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BRAZIL'S REGULATORY FRAMEWORK: PREDICTABILITY OR UNCERTAINTY?

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RESUMO

Este trabalho discute as perspectivas da regulação econômica no Brasil. Para tanto, primeiramente apresenta-se a evolução histórica da regulação no país, discutindo as principais questões relacionadas às agências reguladoras federais. Em segundo lugar, os marcos regulatórios de cinco diferentes setores (telecomunicações, eletricidade, saneamento básico, petróleo e gás natural) são analisados. Em terceiro lugar, a questão do financiamento de investimentos em infra-estrutura é tratada, enfatizando o papel das parcerias público-privadas (PPPs). Uma seção final contem um possível agenda para a regulação no Brasil.

PALAVRAS CHAVES

Regulação e infra-estrutura no Brasil; agencies reguladoras; parcerias público-privadas; telecomunicações; eletricidade; saneamento básico; petróleo; gás natural.

CLASSIFICAÇÃO JEL

L50, L59, L94, L95, L96

ABSTRACT

This paper assesses the Brazilian regulatory framework and discusses the prospects for regulation in Brazil. First, a historical perspective on Brazilian economic regulation is provided, addressing the major issues concerning the Brazilian regulatory agencies. Second, a discussion of the regulatory framework in five sectors (telecommunications, electricity, water and sanitation, petroleum and natural gas) is presented. Third, the financing problems with special emphasis to public-private partnerships (PPPs) are addressed and a final section contains a possible agenda for regulatory policy in Brazil.

KEY WORDS

Brazilian regulation; Brazilian infra-structure; regulatory agencies; public-private partnerships; telecommunications; electricity; water and sewage; petroleum; natural gas.

1   Introduction

The objective of this paper is to assess the Brazilian regulatory framework and discuss the prospects for regulation in Brazil. It is impossible to overstate the importance of adequate regulation for development. GDP and productivity growth are quite sensitive to investment in infra-structure. The latter, in turn, depends on a good regulatory framework.

This study is divided into five sections. Section 2 provides a historical perspective on Brazilian economic regulation. Section 3 contains the major issues concerning the Brazilian regulatory agencies.

Section 4 assesses the situation of the regulatory framework for five sectors: telecommunications, electricity, water and sanitation, petroleum and natural gas. Section 5 discusses financing problems with special emphasis to public-private partnerships (PPPs). A final section contains a possible agenda for regulatory policy in Brazil.

2   Brazilian Regulation in Historical Perspective

The institutional aspects of the Brazilian economy during the eighties date back to the process of industrialization of the country since the beginning of the century and more clearly after the thirties. Under the so-called import substitution model, the State built up a productive structure, mainly involving infra-structure and intermediate goods and services, in order to induce industrialization. In addition to the prominent presence of the State, this model was also characterized by a closed economy producing mainly for the domestic market.

The increasing importance of the State as a regulator relative to its presence in the production of good and services is associated with three factors. First, the previous phase of privatization attracted private, national and foreign capital interested in investments in segments controlled by the State. Second, the State mechanisms of intervention had been

depleted due to the fiscal crisis and increasing distortion provoked by the usual mechanisms of intervention such as subsidies, quotas and price controls. Third, the technological development in segments previously characterized by natural monopoly extended the possibilities of the introduction of competition in those segments.

As occurred in other countries, such elements led to privatization programs in Brazil and, as a consequence, to the necessity of regulation in segments which were under the control of State monopolies. The Brazilian program surpassed the processes of privatization in other developing countries. It was, however, a partial process since important segments of petroleum, sanitation and banks, among others, remained in the hands of the State.

The forms and extent of privatization in Brazil has varied sharply across sectors. Telecommunications and railroads have been privatized. Partial privatization has occurred in electricity. More flexible entry permission was given to the private sector without the privatization of the state-owned company in petroleum. Concessions to private operators were provided to private operators and entry conditions were reduced to new competitors in civil aviation.

The first phase of the privatization process benefited from capital account liberalization.[1] Federal Law No. 8031/90[2] enacted the Privatization Program, which began the process of reducing direct state intervention in the Brazilian economy. Its first phase covered the 1991-1994 period and focused on privatizing industrial-sector enterprises such as steel, petrochemicals and fertilizers that did not require the introduction of a specific regulatory framework. Receipts from privatization totaled US\$ 8.6 billion in this period.

The second privatization phase (1995-1998) comprised the sale of state-owned companies most directly active in infrastructure sectors such as telecommunications, electricity and railroads. In all, the program represented receipts of US\$ 86.9 billion of which US\$ 70.3

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[1] According to Bauman (1999), one result of capital account liberalization was that inflows of foreign portfolio investments rose from US\$ 800 million in 1992 to US\$ 7 billion in 1993.

[2] Published April 12, 1990.

billion corresponded to actual revenue from sales. Chart 1 summarizes the sectors that participated in both privatization phases in Brazil and indicates the degree of privatization (measured as private participation in production) that was observed.

Chart 1: Degree of Privatization in Brazilian Sectors

High	**Medium**	**Low**
Petrochemical	Electricity	Financial Services
Fertilizers	Natural Gas	Petroleum
Steel		Sanitation
Telecommunications		

In the second phase of the privatization program, given the nature of the sectors involved, specific regulatory frameworks were required. Brazil already had some government agencies with regulatory powers[3], but they did not have the same characteristics as the regulatory agencies created in the second half of the nineties, as part of the process of transforming the role of the State in the economic sphere.

The new institutional environment, replacing the closed economy and its direct intervention by the open economy along with regulation, was related to private sector pressure to protect investments. Since investments involve long-term contractual commitments, the independence or autonomy of regulatory agencies provide greater certainty, making it less vulnerable to any intervention by the Executive in the regulated sector.

Indeed, the institutional environment in Brazil was significantly altered during the nineties with less direct intervention in economic activity and the state taking on more of a regulatory role. The creation of regulatory agencies was one of the key features of this process of institutional change. Their format is discussed in more detail in the next section.

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[3] Such as the Central Bank (BACEN) - created by Law No. 4595, of December 31, 1964, or the Superintendence of Private Insurance (SUSEP) - created by Law No. 73, of November 21, 1966 - or the Securities and Exchange Commission (CVM) - created by Law No. 6385 of December 7, 1976.

