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THE ANALYSIS OF BRAZILIAN NATURAL GAS MARKET UNDER THE NEW INSTITUTIONAL ECONOMICS APPROACH

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Resumo

O propósito deste trabalho é identificar e explicar os empecilhos institucionais presentes no mercado brasileiro de gás natural. A análise se baseará na Nova Economia Institucional. Esse trabalho expõe os aspectos institucionais chave da indústria brasileira de gás natural, e também introduz uma discussão em relação aos potenciais impactos da proposta para mudanças no ambiente regulatório, em análise no Senado Federal.

O trabalho chega às seguintes conclusões: (i) Dado a atual política energética e face aos empecilhos institucionais presentes, espera-se que o gás natural desempenhe um papel secundário na matriz energética nacional; (ii) A política energética nacional deve promover novos processos industriais e tecnologias para uso final baseados no gás natural; (iii) Entretanto, tanto a política energética como as estratégias de negócios dos principais *players* para o setor não refletem tal realidade; (iv) Adicionalmente, a proposta de alteração na regulamentação do setor em andamento no Senado ainda não leva em consideração essas dimensões.

Como consequência, o trabalho sugere que a continuidade do atual desenvolvimento do mercado de gás levará a indústria a obter custos de transação cada vez mais elevados, diminuindo investimentos, perdendo eficiência e produtividade, e podendo comprometer toda a evolução da indústria local.

Abstract

The purpose of this work is to identify and explain the institutional restraints, which are present in the Brazilian natural gas market. The analysis, based on the New Institutional Economics theory, will depict the key institutional aspects of the Brazilian natural gas industry and also introduces a discussion regarding the potential impacts of the proposal for changes on the Brazilian gas regulation, under analysis in the Senate.

The paper concludes with the following main results: (i) Given the present energy policy and faced the institutional restraints, is expected that the natural gas plays only a marginal role in the Brazilian energy mix; (ii) The Brazilian gas policy should promote new gas-fired industrial processes and technologies; (iii) However, both the current business strategies from the main gas players and the national energy policy do not reflect such reality; (iv) Moreover, the proposal for law and regulation under discussion in the Brazilian Senate does not take those dimensions on perspective.

As a consequence, the paper suggests that the continuation of the current development will lead the domestic gas industry into growing transaction costs, declining investments, losing of efficiency and productivity, which might therefore compromise the whole evolution of the industry.

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1. Introduction

This study has as main objective identify and explain the main factors that characterize the current natural gas institutional environment in Brazil. Such environment consists in a scenario with trends towards the sub-utilization of the natural gas as back up for energy generation, resulting, among other things, in the irrational utilization of the energetic and loss of social well fare and industrial competitiveness.

Are concerned, in this institutional environment, the national energy policy, including the proposed regulatory law for the sector, the business strategies of the main players and the interrelation among other energetic.

The other objective is to suggest the first step toward the optimization of the consumption of natural gas, conditioned with the features of the energy mix. The investment in new technologies for final use is the guide of the suggestions, with the assumption that the hydro energy has the cheapest cost of expansion of the electric generation in Brazil.

The approach relies on the New Institutional Economics (NIE), theory based on the existence of transaction costs on the economic organization, and created as alternative for the neoclassical approach of analysis, in 1930's. The utilization of the NIE has as main advantage the consideration of the effects of institutional restraints on the contractual relations between agents, changing its flexibility. By this way, not just price and quantity interfere the final decision of consumers and suppliers. I suppose in this study that the highest flexible the contract, the better and faster is the development of the whole market of natural gas, because the agents would prefer always fewer long-term commitments.

The role of the transaction costs, not just in the current decisions, but also in the expectations of the natural gas market, has important influence in his path of development. Considering a scenario where the natural gas becomes a world-wide instead of a regional commodity (through investments in the NGL transport mode, for example, viable due to high oil prices), can be stated that the effects of each economic factor in the contractual relation is minimized, because the dependence between producer – consumer is weakened. However, the role and importance of the institutions in this process will determine the features of the market development, and if the maximization of the benefits due to the use of the natural gas is attained.

2. The New Institutional Economics

The analysis is made with tools extracted from the NIE theory, mainly those from the seminal works of Oliver Williamson (1985). In his work, he exposes the structure of the theory. Concerning the human behavior, differently from that supposed in the neoclassical theory (and used by many market analysis), the NIE build the human guidelines based on the bounded rationality (prejudiced by the cost of information, mainly) and on the actions following the own interest.

