

**THE GEORGE WASHINGTON UNIVERSITY
SCHOOL OF BUSINESS AND PUBLIC MANAGEMENT -
INSTITUTE OF BRAZILIAN BUSINESS AND PUBLIC MANAGEMENT
ISSUES – IBI**

**MINERVA PROGRAM
FALL 2008**

**ELECTRICITY TRANSMISSION SECTOR IN
BRAZIL – ANALYSIS OF THE AUCTIONS'
RESULTS AND THE PUBLIC AND PRIVATE
FIRMS' COSTS**

EDUARDO SERRATO

ADVISOR: PROF. JOHN FORRER

WASHINGTON-DC, DECEMBER 2008

TABLE OF CONTENTS

Chapters

Introduction.....	4
Chapter 1. Electricity Transmission Sector in Brazil.....	6
Chapter 2. Electricity Transmission Enterprise Auctions.....	14
Chapter 3. Transmission Firms' Cost Analysis.....	21
Chapter 4. Conclusion.....	33
References	37

List of Tables

Table 1.1 – Public firms in electricity transmission sector in Brazil	7
Table 1.2 – Public-private consortia in electricity transmission sector in Brazil	10
Table 1.3 – Private firms in electricity transmission sector in Brazil.....	11
Table 2.1 - Total amount of Revenue (RAP) entrepreneurs receive from transmission assets acquired in auctions since 1999.....	19
Table 3.1: Percentages of operational and administrative subcontract expenses in controllable costs.....	27
Table 3.2 - Percentage of operational and administrative personnel expenses in controllable costs.....	29

List of Charts

Chart 2.1 - Quantity of enterprises offered and auctions held.....	14
Chart 2.2 – Average quantity of competitors for each enterprise offered.....	15
Chart 2.3 – Average discount in revenue offered by competitors in the auctions.....	16
Chart 2.4 – Average revenue (RAP) offered per enterprise (values in June, 1999). 17	
Chart 2.5 - Quantity of enterprises each kind of entrepreneur acquired in auctions from 1999 to 2007	18
Chart 2.6 - Average revenue offered in auctions by each kind of entrepreneur from 1999 to 2007 (values in June, 1999)	19
Chart 2.7 - Average discount in the Revenue (RAP) offered by each kind of entrepreneur in auctions since 1999	20
Chart 3.1 – Firms´ total costs divided into financial and operational-administrative expenses.....	22
Chart 3.2 – Operational-administrative costs divided into not-controllable and controllable expenses	24
Chart 3.3 – Controllable operational-administrative costs divided into personnel, equipment and general purchases, subcontracts, rental and others	25
Chart 3.4 – Firms´ subcontract costs divided into operational and administrative expenses.....	26
Chart 3.5 - Firms´ personnel costs divided into operational and administrative expenses.....	28
Chart 3.6 – Equipment and general purchase costs divided into operational and administrative expenses	30
Chart 3.7 - Rental costs divided into operational and administrative expenses.....	30
Chart 3.8 – Other costs divided into operational and administrative expenses.....	31
Chart 3.9 – Total controllable costs divided into operational and administrative expenses.....	32

Introduction

In Brazil, most of the electricity used by households and industries is supplied by hydropower plants. In general these plants are built on rivers with natural waterfalls that are usually very far from Brazilian consumers. Such technical constraint requires a high-power transmission infrastructure to convey the electricity produced to the urban areas, which makes the transmission segment a fundamental part of the electricity sector, as important as power production and distribution.

Brazil is an enormous country and therefore demands huge electricity transmission infrastructure. In the latest 10 years, hundreds of high power lines and substations were built to increase the electricity transmission capacity and to improve its performance (reliability and availability). In the next years, investment opportunities in the transmission market in Brazil tend to keep at high levels, since new enterprise concessions will be offered in public auctions, particularly those connecting hydropower plants in the Amazon region¹ to the populated areas of the country.

Part of the success observed in the transmission sector in Brazil is due to the regulatory model implemented by the federal government in the nineties, which intended to accelerate private investments in the electric power industry. Since 1999, when transmission concessions started to be offered in public auctions, lots of private firms have joined the transmission market, particularly foreign companies from Spain, Italy and Colombia. The results of the auctions in the latest years indicate an increasing competition between the entrepreneurs to obtain new

¹ Most of the hydropower potential in Brazil is located in the Amazon region, which has been barely explored yet.

concessions. We can see clear that the remaining public firms are struggling to expand their transmission lines.