3 The Brazilian Regulatory Agencies

The institutional format of the regulatory agencies is new in Brazil. Chart 2 shows, in chronological order, a subset of regulatory agencies created in Brazil in the second half of the nineties as part of the changes associated with the privatization of infra-structure.

Chart 2: Brazil - Regulatory Agencies

AGENCY	LAW	ACTIVITY	MINISTRY
ANEEL – Agência Nacional de Energia Elétrica	Law No. 9427, 1996	Regulation and inspection of production, transmission, distribution and commercialization of energy	Mines and Energy
ANATEL – Agência Nacional de Telecomunicações	Law No. 9472, 1997	Regulation and inspection of telecommunications	Communications
ANP – Agência Nacional do Petróleo	Law No. 9478, 1997	Regulation and inspection of petroleum industry and gas	Mines and Energy
ANVISA – Agência Nacional de Vigilância Sanitária	Law No. 9782, 1999	Sanitary control of the production and the commercialization of products and services, as well as the control of ports, airports and borders	Health
ANS – Agência Nacional de Saúde Suplementar	Law No. 9961, 2000	Regulation and inspection of the activities that guarantee health supplemental assistance	Health
ANA – Agência Nacional das Águas	Law No. 9984, 2000	Enforcement of the National Policy on Water Resources.	Enviroment
ANTT – Agência Nacional de Transportes Terrestres	Law No. 10233, 2001.	Enforcement of the Conselho Nacional de Integração de Políticas de Transportes' politicies and regulation and inspection of transports' services	Transport
ANTAQ – Agência Nacional de Transportes Aquaviários	Law No. 10233, 2001.		

Source: laws cited above.

The following three subsections discuss the characteristics of the regulatory agencies, how the private sector evaluates two of the most important agencies (in electricity and telecommunications) and how independent the Brazilian agencies are in comparison with a sample of agencies in the world.

3.1 THE CHARACTERISTICS OF THE BRAZILIAN REGULATORY AGENCIES

The regulatory agencies replaced the direct administration in a number of functions. Part of the decision power of the sectoral ministries was transferred to them. This requires institutional building. For the new system to work well a number of prerequisites have to be met:

i)   precise definition of the jurisdiction of each agency;

ii)   coordination among the different agencies;

iii) strong technical expertise; and

iv)   independence from the central administration and from any private interest.

The lack of precise definition of functions is a major problem in Brazil. There is a frequent overlapping of functions among different agencies. Take for instance the example of a merger between two companies in the distribution of natural gas. The electricity regulator, ANEEL, has jurisdiction because natural gas is an input for thermoelectricity; but the regulator of natural gas is ANP; however, the distribution of the product is under the responsibility of the subnational state which has a subnational regulator; finally, mergers are authorized by the competition authorities, which in the case of Brazil means three different bodies attached to two different ministries!

Lack of coordination is another great problem. It is becoming frequent to have several issues relating shared infra-structure in electricity, telecomunnications and other sectors. There is not a solid legal basis for providing a rapid and efficient decision process. The problem is

even more serious in regard to the numerous antitrust questions which come up among regulated firms. It is far from clear which regulator has jurisdiction in many cases: the sectoral regulator or the competition authority.

The lack of adequately trained staff varies across sectors. The absence of a specific bureaucratic career for regulators within the Brazilian state remains as a serious pitfall. This fact explains the relatively high rate of turnover among public officials and consequent waste of public resources in training and loss of institutional memory.

But among the desirable characteristics of the regulatory agencies, independence is the most important one. Private investors need to know whether there is a regulator who will be impartial. The decision making autonomy of these agencies is vital for the adoption of technical decisions. The latter is key for the stability and quality of the regulation, which is essential for attracting investment.

We can identify eight characteristics which are associated with agencies' independence:

    i.   participation of Congress in the nomination of the directors of the agencies;

    ii.   technical background for directors required by law;

    iii.   long directors' tenure;

    iv.   budget autonomy;

    v.   collective decision;

    vi.   quarantine after completion of term;

    vii.   appeal of decisions only to courts;

    viii.   transparency.

The directors' tenures vary from three to five years. In five of the agencies (ANVISA, ANS, ANTT, ANTAQ and ANA) a second term is possible as noted in Chart 3. This can affect the agency's independence, since there might be an incentive for a director to avoid confrontation with the central administration in order to obtain another mandate.

Chart 3: Agency Directors

AGENCY	DESIGNATING AGENCY DIRECTORS PROCESS	DIRECTOR'S MANDATE	POSSIBILITY OF A SECOND TERM
ANEEL	Proposed by the President and appointed by the President after Senate approval.	4 years.	No.
ANATEL	Proposed by the President and appointed by the President after Senate approval.	5 years.	No.
ANP	Proposed by the President and appointed by the President after Senate approval.	4 years.	No.
ANVISA	Proposed by the President and appointed by the President after Senate approval.	3 years.	One re-appointment.
ANS	Proposed by the President and appointed by the President after Senate approval.	3 years.	One re-appointment.
ANA	Proposed by the President and appointed by the President after Senate approval.	4 years.	One re-appointment
ANTT	Proposed by the President and appointed by the President after Senate approval.	4 years.	One re-appointment.
ANTAQ	Proposed by the President and appointed by the President after Senate approval.	4 years.	One re-appointment.

Source: laws cited in Chart 2

Even when regulatory agencies enjoy functional independence, ensured by the mandate granted for their directors, there must be financial independence - otherwise regulatory agencies will inevitably be dependent upon the will of the controller of the budget. In the

Brazilian case, although 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 Executive. Thus, the financial resources of the regulatory agencies must arise from the revenues with taxes for services related to the regulatory activity.

Besides agency independence from political pressures, it is crucial to insulate the decision body from the regulated companies. Thus, the following characteristics of the agencies are important to prevent its capture by the private sector through lobbies and corruption: collective decision (Chart 4), quarantine (Chart 5), inexistence of administrative appeal within the Executive and maximum transparency in its activities. (Chart 6). Charts 4, 5 and 6 illustrate how such characteristics are present at least formally in the design of the Brazilian agencies.