The recognizing that the transaction costs determines the governance structure results in a different kind of analysis, compared with that based in the neoclassical principles. In this work, the explanation of preferences of the agents in terms of price and quantity is not enough. Laws, expectations and pressure of groups will have impact in the decisions of consumption and investment, not rare more strong than the effects of price and quantity.

The analysis' tools used in this work relies on the 3 dimensions of the transaction, explained by Williamson:

The first one is the specificity. Directly related with the supply and demand, the specificity could be defined by the existence and accessibility by the agent of other contract options, beyond the current contractual relation. In the case of the natural gas, we can exemplify supposing a contractual relation between a shipper, owner of the natural gas in the transport level, and the owner of the gas pipeline, called "operator". With a contract where long term ship-or-pay clauses are present, the operator will confront difficulties to find a shipper willing to assume those obligations, only possible if there are some legal or geographic restrictions on the supply of natural gas, and the dependence of the distributor related to some mean of transport of gas is strong. Restrictions of supply and dependence of agents, for example, can create a specific contract.

The second dimension, the uncertain, is an important factor on the construction of expectations constructed by the agents, because his magnitude projects a risk, of demand, supply, political or of exchange ratio, for example, risks that should be paid by a premium. Can be affirmed that in the natural gas market in Brazil, with a regulatory environment undefined and with dependence of external supply (from political unstable countries), the uncertain of the

transaction affects strongly the investment decisions and the contractual relationship between the agents, forcing the avoidance of long term contracts by players or the focus on low price as the main determinant of the decision by the gas, becoming possible the quick amortization of the investments in infrastructure.

The third dimension is the frequency of the transaction, determining the degree of dependence between supplier and consumer (or in our case, between the concessionaire distributor and the shipper, or between the shipper and the pipeline operator), the governing structure (long term contracts or the spot market?), and the conditions of amortization of the investments in infrastructure. In short, the frequency of the transaction is able to affect strongly the decisions of consumption and investment.

The analysis of the institutional environment of the natural gas in Brazil is focused in the observation of these 3 dimensions previously described and his effects in the agents' decisions, becoming possible the identification of the institutional restraints.

3. Brazilian Natural Gas Market

The natural gas production in Brazil shows a positive rate of growth in the last years, increasing from 36,28 million m³/day (2000) for 48,48 million m³/day (2005), accordingly to the ANP, the Brazilian Oil Agency. Factors like new investments in transport facilities (by the stated-run Petrobras, mainly), the focus on the natural gas in the seventh round of blocks of ANP, the start expected of production of natural gas on Santos, Campos and Espírito Santos Basins in 2008, and the possible expansion of the Bolivia – Brazil pipeline's capacity (project in stand-by after the Bolivian pressures of nationalization of assets), becomes able to expect a growth of domestic supply, in 12 million m³/day for the Southeast market by the 2nd semester of 2008, accordingly to Petrobras Plans. By 2010, this volume should increase to approximately 30 million m³/day, contributing for the decrease in the participation of imports in the total supply of natural gas.

The natural gas from Bolivia represents currently almost 50% on the Brazilian supply of natural gas, consisting in 91% of the total imports (9% from Argentina). The Bolivian policy, considering the natural gas his main source of wealth, in 2006 made pressures generating negatives impacts in the Brazilian industry, increasing prices and creating bad expectations for the future.

The relation of prices between energetic, mainly in Brazil, a country with a large renewable energy potential, should be considered in the institutional analysis as well. In Brazil, the hydro energy is a competitive supply and available in large scale, representing our major source of electric energy (77%) in 2005. Another kinds of renewable energy, such as ethanol and biodiesel (fuels) and co-generation by biomass (electric energy) have many projects economically viable, even in a small-scale production. Concerning biodiesel, is expected that the dependence of the demand created by the federal legislation (that imposes mixture in mineral diesel of 2% and 5% by 2008 and 2013, respectively), becomes weakened, with the productive sector fulfilling demands originated in the domestic and the foreign markets.