Such enthusiasm to participate in the transmission market reveals that entrepreneurs are getting the expected economic returns from their investments. Operational and financial costs also seem to be at expected levels, once transmission revenues are fixed by the entrepreneurs themselves². Therefore, an accurate cost analysis of the transmission firms would be a helpful contribution to understand how they are running their business in this competitive market; however, this analysis should differentiate those firms, since a brand new private transmission firm is not expected to have the same cost structure as a big and old public transmission one. Moreover, firms controlled by the federal government are managed in a different way than those controlled by a Brazilian State.

This paper intends to analyze the cost structure of transmission firms in order to get a clear understanding how they are running their business and reaching their goals. To get to this point, the first chapter describes briefly what the Brazilian Electricity Transmission Sector is about and how it works. Chapter 2 presents the results of the public auctions since the beginning of this process, in an attempt to show its successful achievements. Chapter 3, which is the core of this paper, regards the transmission firms' costs. It shows, through pie charts, the overall costs of federal-owned, state-owned and private companies. The figures were aggregated and are shown as percentages, so it's possible to observe the difference between those firms. At last, Chapter 4 presents the conclusion about the whole analysis.

² The auction winner is the proponent who offers the lowest annual revenue, called Permitted Annual Revenue (Receita Anual Permitida – RAP)

Chapter 1. Electricity Transmission Sector in Brazil

In the nineties, Brazilian government implemented an electric sector reform that changed significantly the regulatory rules for the electricity production, transmission and distribution in the country. In general, the new model determined the following rules to these segments:

- 1) The electricity production became a competitive market. Hydropower and Thermo Power plants started competing between themselves in a free market;
- 2) The electricity distribution segment was considered natural monopoly and comprised firms with power lines inferior than 230 KV. Ultimately, distributors are responsible to deliver electricity to final consumers (households and industries). Tariffs in this segment were strictly regulated (price cap regulation);
- 3) The electricity transmission segment was also considered a natural monopoly and was defined as those firms who owned high tension power lines (equal or higher than 230 KV). Transmission firms' revenues turned to be fixed (revenue cap regulation).

The reform had clear purposes of preparing firms to be privatized, attracting private investors and modernizing the electric sector. At that time, most of the firms were public, and they used to participate in more than one electricity segments (production, distribution and transmission). However it was expected that the privatization would be more successful if these firms had their activities segregated. Therefore, as a first step, all the firms had to segregate the activities in

their financial statements, so their assets, liabilities and costs could be separately observed³. Furthermore in 2004, the federal Law 10.848 determined that the distribution segment should be absolutely segregated from the other segments, which meant a distinct distribution firm to run this activity.

During the nineties and early 2000, many firms were privatized, mainly in the distribution and production segment. Nevertheless privatization original plan was not fulfilled and many others, including most of the electricity transmission firms, kept under control of Federal and Brazilian States governments. Table 1 lists these firms and points out some of their characteristics, such as i) their activities; ii) the date they assigned the new concession contract; iii) their line length.

We can observe in Table 1.1 that most of those public firms are also electricity producers. Indeed, the federal controlled firms own the biggest hydropower plants and thus are huge electricity producers in Brazil. Moreover, they have the biggest transmission assets, which are spread all over the country, including the less populated areas.

Table 1.1 – Public firms in electricity transmission sector in Brazil

Public Firms	Activity	Concession Granted	Line Length (Km)
Federal-Owned Firms			
CHESF -Companhia Hidro Elétrica do São Francisco	Production/Transmission	6/29/2001	18,468
ELETRONORTE -Centrais Elétricas do Norte do Brasil S/A.	Production/Transmission	6/27/2001	9,840
ELETROSUL -Eletrosul Centrais Elétricas S/A	Transmission	6/20/2001	9,145
FURNAS -Furnas Centrais Elétricas S/A.	Production/Transmission	6/29/2001	19,278

³ On the whole, transmission firms assets comprise high-tension lines, that convey electricity from one region to another, and substations, that reduce or increase the line tension and enable producer/consumer connection to the line.