Chart 4: Management Structure of Agencies

AGENCY	BOARD	DECISIONS
ANEEL	– Collegiate regime, board composed of a Director General and four Directors. – There is an Attorney General as part of the organizational structure.	Majority.
ANATEL	– Collegiate regime, executive board consisting of a President and 4 board members. – The organizational structure includes Consultative Council, an Attorney and an Ombudsman.	Majority.
ANP	– Collegiate regime, board consisting of a Director General and four Directors. – There is an Attorney General as part of the organizational structure.	Majority.
ANVISA	– Collegiate regime, board consisting of a President and 4 Directors. – The organizational structure comprises a Consultative Council (representatives from Federal authorities, States, the Federal District, Municipalities, producers, commerce, the scientific community and users), an Attorney General, an Auditor General, an Ombudsman and specialized units assigned different functions.	Majority.
ANS	– Collegiate regime, board consisting of a President and 4 Directors. – The organizational structure comprises an Attorney General, an Auditor General, an Ombudsman and specialized units assigned different functions. – There is also the Supplementary Chamber of Health, which is a standing body of an advisory character.	Majority.
ANA	– Collegiate regime, board consisting of a President and 4 Directors.	Majority.
ANTT	– Collegiate regime, board consisting of a Director General and 4 Directors. The organizational structure includes an Attorney, an Ombudsman and an Inspector General (whose duty is to supervise the	Majority, Director General has casting vote.

	functional activities of the agency and conduction of administrative and disciplinary proceedings).	
ANTAQ	Collegiate regime, board consisting of a Director General and 2 Directors The organizational structure includes an Attorney, an Ombudsman and an Inspector General (whose duty is to supervise the functional activities of the agency and conduction of administrative and disciplinary proceedings)	Majority, Director General has casting vote.

Source: see text

Chart 5: Quarantine Arrangements for the Agencies

Agency	Quarantine
ANEEL	12 months before direct or indirectly providing services to companies under regulation of or overseen by the agency, including controlled companies, affiliates or subsidiaries, under penalty of conducting administrative advocacy. During the impediment period, a former-director may continue to provide services to ANEEL or any other organ of the direct public federal administration with remuneration equivalent to that of the position previously held.
ANATEL	For 1 year after leaving a position, a former-board member may not represent any person or interest before the agency.
ANP	12 months before providing services to a company in the oil industry or distribution under penalty of committing administrative advocacy. – During impediment, any former-director not dismissed under the terms of Article 12 may continue to provide services to ANP or to any body of the Direct Administration, for remuneration equivalent to that of the director's position held.
ANVISA	– For 1 year after leaving the position, a former-director is not allowed to represent any person or interest before the agency.
ANS	– For 1 year after leaving the position a former- director of ANS may not represent any person or interest before the agency or hold an interest, position or function in an organization subject to regulation by the agency.
ANA	– There is no specific provision in this respect.
ANTT	– For 1 year after leaving the position a former-director may not represent any

	person or interest before the agency.
ANTAQ	For 1 year after leaving the position a former- director may not represent any person or interest before the agency

Chart 6: Instruments for Transparency and Participation in Agencies

AGENCY	ORGANIZED PARTICIPATION OF SOCIETY	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 ANEEL board for the purpose of settling disputes among economic agents of the electricity sector or between the latter and consumers, 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.
ANATEL	– The Agency has the competence to implement, within its sphere of attributions, the nation's telecommunications policy, issue rules on the licensing, provision and usage of telecommunications services under the public regime, with prior public consultation for proposals to be submitted to the President.	– Deliberative board sessions for settling disputes between economic agents, or between the latter and consumers and users of telecommunications goods and services, will be held in public; sessions may be electronically recorded and interested parties have the right to obtain transcriptions.
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	– 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.

	agents and between the latter and users or consumers, with the emphasis on conciliation and arbitration.	
ANVISA	– Existence of an Consultative Council consisting of representatives of federal institutions, states, the Federal District, municipalities, producers, commerce, the scientific community and users.	– Management contract negotiated between its President and the Minister of Health, after prior consultation with the Ministers of Finance and Planning within a minimum (*sic*) of 120 days after the appointment of the President[4].
ANS	– Through the Supplementary Health Chamber	– The board has the function of drafting and publishing periodic reports on its activities. Forward ANS accounting statements to the competent organs. – The management of ANS is governed by a management contract negotiated between its President and the Minister of Health and approved by the Council for Supplementary Health, which sets parameters for the internal administration of ANS and indicators to objectively assess its administrative work and level of performance.[5]
ANA	---	– will publicize requests for the right to use water resources in the federal domain, as well as administrative actions resulting from the these requests, through publication in the official press and in at least one newspaper widely circulated in the corresponding region. – The board has the competence to: draw up and publish reports on the activities of the agency; (ii) forward the agency's accounting statements to the competent bodies.
ANTT	– Draft legislation initiatives, alterations of administrative rules and the board's decisions when settling disputes that affect the rights of economic agents or users of transport services will be preceded by a public hearing. – Any interested party is entitled to submit petition or appeal against actions of the agency, within 30 days of their becoming official.	– Decisions taken by the agency's board will be recorded in publicly available minutes together with relevant documents whenever publicity does not endanger the security of the Country or violate confidentiality.

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[4] Under the legislation that set up ANVISA, the management contract is the instrument for evaluating the administrative performance of the agency, deciding parameters for the organizations internal administration, and indicators for periodically and objectively assessing and quantifying its performance.

[5] Under the legislation that set up ANS, the management contract will set parameters for the internal administration of the agency, as well as indicators for objectively evaluating its administrative work and level of performance.

ANTAQ	– Draft legislation initiatives, alterations of administrative rules and the board's decisions when settling disputes that affect the rights of economic agents or users of transport services will be preceded by a public hearing. – Any interested party will be entitled to submit a petition or appeal actions of the agency within 30 days of their becoming official.	– Decisions taken by the agency's board will be recorded in publicly available minutes together with relevant documents whenever publicity does not endanger the security of the Country or violate confidentiality.

