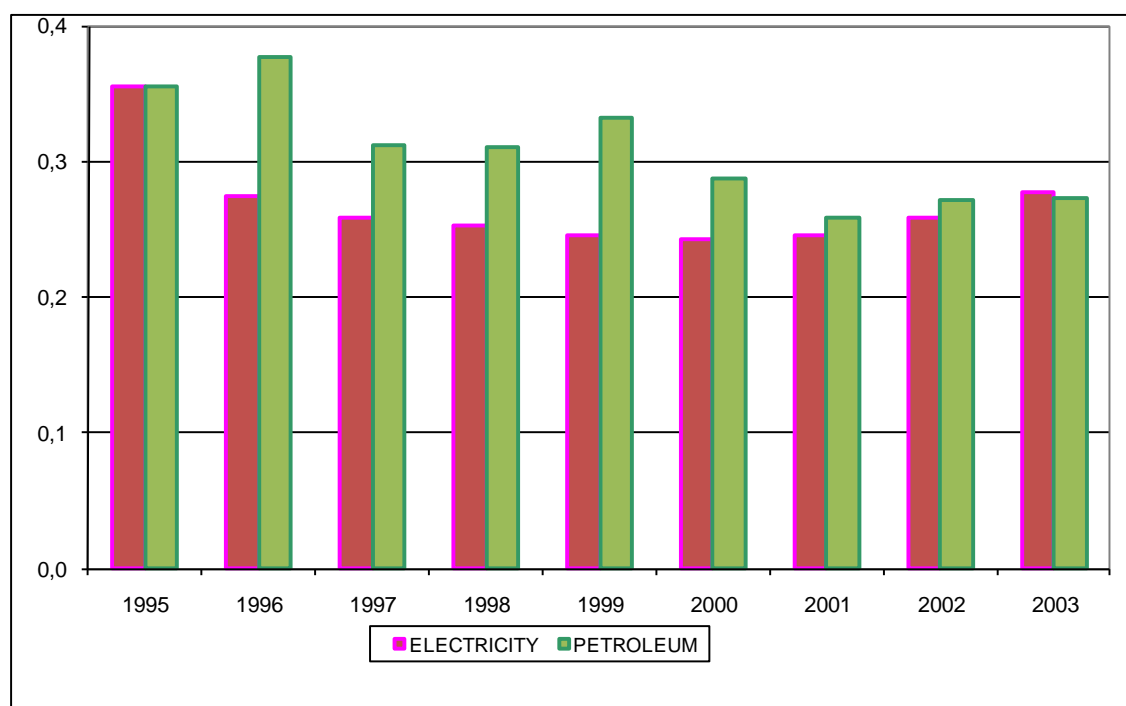
Source: Authors

An index value near 1 means the regulated sector has a good performance, with lower prices and higher supply. So, both agencies have not good performance index. Some aspects of the results shown are noteworthy. First, the smoothing increases of the SPI for both petroleum and electricity sectors, after 2001. Second, it corresponds to the

impressionistic perception that the Brazilian infrastructure deteriorated between 1995 and 2003.