Cont. Table 1.1

Total			56,731
State-Owned Firms			
CEEE-GT -Cia Estadual de Geração e Transm. de Energia Elétrica	Production/Transmission	10/1/2001	5,748
CELG G&T -	Production/Transmission	6/20/2001	5,734
CEMIG-GT -CEMIG Geração e Transmissão S/A	Production/Transmission	7/10/1997	4,874
COPEL-TRANS -Copel Transmissão S/A	Transmission	6/20/2001	7,287
CTEEP -Cia de Transmissão de Energia Elétrica Paulista *	Transmission	6/20/2001	18,494
Total			42,137

* Privatized in November 2006 by the State of Sao Paulo

In order to adapt to the electric sector model designed in the reform, all those public transmission firms had to assign new concession contracts, which contained their fixed annual revenue for the concession period (30 years). The National Electricity Regulatory Agency (Agencia Nacional de Energia Eletrica - ANEEL) calculated and set the revenues according to firms' existing transmission assets. Since that moment, if these public firms intended to get new transmission concession, they had to participate in public auctions in the same condition as any other proponent.

The first transmission enterprise auction was held in 1999. To date, sixteen public auctions have already been held and almost 80 concessions have already been granted⁴. On the whole, the rules⁵ are as follows:

- The federal government defines the general project requirements of the new transmission enterprises;

⁴ The Tables presented in this chapter contain only the concessionaires whose enterprises were in operation in the end of 2007. Therefore they do not show many other concessionaires that were still building their enterprises by that date.

⁵ For details of the auction, see www.aneel.gov.br, so in English version click "enterpriser's space", then "transmission Edicts" or "Transmission Programs"

- The Brazilian Electricity Regulatory Agency (ANEEL)⁶ carries out an international public auction, offering transmission enterprises to investors;
- Public, private, national, international, consortium and individual firms can participate in the auction.
- The winner is the one who offers the lowest annual revenue it is supposed to get during the period of concession (30 years). It is a revenue cap regulation;
- The winner is responsible for construction, operation and maintenance of the whole enterprise during this period.
- The revenue offered by the winner is supposed to cover the firm's investment, as well as its operational costs, its maintenance costs and, eventually, its profit. It is called Permitted Annual Revenue (Receita Anual Permitida – RAP).

Public firms have been participating in auctions as well, sometimes as an individual firm, but more usually joining a private consortium with less than 50% of its capital. It's been convenient for them to join consortia as a minority shareholder in order to be more competitive in the auctions. The main advantages of this public-private relationship are: i) each firm take advantage of its expertise; ii) line construction is faster and cheaper since the concessionaires are not constrained by the federal law of auctions in Brazil (8.666/93); iii) the assets are located within the concession areas of these public firms, so they can easily be responsible for the lines and substations maintenance after construction.

⁶The Brazilian Electricity Regulatory Agency (ANEEL) was created in 1995 by Law 9,074 to regulate the electricity concessionaires, which includes determination of the distributors' tariffs, calculation of the transmission firms' revenues and auditing of concessionaires.

Table 1.2 shows the list of public-private consortia that had already finished building their transmission enterprises, according to the new model, in the end of 2007. It also shows the data the concession was granted and the date the enterprise started operating, which corresponds to the beginning of the 30 year concession period. Finally, Table 1.2 presents the transmission line lengths, and we can observe that they are much shorter than the public firms' lines.

Table 1.2 – Public-private consortia in electricity transmission sector in Brazil

Public-Private Consortium	Segment	Concession Granted	Operation Started	Line Length (Km)
AETE - Amazônia - Eletronorte Transm. de Energia S/A	Transmission	2/18/2004	8/21/2005	193
ARTEMIS - Artemis Transm. de Energia S/A	Transmission	2/18/2004	10/31/2005	376
Companhia Transirapé de Transmissão	Transmission	3/15/2005	5/23/2007	65
Companhia Transudeste de Transmissão	Transmission	3/4/2005	2/23/2007	140
ECTE - Empr. Catarinense de Transm. de Energia S/A	Transmission	11/1/2000	3/9/2002	253
ETAU - Empr. de Transm. do Alto Uruguai S/A	Transmission	12/18/2002	7/24/2005	174
STN - Sistema de Transmissão Nordeste S/A	Transmission	2/18/2004	12/19/2005	541
TRANSLESTE - Cia Transleste de Transm.	Transmission	2/18/2004	12/18/2005	150
Uirapuru Transmissora de Energia S/A	Transmission	3/4/2005	7/9/2006	120
Total				2,012