Source: see text

3.2 HOW THE BRAZILIAN AGENCIES ARE SEEN BY THE PRIVATE SECTOR

The information of Subsection 3.1 corresponds to legal definitions. In addition, it is useful to see a survey conducted by the American Chamber of Commerce in São Paulo in order to evaluate the performance of ANATEL and ANEEL. The results are based on a questionnaire, answered by regulated firms, consulting companies, associations related to the regulated sector, financial institutions and consumers. Chart 7 and Chart 8 present the answers of some of the main questions of the survey.[6]

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[6] The surveys are available at www.amcham.com.br

Chart 7: Evaluation of ANATEL

	2003		2004		2005	
	Never/Rare	Often/Always	Never/Rare	Often/Always	Never/Rare	Often/Always
Is ANATEL's regulation process transparent and made by public consults?	15,8%	84,2%	10,0%	90,0%	21,2%	78,8%
Does ANATEL act in a preventive form in order to promote and guarantee competition in the sector?	86,3%	23,7%	71,0%	29,0%	77,3%	22,7%
Does ANATEL present a technically prepared personnel?*	60,5%	39,5%	34,0%	66,0%	35,4%	64,6%
Does ANATEL act in coordination with different agencies, such as ANP, ANEEL and Cade?	47,4%	52,6%	39,0%	61,0%	54,7%	45,3%
Is there a duplicity of functions between ANATEL and the Ministry of Communications?	71,1%	29,0%	73,0%	27,0%	39,7%	60,3%

Source: see text.
In 2005, this question was divided into financial and technical aspects. The results above refer to the technical expertise of the agency's personnel.

Chart 8: Evaluation of ANEEL

	2003		2004		2005	
	Very Bad/Bad	Regular/Good/Very Good	Very Bad/Bad	Regular/Good/Very Good	Very Bad/Bad	Regular/Good/Very Good
Do ANEEL's regulatory acts garantee a high level of competition?	83,45%	16,55%	33,33%	66,67%	25,00%	75,00%

Do the audiences and public consults promoted by ANEEL garantee society's participation in the elaboration of normative instruments?	38,73%	61,26%	38,89%	61,11%	25,90%	74,10%
How do you rate the personnel's technical expertise?	38,73%	61,26%	22,22%	77,78%	11,10%	88,90%
	Very Low/Low	Medium/High/Very High	Very Low/Low	Medium/High/Very High	Very Low/Low	Medium/High/Very High
How do you rate the level of government interference in the process of decision-making, regulation and inspection of the agency?	--	--	16,67%	83,33%	0,00%	100,00%

Source: see text.

The survey indicates that both agencies present a reasonable level of technical expertise and transparency. However, it is evaluated that ANATEL has not been capable of promoting competition in the telecommunication's sector. Moreover, there does not seem to prevail a precise definition of ANATEL's jurisdiction, since the survey points to the existence of duplicity of functions between the agency and the Ministry of Communications.

In regard to ANEEL, the agency is perceived as being able to promote competition. However, the survey also points out to a very high level of political intervention in ANEEL's actions.

3.3 BRAZILIAN REGULATORY AGENCIES IN COMPARATIVE PERSPECTIVE

The previous subsection discussed agents' perception about the regulatory agencies. We now try to provide a less subjective piece of evidence. From the eight characteristics associated with independence and from the previous description of the Brazilian agencies we can provide a general idea, at least from the formal point of view.

In order to do that we apply an independence indicator (II) to a sample of International Competition Network – ICN countries. The questionnaire was sent to the 86 ICN member countries, obtaining answers from 29 countries (33% of the population). Further details of how the index was constructed can be found in Appendix I and in Oliveira, Machado, Novaes and Cardoso (2005).

In order to capture the independence characteristics the following measuring criterion was used: value 1 was ascribed for each of the eight elements of independence. The lack of an institutional characteristic that favors independence will be captured by the value zero. For questions with more than one item the result represents the average of values for each item. Lastly, the partial points are added and II is obtained as shown in Equation 1.

$$II = \sum_{i=1}^{8} a_i;$$

(1)

Where i represents each individual question, so that $a_i \in [0; 1]$ represents the score obtained; and $0 \leq II \leq 8$. The closer the score is to eight, the higher the independence indicator is. <u>Note that this indicator captures only formal independence. The extent to which the regulatory authority is independent in practice is not directly reflected in II.</u>

Note also that the respondents are competition authorities. Although the answers may not be considered official and safe from errors, the questions are objective and do not allow significant deviation. In any event, if there is some leeway for different interpretations of a

particular question, competition authorities are presumably more capable of providing an impartial and external view.

The replies of a total of 117 regulatory agencies of various countries were analyzed. Twenty-eight pertain to the telecommunications sector, 27 to the electricity sector, 25 to the fuel sector, 20 to the transportation sector and 17 to other sectors. One perceives a high concentration of agencies in four sectors, which account for 85.47% of the questionnaires received.

It is rather surprising that the II results do not vary in line with the development levels. One would initially think that developed countries would present a higher II than developing nations.

Chart 9 shows the ranking of countries, obtained from the arithmetic average of the regulatory agencies of the respondent countries. It is noteworthy that the averages of II obtained by developed countries. This suggests that there is not a simple relation between the level of development and the level of independence.

The Brazilian agencies are endowed with a series of formal instruments to assure its independence. Thus, Brazilian agencies present a relatively high level (sixth place) of independence within a ranking of formal independence based on a survey of 117 agencies of 29 countries, as showed in Chart 9.

Chart 9: Independence index (II) by country

Country	II average	Number of agencies
Serbia	7.75	1
France	7.55	3
Latvia	7.41	4
Italy	7.16	3
Portugal	6.75	4
Brazil	6.66	4
Turkey	6.50	4
Bulgaria	6.44	3
Cyprus	5.54	2
Hungary	5.44	4
Germany	5.17	4
Estonia	5.12	5
Lithuania	5.07	5
United States*	4.94	4
Spain	4.83	3
Sample	**4.60**	**117**
Argentina	4.54	7
Australia	4.42	5
Zambia	4.38	5
Pakistan	4.03	5
Mexico	4.02	5
Netherlands	3.42	4
Tunisia	3.25	1
Uzbekistan	3.19	7
Sweden	3.17	4
Ireland	3.17	4
Japan	2.83	4
Chile	2.53	5
Poland	1.88	4
Taiwan	1.75	4

* The U.S. respondents indicated that questions 4.1 and 4.2 were not applicable. In this case, we assumed those to be 0.