The existence of a renewable and cheap energy, by one side, stimulate the increase in the consumer's income and becomes more easy the access to energy by the population. But from another side, brings to society also the irrational use of the energy available, without considerations concerning the ecological impacts or the future supply required to fulfill this excessive demand. Large social costs would be created (as Brazil suffered in the energy blackout of 2001).

From a microeconomic point of view, the substitution of energetic based on costs, factor that varies in the short term, not considers qualitative factors, and maybe value added could be wasted. From a macroeconomic point of view, the substitution prejudices the rational role of the natural gas in the energy mix, because the gas is moved for another uses, as the back up for hydroelectric energy.

Still speaking about the relationship between energetic, the necessity of Petrobras to find demand in the domestic market for his oil becomes limited the insertion of the natural gas in the energy mix. The willing of the company, in a scenario of scarce supply of gas, to substitute its own consumption of natural gas (14 million m³/day) by own oil in his thermal power plants (April 2006) maybe reflects that there is no much interest, by the company, to move out the oil benefiting the natural gas in the domestic market.

4. Institutional Restraints

Among the main institutional restraints present in the contractual relation between distributor and consumer in Brazil, we can point out the following ones:

4.1 The period of monopoly rights about the commercialization of natural gas and the take-or-pay and ship-or-pay clauses (valid for the State of São Paulo, the largest Brazilian state consumer).

For distribution companies (from the State of São Paulo) the monopoly of distribution of natural gas covers the whole period of the concession term. However, the commercialization, excluding for the residential and commercial segments, will be exclusive of the distributor by 12 years after the signature of the concession contract, in the case of Comgas. For Gas Brasileiro and Gas Natural SPS, the period of monopoly covers 12 years after the construction of city-gates in determined regions, or 20 after the signature of the concession contract. The distributor has commitment through long-term take-or-pay or ship-or-pay clauses, meanwhile confronting high uncertainty about the demand at the same period. Due to the incompatibility of periods, the distribution company will try, accordingly to his bargaining power, transmit part of the risk for the consumer, through take-or-pay clauses. This kind of contract reduces the uncertainty of the distribution companies. However, more rigid the clauses, higher the risk for the consumer, and in the case of the industrial one, this affects directly his costs and profitability. The uncertainty decreases the contract flexibility, affecting the expansion of natural gas market.

4.2 The guarantee of supply

The guarantee that supply will not show any interruption is a fundamental factor in order to eliminate the uncertainty. Due to the specificity feature of the natural gas (should not use other energetic with the same infrastructure, has low flexibility among other energetic), the interruption prejudices industries and the well fare of the society. If uncertainty exists, the consumer will not invest in equipment by natural gas, deciding by another energetic, even if natural gas can generate good benefits in quality and costs.

4.3 The pricing of the Gasbol's transport tariffs

Due to the necessity of amortization of a high amount of capital for his construction, we have a high level tariff of transport in this pipeline, reducing the competitiveness of the natural gas in Brazil. Of course, if the model to insert the gas in the energy mix relies in his qualitative advantages instead of factor of costs, the tariff of transport maybe should not be one restraint. The price of the Bolivian gas might be lower than in other places, however, the interrelation between his final price and the exchange rate, and the high cost of the transport prejudices the decision of consumers for the natural gas. While the natural gas policy in Brazil relies in the simplest increase of supply, the pricing of transport prejudices the national market.

4.3 Impacts from tax policy

The distributor of natural gas, acquiring the Bolivian gas, pays a percentage 9,25% due to the PIS/COFINS tax. Concerning the contracts with pre-determined prices (those signed before the Law nº 10.833/2003), the distributor makes deductions of just 3,65%, in the sales of the same gas for the consumers. This difference will require higher tariffs to pay the capital invested by the distributor in distribution facilities. Another taxation problem is found on the collection of the ICMS tax. In way of the Bolivian gas until the large state consumer, São Paulo, the tax remains in the State of Mato Grosso do Sul, where the natural gas goes until São Paulo. For the Brazilian natural gas, the ICMS remains in the State of Rio de Janeiro, because is extracted there. That is not a direct restraint for the contractual relation distributor – consumer of natural gas, but consists in a transference of income between São Paulo and another states.

4.4 The role of Petrobras and the Brazilian oil market

The Petrobras, present in the natural gas production chain (as the main producer, importer and transporter), has activities also in the oil production chain, concurrent of the natural gas. The industry of the natural, in the current Brazilian regulation, has high dependence of investments of Petrobras. Owner of natural gas wells, of pipelines and with share participation in several distribution companies in Brazil (excluding those of São Paulo and Rio de Janeiro), the decisions of the company affects the market as a whole.