At last, Table 1.3 lists the private firms that were operating by the end of 2007. Similar to the public-private consortia, these firms got their transmission concessions through public auctions, so they have only transmission assets as well. A private firm can take part in auctions by itself or join other private firms as a consortium. This Table, however, does not distinguish these options and define them all as “private”. As we can see, private firms were running 23 concessions by

December 2007 and operating a quite significant quantity of transmission enterprises.

Table 1.3 – Private firms in electricity transmission sector in Brazil

Private Firms	Segment	Concession granted	Operation started	Line Length (Km)
ATE - Transm. de Energia S/A	Transmission	2/18/2004	10/27/2005	370
ATE II Transm. de Energia S/A	Transmission	3/15/2005	12/11/2006	937
CPTe - Cachoeira Paulista Transm. de energia S/A	Transmission	12/20/2002	11/28/2004	181
EATE - Emp Amazonense de Transm. de Energia S/A	Transmission	6/12/2001	3/10/2003	924
ENTE - Emp. Norte de Transmissão de Energia S/A	Transmission	12/11/2002	2/12/2005	464
ERTE - Emp. Regional de Transm. de Energia S/A	Transmission	12/11/2002	9/15/2004	179
ETEO - Emp. de Transm. de Energia do Oeste Ltda.	Transmission	5/12/2000	10/14/2001	505
ETEP - Emp Paraense de Transm. de Energia S/A	Transmission	6/12/2001	8/25/2002	330
ETIM -Expansion Transm. Itumbiara Marimbondo S/A	Transmission	12/20/2002	6/28/2004	210
Expansion Transm. de Energia elétrica S/A	Transmission	12/20/2000	12/28/2003	575
GTESA - Goiana Transm. de Energia S/A	Transmission	1/21/2002	8/26/2003	51
Itumbiara Transm. de Energia Ltda.	Transmission	3/4/2005	12/20/2006	811
LUMITRANS - Lumitrans Cia Transm. de En. Elétrica	Transmission	2/18/2004	7/30/2007	51
Munirah Transm. de Energia S/A	Transmission	2/18/2004	10/30/2005	106
NOVATRANS - Novatrans Energia S/A	Transmission	12/20/2000	4/8/2004	1,278
NTE - Inabensa Brasil Ltda	Transmission	1/21/2002	1/25/2004	386
PATESA - Paraíso - Açú Transm. de Energia S/A	Transmission	12/11/2002	9/1/2004	135
PPTE - Porto Primavera Transm. de Energia Ltda	Transmission	3/4/2005	10/17/2006	492
SC ENERGIA - Emp. de Transmissão de Energia de Santa Catarina S/A	Transmission	3/4/2005	9/17/2006	750
STC - Sistema de Transmissão Catarinense S/A	Transmission	4/27/2006	6/30/2007	195
STE - Sul Transmissora de Energia S/A	Transmission	12/19/2002	7/18/2004	389
TSN - Transmissora Sudeste Nordeste S/A	Transmission	12/20/2000	3/4/2003	1,050
Vila do Conde Transmissora de Energia Ltda.	Transmission	3/4/2005	5/9/2006	324
Total				10,693

It is also important to point out that electricity transmission comprises thousand kilometers of high-tension lines that should cross mountains, forests, rivers and isolated areas in the country. To avoid any interruption of the electricity transmission, these lines must be all interconnected, so if one piece fails the electricity can be conveyed the other way round. In Brazil, this grid of transmission lines is called National Interconnected System (Sistema Interligado Nacional – SIN).

The construction of a reliable transmission grid has been a government priority. In the new electric model, a private agency, the National System Operator (Operador Nacional do Sistema Elétrico – ONS), is responsible for the supervision of the SIN⁷. It was expected that an interconnected transmission grid operated by a centralized agency would be the most efficient way to reach high standards of reliability and availability of the whole system, what proved to be absolutely correct.