Source: The authors

With the purpose of assessing the existence of a relationship between the level of independence and certain attributes of the regulatory agencies. Equations (2) and (3) show the tested models:

Model 01:

$$II = \beta_0 + \beta_1.HDI + \beta_2.S\_Electr + \beta_3.S\_Telecom + \beta_4.S\_Gas + \beta_5.F\_Franc \qquad (2)$$

Model 02:

$$II = \beta_0 + \beta_1.AGE + \beta_2.HDI + \beta_3.S\_Electr + \beta_4.S\_Telecom + \beta_5.S\_gas + \beta_6.F\_Franc \quad (3)$$

Where,

AGE: the legal age of each regulatory agency[7];

HDI: human development index of the country of the regulatory agency;[8]

S_Electr, S_Telecom, S_gas: Vectors of dummies variables that identifies the regulated sector;

F_franc: Vector of dummy variables that identifies the legal family of the country.[9]

The following hypotheses were tested:
- If the age of the agencies is associated with the independence attributes;
- If countries with lower degree of development delegate more power to independent agencies in order to reduce a possible credibility deficit;
- If the regulated sector has a high explanatory power; and
- If legal tradition of the country matters.

The estimation for the model proposed in Equation 2 used the series in the logarithmic form, obtained through a monotonic transformation. Additionally, the observations of agencies with up to one year of age were eliminated. In the last decade a certain format for the regulatory agencies was established that follows a trend of more independence of the regulatory bodies.

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[7] The information was obtained directly from the Internet pages of each regulatory agency.

[8] The data was gathered from the World Bank for year 2004.

[9] According to Djankov et al (2003) the legal families of the countries are German, English, French, Scandinavian and Socialist.

The regression results obtained by OLS are showed in Appendix II. The dummy variables for the regulated sector and legal families appear to be significantly relevant (Chart 14). Note that the variable AGE, included in Model 2, is not significant.

Although preliminary, the results obtained suggest a few points. First, the existence of negative relation between the II and the AGE of the regulatory agency shows that in the course of time the independence attribute do not become a characteristic that is present in the legal format of the regulatory agencies.

Second, the existence of negative relationship between the HDI and the II could validate the credibility hypothesis. Developing countries lack credibility in their institutions. Therefore their governments resort to a higher and not lower degree of delegation to the regulatory agencies.

The sector and the legal tradition seem to have an influence at least in terms of formal independence which is the type of independence we are being able to capture at the moment. The existence of independent regulators is crucial for attracting investment. However, we note that there is not a uniform way to conceive and measure independence. Moreover, we have not yet been able to capture real independence.

Our preliminary evidence suggests that there is not a positive association between development levels and independence of regulatory agencies. This could indicate that the "credibility hypothesis" is valid. This hypothesis states that developing countries lack credibility in their institutions and therefore their governments resort to a higher and not lower degree of delegation to the regulatory agencies.

The above discussion points to the importance of formal mechanisms to guarantee agency independence. However, it is also necessary to have indications of real independence. This requires an effort to go beyond the mere verification of what the law states. A possible measure is what we call the index of potential political influence based on the commissioners' background.

A simple form is to distinguish between a "technical background" from a "political background". We analyzed a sample of regulators' CVs from ANATEL, ANEEL, ANP, ANVISA, ANS, ANA, ANTAQ and ANTT. If the regulator showed any technical or academic experience related to the specific sector, we consider his or her background to be technical. It was considered a "political background" otherwise. <u>Chart 10 suggests that there has been an increase in the percentage of regulators with political background in 2005 compared to 2002.</u>

Chart 10: Degree of Potential Political Influence in the Regulatory Agencies

Year	2002	2005
Number of directors	31	33
Director without specific technical background	2	4
IPR	6,5%	12%

Source: own elaboration. See text for the methodology

In sum, Brazilian regulatory agencies represented an important institutional change. However, several improvements are still necessary:

- more coordination among the different sectoral agencies and betweem them and the competition authorities;
- in practice the mechanisms of financial independence do not work and agencies do not have stable and adequate human and material resources;
- <u>formal</u> independence seems to be high by international standards, but there is much to be done in terms of <u>real</u> independence;
- the degree of potential political interference seems to be high and increasing.

4 Regulatory Framework in Selected Sectors

A single general regulatory framework is not enough. The construction of a sectoral regulatory framework constitutes a *sine qua non* condition to stimulate investment. Such framework contains the relevant rules to participate in each segment. The next paragraphs describe the current issues in   telecommunications, electricity, sanitation, petroleum and natural gas sectors.

These five sectors have been chosen in a rather arbitrary way. However, they are obviously important in terms of investment. They also illustrate the diversity of the regulatory situation of the Brazilian infra-structure as Chart 11 shows.

Chart 11: State Intervention and Legal Uncertainty in Selected Sectors

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

* X – Low, XX – Medium, XXX – High.

Telecommunications

Telecommunications is a success case in terms of privatization and regulation in Brazil in comparison with the other sectors. l. The access of the Brazilian population to fixed and mobile phones has shown a strong growth in the previous years. Since ANATEL´s creation in 1997, the number of fixed telephone accesses more than doubled while the number of mobile phones in operation grew by more than 1500%.

Part of the success of the telecommunications sector regulation in Brazil can be explained by the fact that, differently from what occurred in the electricity and sanitation sectors, privatization was preceded by the establishment of a regulatory framework. Thus**,** the

General Law of Telecommunications and the creation of ANATEL in 1997 allowed and stimulated private investments after the privatization of the Telebrás system in 1998.

Besides, three aspects of the regulation in the sector contributed to its relative success. Firstly, the establishment (prior to the privatization) of expansion and quality goals. Secondly, the possibility of competition, with the creation of mirror-companies, competitors of the privatized regional *holdings.* Lastly, the use of mechanisms (such as price caps) of tariff correction that stimulates the productivity of the regulated firms.

However, two aspects raise concerns about regulation in telecommunications in Brazil. First, technological advance and the development of the market have made the current regulatory framework obsolete. The increasing substitution of fixed telephones by mobile phones and the creation of the so-called third-generation telecommunications, linking voice, video and data transmission in one piece, for example, imposed new challenges to the creation of a regulatory framework.

Regulation must be ruled by technological neutrality, allowing the market to select the appropriate technology. The rules of the game must adapt to the technological changes: regulation must not be divided into industries, but into services.

Second, in the last three years there have been a series of interventions by the Judiciary in the sector, altering the tariff correction index (in 2003) and forbidding the exercise of two-part tariffs in the fixed telephony and the expiration of credits in mobile "pre-paid" telephones. In addition, it should be noted that two of the Communication Ministers have publicly manifested their opposition to the previously established contractual rules. Regardless of the merit of the question, these actions do represent breaches in contracts between ANATEL and the regulated companies, and this instability contributes negatively to investment in the sector.