The conflict exists because Petrobras becomes concurrent, supplier and distributor. A relation of dependence is created between the distribution companies and the supplier, who is also the concurrent (because operates with oil also).

The behavior uncertain, defined by Williamson as resultant of the bilateral dependence of the agents, is predominant in that situation.

By the New Institutional Economics Approach, the presence (many times predominant) of the Petrobras in several steps of the production chain of the natural gas and another energetic increases his power of bargain to negotiate prices, volumes and terms. Combined with risks in exploration and production, the way as part of this risk is transferred along the production chain is by long-term contracts. The rigid clauses of these contracts not just prejudice the consumption of natural gas, but also new investments in exploration and production of new players (because then are afraid about the dependence of just one agent for the transport, Petrobras).

4.5 The scarce infrastructure of transport

The investment in the distribution facility is viable if the pipeline is located near the consumption. In Brazil the transport infrastructure is scarce, prejudicing the reach of the distribution facilities. The transport by CNG – Compressed Natural Gas is not economic viable for large distances, higher than 200 km. By the institutional point of view, the existence of supply by CNG creates an uncertain of guarantee of supply in the long term for the consumer.

Furthermore, the final price might be higher compared with the piped distribution. In short, the limited reach of the transport infrastructure restrains the potential of growth of the market and prejudices the contractual relations between distributor – consumer, because the uncertain and the higher frequency of the contract creates costs of transaction. Should be considered also the economies of scale lost in the distribution of gas due the small reach of the transport infrastructure.

With the utilization of “virtual pipelines” as CNG or LNG, to create demand and compensate the scarce infrastructure, regulatory conflicts between Federal and States appears. One example is the joint venture between Petrobras and White Martins to construct and operate a plant of LNG in the State of São Paulo. The natural gas comes from Petrobras, but Comgas understands that the right of supply is not of Petrobras, because this supply is distribution, not transport. In short, the scarce infrastructure of transport restrains the consumer market, the investments in distribution facilities, higher efficiency of the distributor and creates regulatory problems.

4.6 The regulation about tariff discrimination - the selection of criteria

Accordingly to the concession contracts and São Paulo law's CSPE 160, the concessionaire of distribution cannot discriminate users in similar conditions in terms of tariff. Are not considered discriminatory treatment, by law:

- a) Different segments of users and modality of services.
- b) Localization of the user's unit
- c) Different conditions of the supply of service.

Is not open the chance of discrimination accordingly to the importance of natural gas to the respective productive sector of the consumer. This importance should be found by the competitiveness that the natural gas brings to the consumer. This kind of importance affects the bargaining power of the agents and the format of the contracts. Becoming possible the discrimination accordingly to the sectors' state-of-art of the technology, and consequently by the competitiveness brought by the natural gas, distributor and consumer can explore better his respective bargaining power to obtain benefits. Without the discrimination, the chance to expand the natural gas to other sectors, not just by this mechanism described, but also by economies of scale, which can appear due of such mechanism, is lost. What is defended is not that the elimination of consumer's surplus, but that this surplus can be used to finance the natural gas market expansion where competitiveness is stimulated and well fare is created for the whole society.

5. Short Analysis of the Proposed Law for the Sector

Following described and analyzed, within the New Institutional Economics concepts, some main features of the law proposed for the sector of natural gas, made by the former Minister and Deputy Mr. Rodolpho Tourinho:

5.1 The Gas Law

The proposed law, currently under analysis in the Brazilian Senate, in short threatens the predominance of Petrobras in the transport of natural gas in Brazil, and becomes more closest the markets of natural market and electric energy. We can highlight in the project the following main points:

5.1.1 New pipelines will be constructed under a bidding process, and the interested must dispute the concession of operation accordingly to the low tariff criteria. Should exist compatibilities between the shipper and the operator of the pipeline.