By and large, the transmission concessionaires must stick to the following rules⁸:

- ONS is continuously checking lines availability and is able to measure the transmission concessionaires' performance.
- Their assets should be 100% available to electricity transmission; otherwise their revenues are reduced as a penalty.
- ANEEL uses ONS's information to calculate the penalties and set a reduced annual revenue for the transmission firm;

⁷ ONS was created by law 9,648/98. Indeed, the its major task is to command the hydropower plants to start and to stop producing electricity, so it can manage the water stock in the hydropower reservoirs and assure the continuity of electricity production in the short and medium term. The water stock control is necessary because the southern region of Brazil has a different rain pattern than the rest of the country, so when it is raining in the south (reservoirs are getting full), it is a dry season in the south–east and in the centre of Brazil (reservoirs are reaching low level).

⁸ See Law 9,074/95 for details of the rules for transmission concessionaires.

- When these concessionaires are requested, they should connect any producer, distributor, other transmission firm or major consumer to their lines. In this case, they are paid by providing connection to others through bilateral contracts;

Although the transmission concessionaires in Brazil have to face very tough regulatory rules to enter the market and to operate their lines, it is easily observed how attractive this segment has turned to be. In the next chapter, we show the increasing competition in the auctions and how private and public entrepreneurs are doing to get new concessions.

Chapter 2. Electricity Transmission Enterprise Auctions

In this Chapter, we analyze some parameters obtained in the public auctions where transmission enterprises were offered by Brazilian government. Figures are shown in column charts from 1999 to 2007. The objective of this arrangement is to show how competition evolved along these years. In the end of the chapter, we show, in column charts as well, how public and private entrepreneurs are performing in these auctions.

In 1999 the Brazilian Electricity Regulatory Agency (ANEEL) started offering transmission concessions, which comprised transmission lines and substations, through public auctions. Since that year, ANEEL has already carried out 16 auctions, including the one held in June 2008, distributed as shown in Chart 2.1. In the same Chart, it is also depicted the quantity of enterprises that was offered in each auction. As we can observe, ANEEL carried out at least 1 auction every year to a maximum of three auctions, in 2000. Moreover, the quantity of enterprises increased from two, in 1999, to a maximum of thirteen, in 2004 and in 2006.

Chart 2.1 - Quantity of enterprises offered and auctions held.

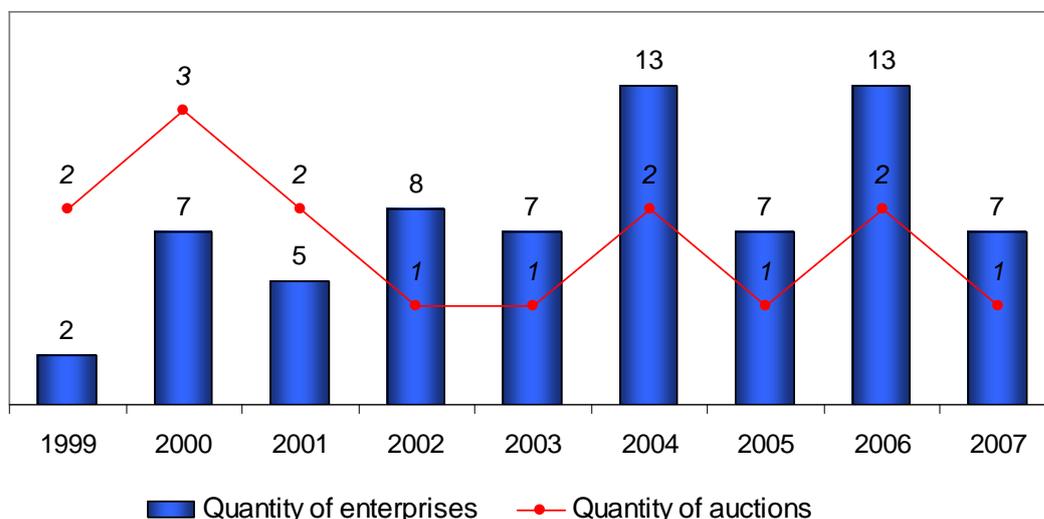
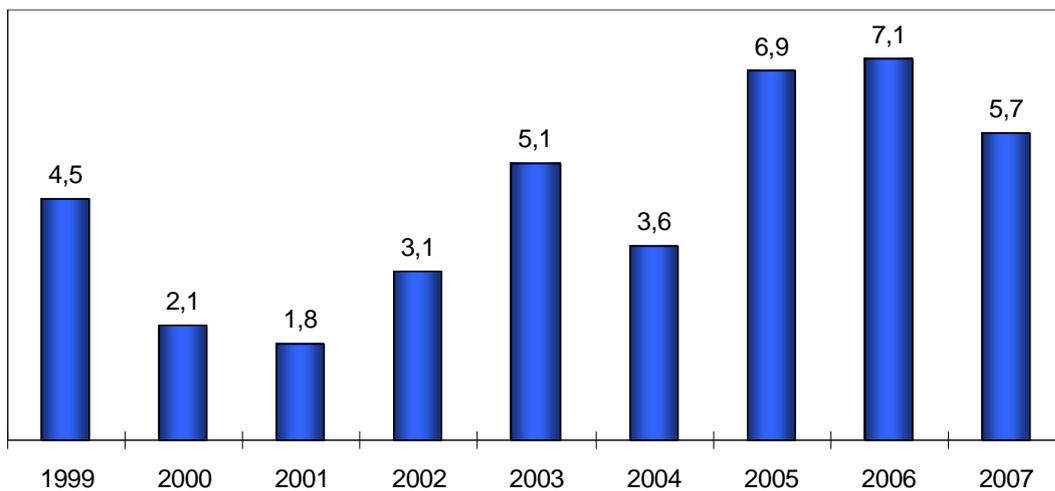