Electricity

Privatization and regulation in electricity have failed in many aspects. The current regulation was established in the biennium of 1997-98, with the creation of ANEEL and the

Wholesale Energy Market (MAE). The model divided the vertically integrated structure of the sector, attracting private ownership to the segment where there is the possibility of competition (energy generation). A price regulation scheme was established in segments characterized as natural monopolies (transmission and distribution), aiming at establishing incentives for moderate tariffs as well as for investment.

The supply crisis that culminated with the electrical energy rationing in 2001 reflects the failure of the policy adopted in the sector. However, such failure cannot be attributed only to the privatization process. By the time of the energy crisis, only 20% of the generation was privatized. Part of the problem is that the planned privatization process was not actually implemented. The lack of definition regarding crucial variables such as the price of natural gas prevented investment in thermoelectricity from increasing.

Despite the fact that the lack of energy supply was solved after the energy rationing period, the privatization process stopped and the lack of regulation to promote investments remain until today, mainly because of the instability associated with the new model for the electricity sector.

The new paradigm established by the current government assumes that a competitive model would be incapable to guarantee moderate tariffs and service continuity. Thus, the government transferred the majority of the energy production decisions to a state agency (Empresa de Pesquisa Energética), and established that the contract of forecasted energy is to be done through a minimum price auction bid.

The new model transfers the power from ANEEL to the Ministry of Mines and Energy. Thus, it centralizes the decisions in the Executive Power and does not create the stability of rules necessary to stimulate investment.

Rodrigues and Schechtman (2005) point out that in a scenario where the Brazilian GDP grows at a 4% annual rate, there is the possibility of a new energy rationing in 2009 or 2010, unless new investments are immediately initiated. Moreover, TCI (2003) estimates that the current investment gap in the sector is R$ 11 billion per year, assuming a 3.4% annual

growth over the next decade; it is estimated that the necessary average annual investments in the electricity sector is R$ 20.1 billion and only R$ 9 billion can be financed by public sources and multilateral agencies.

Sanitation

The major institutional problem of of sanitation   is the absence of a regulatory framework. Since the 1988 Constitution, four projects of sector regulation were sent to Congress, and none of them have been approved until now[10]. However, the matter is urgent. According to Census data, less than half the Brazilian urban population has access to appropriate sewage systems.

According to Turolla and Ohira (2005), the lack of consensus regarding the allocation of conceding power between states and municipalities constitutes the main political drawback for the approval of old projects.

The current structure of the sector is similar to the one established by the Planasa (National Sanitation Plan) in 1971. Nowadays, however, the public companies are not able to attend the sector investment needs. Motta (2005) points out that public companies have deficits or are dependent on subsidies and transfers from the State, being unable to promote the necessary investments in the sector, estimated in 0.5% of GDP.

The lack of clear rules also avoids privatization. Only 4% of the country is operated by the private sector, a figure that contrasts with neighboring countries such as Argentina, where more than half of the municipalities make use of private sanitation services.

The project of regulation recently sent by the federal government to Congress shows improvement by defining the allocation of conceding power and seeking transparency in the taxes and cross-subsidy structures in the sector. However, there are still great deficiencies in the project. Firstly, there are no instruments to encourage the efficiency of the regulated firms.

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[10] PLC 199/91, PLS 266/96, PL 4147/01, PL 5296/05

In this sense, Motta and Moreira (2004) point out large efficiency variations among sanitation companies, which would indicate the lack of appropriate incentives in certain locations. Moreover, the study shows that the efficiency gains are not passed on to the tariffs.

Secondly, there are still breaches to hire public companies without the use of competitive bids. This last point makes it possible to use political criteria when hiring companies and inhibits private participation and investment.

Petroleum:

For over 40 years, the petroleum and natural gas sectors were dominated by Petrobras, holder of the legal monopoly over the activities of exploration, refining and transportation of petroleum derivatives. As the public monopoly was made more flexible in 1995, it became necessary to establish rules that would allow the private participation in the sector, which originated the "Petroleum Law" and the ANP (National Petroleum Agency) in 1997.

However, Petrobrás practically kept its monopoly over the refining and transportation segments, being responsible for 95% of the petroleum derivatives production and controlling 90% of the draining capacity of these products. Thus, ANP became mostly responsible for controlling entry in the exploration sector, via auctions, and resale inspection (gas stations).

Moreover, even with the end of the state control over petroleum derivative prices in 2002, there is still a certain amount of government influence over Petrobrás prices. Gasoline prices in the Brazilian refineries are not in line with the international price at the moment, even with the recent rise in prices.

Petrobras investments made possible an almost self-sufficiency in petroleum, which contrasts with the situation at the end of the seventies, when 85% of the petroleum consumed in Brazil was imported. However, it is worth noting that self-sufficiency is associated with the modest growth of the economy, and consequently with the demand for fuel over the last years. Thus, it is possible that in the long run, imports and private exploration become important to guarantee the supply of the product.

In this sense, the main challenge of the sector is to attract private investments in the exploitation and production sectors and in the import infrastructure Indeed, imports could limit somewhat Petrobras' market power. For this, it will be necessary to consider two points. First, give guarantee of access to the transportation and distribution networks from Petrobrás, making it clear that the public company cannot discriminate in its own favor.

Second, it will be important to assure clear rules for pricing policy, eliminating the political interference in pricing decisions. Prices below the international level make it impossible to achieve a positive return of the investments in the production and import segments, removing private participation in the sector.

Natural Gas

Despite the fact that natural gas responds for only 3% of the Brazilian energy matrix, the discovery of the Santos Basin reserves, which tripled the amount of reserves known in Brazil, has increased the importance of this energy source. Natural gas is also relevant as an input for the electric sector, given that the capacity of the natural gas thermo-electrical plants generation corresponds to almost 10% of the national capacity.

The existence of recently discovered reserves increases the importance of appropriate regulation, capable of allowing investments in exploration. However, <u>as happens with the petroleum derivatives, the current regulation does not define clear rules over the access to the gas transportation and distribution structures</u>. This matter is even more complex regarding natural gas, as both the transportation and distribution segments constitute natural monopolies.

Rodrigues and Campos Filho (2004) point out the importance of the access guarantee, by third parties, to the transportation and distribution networks. This is crucial to avoid abuse of market power and to guarantee stability for exploitation investments. However, the authors point out that this does not occur in practice, by mentioning that the market access to the Brazil-Bolivia pipelines dealt with long and conflicting negotiations.