It is supposed that there are investors with financial conditions to fulfill the demand of the shippers in the construction and operation of the pipelines. In this mechanism, is created dependence between the shipper and the operator, a disadvantage for the shipper, who has the demand risk and accumulates long-term commitments. By the another side, the operators will be selected accordingly with the low tariff criteria. As the cost for investments in transport infrastructure is high, the bidders should enlarge the contractual term, becoming the tariffs lower (to the amortization of capital). The flexibility of the contract is affected, by the ship-or-pay clause, and by the period required for the operator to the amortization of his investment. Should be highlighted the practice of creation of virtual pipelines. Because this construction will have now shippers and operators commitment each other and protected by law (with the right of transport), the possibility of a region have a virtual pipeline until reach viability of construction of a pipeline will be prejudiced, because the responsible of the virtual pipeline will be assured if he will be the owner the future pipeline. The pipelines, under this law, should be constructed where there is a high level demand, in a well-demanded region, feature of thermal power plants locations.

5.1.2 The commitment agreement of the shippers about the bid made in the auction about the transport charge.

The agreement of commitment consists in a long-term contract with take-or-pay clauses.

5.1.3 The pipelines already in operation will rely this concession scheme, and after a period (accordingly to the depreciation and amortization), will be transferred for the government ownership.

This might deteriorate expectations and reduce investments, due to uncertain generated in relation to depreciation and amortization of a not consolidated market.

5.1.4 Concerning the storage of the natural gas, the legal scheme will be concession.

5.1.5 Creation of a regulatory power: Will exists an responsible to becomes operational the supply of natural gas, concerning with the transport and storage.

One of the functions of the regulatory agent will be the management of the electric energy generated by the thermal power plants: “*..Destaca-se que uma das funções do órgão será “...viabilizar o atendimento do despacho das instalações de geração termelétrica seja para atendimento energético, bem como para suporte nas intervenções da rede elétrica, definido pelo ONS”.*”

It reflects the approximation between natural gas and electric energy markets. The law gives conditions to the regulator manage the supply of gas from thermal power plants, as priority in relation to another consumer segments, generating uncertain in these segments.

5.1.6 Access by shippers: Auction to define the transport capacities offered by the operator.

5.1.7 Expansion: The expansion project will be preceded of a public auction promoted by the operator.

5.1.8 The operator should permit the connection to another pipelines of transport.

The access rules structure still remains undefined. Transport capacities not compatible between 2 operators can generate conflicts each other, and between shippers. Under the New Institutional Economics approach, a contract between operator and shipper that already has some features of specificity and low frequency (the lower tariff criteria in the auction should force long term contracts) also will increase the uncertain of the agents, concerning the access to other pipelines or even the enforcement of the contract with his own operator, due to the demand of the shippers of another pipelines interconnected.

5.1.9 the law assures the concession rights of the piped natural gas in the states regulatory framework.

6. Conclusion

Confronting the institutional restraints present in the natural gas industry, some recent facts have deteriorated the future expectations about the future supply of natural gas in Brazil. Even the current model (from the energy policy) of insert the natural gas in the energy mix does not works inside his own logic, if we remember that in the case of scarcity of electric energy after 2009, maybe we cannot have an enough volume of natural gas to supply the thermal power plants available.

The current energy policy (and where the players’ decisions relies) showing trends that the natural gas should be understood as a complementary source to the electric energy market, gives to the natural gas a secondary role in the

energy mix, when in some consumer segments, mainly the domestic final use and in industries, the benefits could be better extracted.

As example of the behavior of the large players in Brazil, can be highlighted the preference, of several companies, to announce the capacities that they are willing to contract, in case of expansion of the Gasbol pipeline (threatened by the current Bolivian political pressures) only after the electric energy auction, expected to be held in the second semester of 2006, and that will contract energy supply for 2009. The auction of energy electric stimulates the construction of thermal power plants, because in this short period (until 2009) the new hydro power plants cannot be constructed.

In the law in analysis in the Senate, remains a bias towards the unification of the natural gas and the electric energy markets, without considering that the natural gas supply must grow constantly, a hard task for upstream and downstream players, if the efficiency in the final use do not be stimulated. The main feature of the law, conditioning the construction and operation of pipelines and storage facilities to a bidding process and a concession contract, gives to the thermal power plants in Brazil priority in the supply.

Due to the prejudicing effects created by the current energy policy, the space of action of the regulator is limited, not permitting him to develop totally the market meanwhile the maintenance of a competitive market.