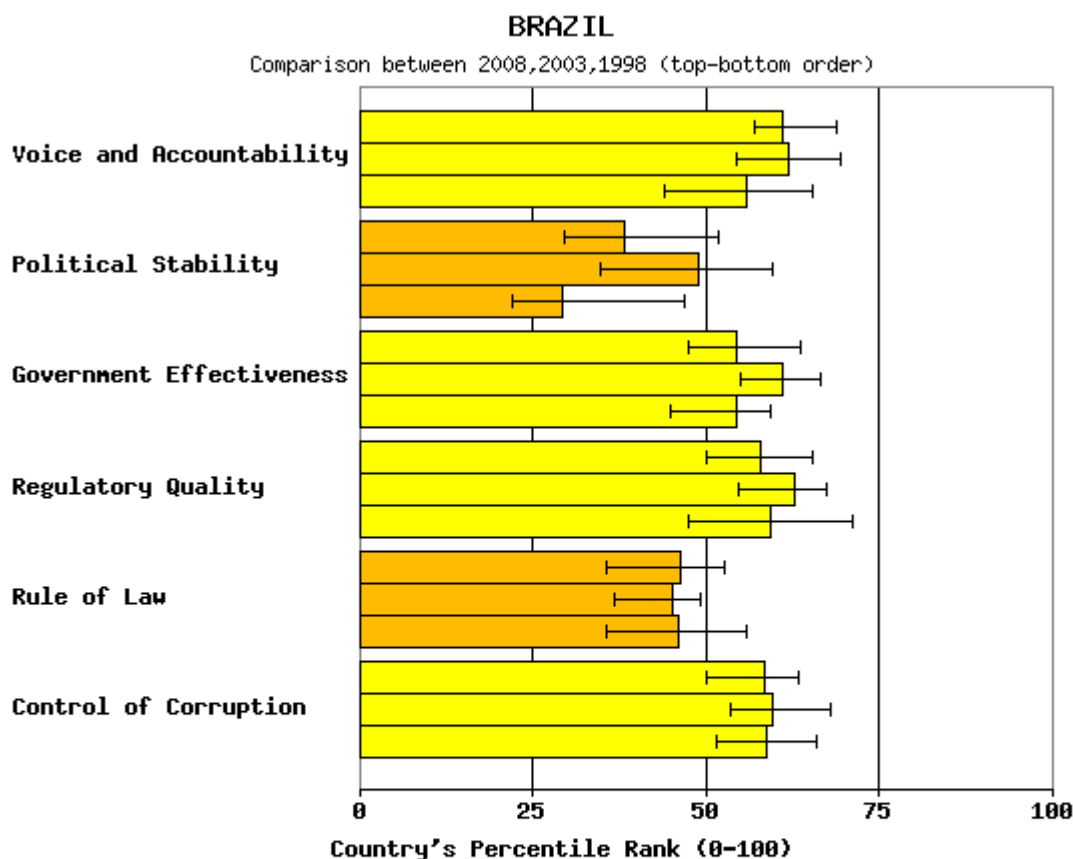## C.   WORLD GOVERNANCE INDICATORS (WGI)

The World Governance Index is a research project initiated by Daniel Kaufmann and Aart Kraay in the late 1990s. The WGI measure six broad dimensions of governance:

- **Government Effectiveness**: the quality of public services, the capacity of the civil service and its independence from political pressures; the quality of policy formulation;

- **Regulatory Quality**: the ability of the government to provide sound policies and regulations that enable and promote private sector development

- **Rule of Law**: the extent to which agents have confidence in and abide by the rules of society, including the quality of property rights, the police, and the courts, as well as the risk of crime;

- **Voice and Accountability**: the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media;

- **Political Stability and Absence of Violence**: the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism;

- **Control of Corruption**: the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Kaufmann and Kraay and Mastruzzi. (2009) identifies many individual sources of data on governance perceptions about these six broad categories. The authors use a statistical methodology known as an unobserved components model to construct aggregate indicators from these individual measures. Finally, these aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of the individual data sources. For 2009 the indicators cover 212 countries and territories, drawing together hundreds of variables from 35 different data sources to capture the views of tens of thousands of survey respondents worldwide.

Chart 15 shows the Brazil percentile rank for the six governance indicators. Percentile ranks indicate the percentage of countries worldwide that rate below the selected country.

Chart 16: World Governance Indicators (1998, 2003 and 2008)

BRAZIL

Comparison between 2008,2003,1998 (top-bottom order)

Country's Percentile Rank (0-100)

Source: Kaufmann D., A. Kraay, and M. Mastruzzi 2009: Governance Matters VIII: Governance Indicators for 1996-2008
Note: The governance indicators presented here aggregate the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, and international organizations. The WGI do not reflect the official views of the World Bank, its Executive Directors, or the countries they represent. The WGI are not used by the World Bank Group to allocate resources.