Moreover, the natural gas is treated on the Brazilian legislation as a petroleum derivative, subject to the determinations of the Petroleum Law. This regulatory framework ignores specific natural gas market characteristics and is not capable of setting clear rules to the sector relations. This matter is aggravated by the fact that the natural gas distribution is subject to the state regulation, generating the need for a clear setting up of jurisdictions and rules for the interaction between state regulatory agencies and ANP, responsible for the regulation of exploitation and transportation links.

Therefore, as in the case of sanitation, it is necessary to create a specific regulatory framework for the natural gas sector. There is already a Law Project in this respect, which correctly establishes rules for competitive bids to the concession of transportation services and strengthens the role of ANP (together with another agency yet to be created) in order to establish rules, tariffs and avoid discrimination in the access of pipelines.

The above analysis suggests that there is a long way to complete the regulatory reform which began in the nineties. The case of relative success of the telecommunications sectors is in clear contrast with other sectors where a regulatory framework is lacking, such as the natural gas or sanitation. Competition problems are also serious when state-owned firms have kept high market power as in the case of petroleum.

5 The Problem of Financing Brazilian Infra-structure

Given the fiscal constraints of the Brazilian state, it is urgent to stimulate a crowding in of private investment. As the international experience suggests, the public-private partnerships (PPPs) constitute a useful instrument to spur private investments in infra-structure. The Executive has negotiated in Congress, in December 2004, the approval of a law which makes the implementation of projects by public and private sector partnerships possible.

After three months of postponements, the Partnership Guarantor Fund (for insolvency cases) was created and its administrator defined, as well as the assets (stockholdings) which will compose it. Despite all the initiatives taken in the federal level in relation to the PPPs, it seems very unlikely that the project contracts elected as priorities by the Executive will be undertaken before 2007.

There are five projects considered priorities by the government: (1) the North-South Railway construction; (2) the recovery of the BR-116 Highway, from Rio de Janeiro to Feira de Santana (Bahia); (3) the São Paulo Railway Beltway; (4) the Railway stretch between Guarapuava and Ipiranga, in Paraná; and (5) the Rio de Janeiro city beltway. However, analysts remain skeptical about the possibility of implementing such projects before 2007.

The PPPs' mechanism, must not be seen as a panacea. It is a useful institutional format but it requires certain pre-conditions. First, it is important that the risk reduction to the private sector is not obtained by the increase in the fiscal risk. Second, the PPP is an "umbrella" contract, which does not substitute the sector rules, but complements it. The partnership will only work if, besides the general terms of the PPP, clear rules are defined and are appropriate to each infrastructure segment.

6 Prospects for the Future

Regulatory reform in Brazil is far from being finished. Serious difficulties and inconsistencies remain in the general regulatory framework. The regulatory agencies have to be strengthened and the sector specific rules have to be defined.

With regard to the national regulatory agencies, the changes should follow five lines:
- more coordination among the different sectoral agencies;
- permanent concern with competition matters and coordination between regulatory authorities and competition authorities;

- institutional building in order to assure that the regulatory bodies are insulated from political interference and are adequately staffed and present technical excellence;
- accountability on the part of the regulators and maximum transparency in their activities.

The ideal scope to establish mechanisms aiming at these elements would be the creation of a general law of regulatory agencies. A project was sent to the Congress in April of 2004 containing part of the concerns listed here. However, there is no deadline for approval and several changes would have to be made in order to assure agencies' independence.

With respect to the sectoral regulatory framework, it is necessary to create new institutional frameworks in specific sectors (as natural gas and sanitation), to modify rules in others (as in petroleum and electricity) and to readjust the current norms in dynamic branches as telecommunications. Many other changes would be necessary for sectors which have not been discussed in this paper such as transportation and ports.

It is obvious that general macroeconomic conditions are also important to permit resumption of investment in infra-structure, especially the financing conditions and the evolution of the long term interest rate. However, the institutional and microeconomic conditions underlined in this study are equally important. Improvement of the Brazilian infra-structure hinges upon the appropriate combination of both macro and micro ingredients. And so does sustained growth.

REFERENCES

AMERICAN CHAMBER OF COMMERCE. *Relatório sobre a Agência Nacional de Energia Elétrica - ANEEL.* August, 2005. Available on: <http://www.amcham.com.br>. Accessed on October 6th, 2005.

AMERICAN CHAMBER OF COMMERCE. *Relatório sobre a Agência Nacional de Telecomunicações - ANATEL.* September, 2005. Available on: <http://www.amcham.com.br>. Accessed on October 6th, 2005.

BRAZIL. Law Project nº 3337, April 12th, 2004. Dispõe sobre a gestão, a organização e o controle social das Agências Reguladoras, acresce e altera dispositivos das Leis no 9.472, de 16 de julho de 1997, no 9.478, de 6 de agosto de 1997, no 9.782, de 26 de janeiro de 1999, no 9.961, de 28 de janeiro de 2000, no 9.984, de 17 de julho de 2000, no 9.986, de 18 de julho de 2000, e no 10.233, de 5 de junho de 2001, da Medida Provisória no 2.228-1, de 6 de setembro de 2001, e dá outras providências. Available on: <http://www.camara.gov.br>. Accessed on September 15th, 2005.

DJANKOV, S., LA PORTA, R., LOPEZ-DE-SILANEZ, F. E SHLEIFER, A. Courts. In: *Quarterly Journal of Economics*, May, 2003

MOTTA, Ronaldo Seroa. O debate do marco regulatório de saneamento. Instituto Tendências de Direito e Economia, April, 2005.

MOTTA, Ronaldo Seroa e MOREIRA, Ajax. Efficiency and regulation in the sanitation sector in Brazil. IPEA: Texto para Discussão n. 1059, 2004.

OLIVEIRA, G.; MACHADO, E. L.; NOVAES, L. M.; CARDOSO, M. R. *Aspects of the Independence of Regulatory Agencies and Competition Advocacy*. Unpublished manuscript, 2005.

PIRES, J.C.L.; REIS, J.G. O setor elétrico: a reforma inacabada. In: GIAMBIAGI, F.; REIS, J.G.; URANI, A. (orgs). *Reformas no Brasil: Balanço e Agenda*. Rio de Janeiro: Nova Fronteira, 2004. p. 385-408.