To reach a rational utilization of the natural gas should be stimulated new technologies of final use, promoting the increase of efficiency. For that, the sources (reserves or imports) should be consolidated, without large risks that can threaten the safety supply, and without strong commitments in the long term, prejudicing the flexibility of the contracts and transferring risks by the whole production chain. The project of law of Mr. Tourinho, adopting the concessions for transport and storage (and with the low tariff criteria for the auctions) stimulates the long-term contracts between shippers and operators. The advantage is that the revenue of the operator is more stable, permitting the entrance of the private sector in exploration and production. A investor can participate in the construction of a pipeline that will transport gas from his own well until a consumer point.

With the consumption of natural gas relying in the low final price of the Bolivian supply, without incentive to betterments in the efficiency of the final use, the supply, as mentioned above, will always have to increase in the path of the demand (not only of natural gas, but of the electric energy also).

Solve that situation, by long distance pipelines connecting the Venezuelan reserves to the Brazilian industries, increases the dependence in relation to unstable democratic countries. By this way the concessions mode for pipelines construction shows his advantage, becoming easier to investor to enter in exploration and production of gas, decreasing the foreign dependence.

The understanding, of the president of the Empresa de Pesquisa Energética - EPE, Mr. Maurício Tomalsquim, in an interview for the Valor Econômico Journal in 12/04/2006, reflects this fact. Accordingly to him, the natural gas from Santos Basin is able just to fulfill the demand growth of the Brazilian natural gas market, and because of that, the construction of hydro power plants is essential: Brazil cannot rely in thermal power plants by natural gas.

Becomes easier the access to equipments that increase the social well fare, and that have energetic rationality in his utilization (rationality understood as the search for the maximum extraction of the benefits offered by the natural gas), the creation of an institutional environment that eliminates the restraints described in this work, where new players might be attracted to the natural gas sector (in upstream and downstream activities) without facing market risks so directly linked with the electric energy market, would be the first step to a sustainable development of natural gas market in Brazil, enjoying his qualitative advantages.

7. References

- ABEGAS. Associação Brasileira das Empresas Distribuidoras de Gás Canalizado. Disponível em <www.abegas.org.br>, Acesso: Março de 2006.
- BNDES. Banco Nacional de Desenvolvimento Econômico e Social. Disponível em < www.bndes.gov.br >, Acesso em Janeiro de 2005.
- BRASIL. Lei nº 10.833, de 29 de dezembro de 2003.
- BRASIL. Lei nº 10.865, de 30 de abril de 2004.
- CARVALHINHO FILHO, J.C.L., O valor da flexibilidade em cláusulas “take-or-pay” de contratos para fornecimento de gás natural industrial, Dissertação de mestrado, FEA/USP, 2003.
- COASE, R.H., The Nature of the Firm, pp 331 - 351, Readings in Price Theory, London, 1952.
- COMGAS. Companhia de Gás de São Paulo. Disponível em <www.comgas.com.br> Acesso em Abril de 2006.
- CSPE. Comissão de Serviços Públicos de Energia. Disponível em: <www.cspe.sp.gov.br>, Acesso: Março de 2006.
- GAS BRASILIANO. Disponível em < www.gasbrasilano.com.br >, Acesso: Dezembro de 2004.
- GAS NATURAL SÃO PAULO SUL. Disponível em <www.gasnaturalsps.com.br> , Acesso: Dezembro de 2004.
- NORTH, DOUGLASS C., Institutions, Institutional Change, and Economic Performance, Cambridge, Cambridge University Press, 1990.
- PETROBRAS - Petróleo Brasileiro S.A. < www.petrobras.gov.br>, Acesso: Maio de 2006.
- MINISTÉRIO DE MINAS E ENERGIA, BALANÇO ENERGÉTICO NACIONAL 2006 Resultados Preliminares ano base 2005, <www.mme.gov.br>, Acesso: Junho de 2006.
- SANTOS, EDMILSON MOUTINHO (org.), Estratégias para uma energia nova no Brasil, Annablume, Fapesp, Petrobras, São Paulo, 2002.
- TBG. Transportadora Brasileira Gasoduto Bolívia Brasil S.A.<www.tbg.com.br>, Acesso: Novembro de 2004.
- VALOR ECONOMICO JOURNAL, Edition 12/06/2006, page B12.
- WILLIAMSON, E. OLIVER. The Institutions of Capitalism, Free Press, New York, 1985.