Higher values thus indicate better governance ratings. The graph also reports the margins of error displayed in the line charts by dashed lines, and corresponding to a 90% confidence interval. This means that there is a 90 percent probability that governance is within the indicated range.In general terms, Chart 15 shows there is not a strong evidence of a significant trend of improvements in Brazil governance over the 10 years of data covered. Specifically, the regulatory quality attribute is worse in 2008 than in 1998. For all six attributes Brazil are in a middle position in the world.

D. PRELIMINARY COMMENTS

The three different indexes used in this section show similar level of regulatory quality in both electricity and oil and gas sector. When compared with other countries, the Brazilian regulatory agencies have intermediary quality indicators, such as WGI show.

More than that, the evolution of all indexes shows that no significant changes in the quality of regulation in the last decade. For instance, SPI indicates that infrastructure in electricity and oil and gas had deteriorated between 2000 and 2005.

Specifically, ANEEL had implemented institutional structures similar the international agencies, such as U.S. institutional design, but lack policy effectiveness, as can be seen in SPI and RGI. Prado (2008) suggests that lack of effectiveness arises because the agency institutional design incorporated in Brazilian legal and political system does not work in the same way as in the United State.

Although reasonably structured frameworks are present for some quality control procedures, ANEEL and ANP lack a systematic use of regulatory quality tools, such as regulatory impact analysis (RIA) methodology. For instance, PRO-REG is introducing RIA as a policy tool to support decision making, but this implementation will take time. In sum, although many positive aspects are present in ANEEL and ANP, there is space to improve its capacities for regulatory quality and increase transparency and accountability for public governance.

CONCLUSION

Regulation of infrastructure sector was an essential component of reform of Brazilian economic. Experience shows that it is important to establish a trusty regulatory framework before commercializing or privatizing utilities, and to deal with issues of market structure from the outset. Negative results in Brazilian electricity privatization corroborate this argument.

The Brazilian regulatory policy in the electricity sector uses similar instruments as in other countries, with emphasis on certain basic prerequisites such as the autonomy to promote a series of policies involving the protection of consumers under a monopoly regime. In addition, these reforms had implemented on a gradual basis, guaranteeing the transition to more competitive.

Despite these positive aspects, the restructuring of the Brazilian electrical system is still incomplete and involves development of the institutional and regulatory aspects in order to expand the generating capacity of the system, while guaranteeing the low cost, continuity and quality of services.

Specifically, one aspect that requires special attention is a necessity of coordination improvement with the ANP, in order to restructure the natural gas sector on a competitive basis and the establishment of a regulatory apparatus that protects competition within that sector.

It is also evident that no single regulatory model can be applied for all Brazilian agencies. The characteristics of each industry, such as ownership structure and potential for competition have important bearings on how regulation can be implemented. However, the results of the both qualitative and quantitative methodologies show a small variation in terms of regulatory quality both electricity and oil and gas sectors. For instance, specific rules regarding the agency's budget, process of nomination and substitution of regulators, requirements for making different types of decision, are desirable characteristics presents in both agencies. This is a possible explanation for analogous results.

The existence of independent regulators is crucial for attracting investment. However, this report notes that there is not a homogeneous way to conceive and measure independence. Thus, considerable care was taken to endowing the two agencies with mechanisms that provide independence, by formally delegating several powers, and by hardwiring in the enabling legislation the channels through which affected parties can participate in the regulatory process. However, it does not mean that ANP and ANEEL have real independence. There were an expressive number of episodes with high level of political interference in Brazilian agencies in last decade.

As stated latter, the effectiveness index is the result of the regulators' action and reflects the success in promoting a more competitive environment. This in turn will lead to greater competitiveness. Both agencies had implemented institutional structures similar to the international agencies, such as U.S. institutional design, but lack policy effectiveness, as can be seen in SPI and RGI.

Although quality control procedures exist, ANEEL and ANP lack a systematic use of regulatory quality tools, such as regulatory impact analysis. So, there is space to improve its capacities for regulatory quality and increase transparency and

accountability for public governance. There is an expectation that the reform of the Brazilian regulatory system, which is presently under discussion in Congress, should strengthen the quality mechanisms for the regulatory agencies.

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