RODRIGUES, Adriano Pires e CAMPOS FILHO, Leonardo. A abertura do setor petróleo e gás natural: retrospectiva e desafios futuros. In: GIAMBIAGI, F.; REIS, J.G.; URANI, A. (orgs). *Reformas no Brasil: Balanço e Agenda*. Rio de Janeiro: Nova Fronteira, 2004. p. 409-432.

RODRIGUES, Adriano Pires e SCHECHTMAN, Rafael. Falta agenda positiva para o setor elétrico brasileiro. *Valor Econômico*, 07/26/2005. Also available on: http://<www.cbie.org.br>

TENDÊNCIAS CONSULTORIA INTEGRADA. Ainda sem PPP's, gastos em infra-estrutura permanecem reduzidos. *Relatório de Transporte e Logística*. Outubro, 2005.

_____. Setor Elétrico Brasileiro: Cenários de Crescimento e Requisitos para a Retomada de Investimentos. Mimeo, 2003.

TUROLLA, Frederico A. e OHIRA, Thelma H. Saneamento básico no Brasil: evolução e desafios. Mimeo, 2005.

APPENDIX I   INDEPENDENCE INDICATOR

The objective of this section is to describe the construction of an independence indicator which reflects the different characteristics of independent regulation mentioned in Section 3. In order to do that, we formulate a questionnaire (Chart 12) to different jurisdictions and regulators, contemplating the relevant topics to assess institutional independence.

Chart 12: Questionnaire of independence of regulatory agencies
International Competition Network

. Transparency?		Electricity	Telecom.	Transportation	Gas	Other
8.1 Public session?	YES (1)					
	NO (0)					
8.2 Decisions and rationales published on the Internet?	YES (1)					
	NO (0)					
8.3 Public consultation?	YES (1)					
	NO (0)					
8.4 Public hearing?	YES (1)					
	NO (0)					
. Quarantine after completion of term	YES (1)					
	NO (0)					
10. How does the regulatory agency named in item 1 interact with your competition agency? (Mark one of the alternatives) (a) Antitrust exemption (b) Competitive competences (c) Complementary competences (d) Antitrust regulation (e) Other (specify)						
1. This questionnaire was answered by?						

Name

Email

Institution

The first question concerns the appointment process. The criterion used was whether the appointment occurs with participation of the Legislative, or with the exclusive responsibility of the Executive Government. If Legislative participates, the agency receives 1 point; if not, it receives zero.

The second question assesses if there is minimal technical background in the relevant area required for the executive to occupy the office. If legislation does not require academic or professional experience, it is deemed that the agency has a low technical requirement, receiving a zero grade. Otherwise the agency receives one point.

The third question attempts to measure the term of office of the main executives. The question was subdivided in to three parts. The first verifies whether the term of office is fixed. If positive, the agency receives one point. The second verifies the possibility of the executive having a second term of office. If negative, the agency receives one point. The third distinguishes between long and short term of office. In this case, long term of office (of four or more years) has preference over short ones (less than four years) in terms of independence, thus receiving one point.

The fourth question assesses the budgetary autonomy of the regulatory agency. In this case it was established that 30% of the agency's budget should come from own resources (fees and public services fees). For any percentage higher this minimum, the agency receives one point.

The fifth question assesses whether or not the decisions are collective. If affirmative, the agency receives one point.

The sixth question assesses whether appeal of agency's decisions is restricted to the judiciary, excluding the possibilities of a hierarchical appeal to ministries or to other bodies of the administration. If affirmative, the agency will receive one point.

The seventh question assesses the degree of transparency of the decisions of the regulatory agency. In this case four sub-questions are used. The first verifies whether or not the

decision sessions are public. The second verifies whether or not the decisions are published on the internet. The third, examines if there are public consultations. Lastly, the forth question verifies whether public hearings exist for important cases. For each positive answer the agency receives one point. The average of the sub-queries is computed as being the results for the transparency field.

The purpose of the eighth question is to verify whether the regulator is submitted to a period of quarantine upon leaving the position in the agency. One point is ascribed if there is a period of quarantine.

In order to capture the independence characteristics described previously, a second measuring criterion was used: value 1 is ascribed for each of the eight elements of independence. The lack of an institutional characteristic that favors independence will be captured by the value zero. For questions with more than one item (questions 3 and 7) the result represents the average of values for each item. Lastly, the partial points are added and II is obtained as shown in Equation 1.

$$II = \sum_{i=1}^{8} a_i;$$

(1)

Where i represents each individual question, so that $a_i \in [0; 1]$ represents the score obtained; and $0 \leq II \leq 8$.

The closer the score is to eight, the higher the independence indicator is. Note that this indicator captures only formal independence. The extent to which the regulatory authority is independent in practice is not directly reflected in II.

APPENDIX II   REGRESSION RESULTS OF THE MODEL

Chart 13: Model 01 Results

Dependent Variable: LNII
Included observations: 112

Variable		Coefficient	Std. Error	t-Statistic	Prob.
HDI	β_1	-0.7817	0.4261	-1.83	0.069
S_Electr	β_2	0.3124	0.1588	1.97	0.052
S_Telecom	β_3	0.3636	0.1570	2.32	0.022
S_Gás	β_4	0.3000	0.1623	1.85	0.067
F_Franc	β_5	0.2401	0.1204	1.99	0.049
Constant	β_0	3.5412	0.3526	10.04	0.000
R-squared		0.1057	F-statistic		2.51
Adjusted R-squared		0.0636	Prob(F-statistic)		0.0346

Source: The authors

Chart 14: Model 02 Results

Dependent Variable: LNII
Included observations: 81

Variable		Coefficient	Std. Error	t-Statistic	Prob.
AGE	β_1	-0.1533	0.3280	-0.47	0.642
HDI	β_2	-1.3543	0.7064	-1.92	0.059
S_Electr	β_3	0.2326	0.1995	1.17	0.247
S_Telecom	β_4	0.3184	0.2015	1.58	0.118
S_Gás	β_5	0.1980	0.1987	1.00	0.323
F_Franc	β_6	0.3913	0.1465	2.67	0.009

Constant	β_0	4.1139	0.6269	6.56	0.000
R-squared		0.1475	F-statistic		2.13
Adjusted R-squared		0.0783	Prob(F-statistic)		0.0594

Source: The authors