Chart 2.2 shows the average quantity of competitors that participated in each enterprise offered per year. For instance, in 1999, when ANEEL executed two auctions, there was an average of 4.5 competitors for each enterprise. Nonetheless, in the next two years, transmission auctions did not seem so interesting, since an average of only 2.1 and 1.8 competitors was willing to invest in the transmission enterprises offered in the auctions. From 2002 to 2004, the parameter increased to a range of 3.1 to 5.1 competitors per enterprise. Finally, since 2005, the average is reaching a much higher level, from 5.7 to 7.1 competitors per enterprise, which shows an increasing competition in the auctions.

Chart 2.2 – Average quantity of competitors for each enterprise offered.

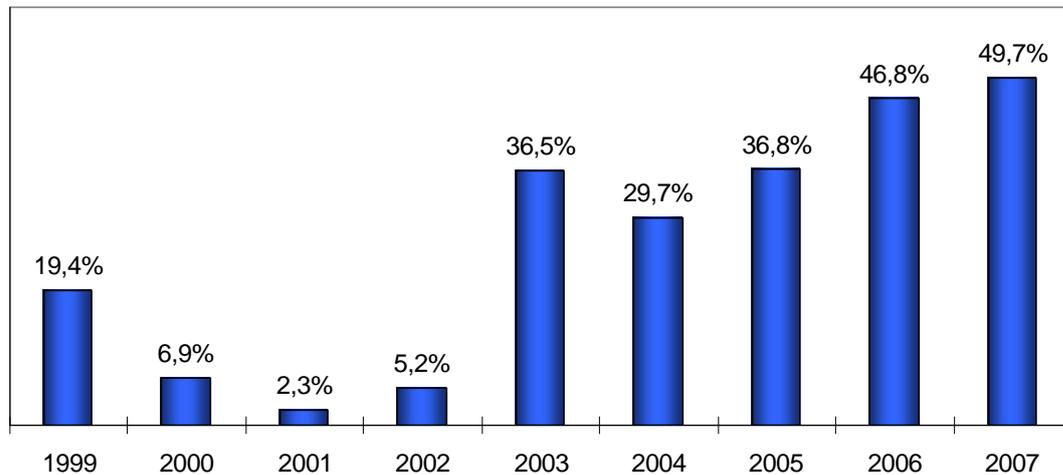


Another parameter to measure the level of competition is the average discount in the revenue offered by the competitor to acquire an enterprise concession. Chart 2.3 shows that competitors are offering an increasing average discount⁹ to get a new transmission concession. Analyzing the figures from Chart 2.2 and 2.3, it suggests that, since 2002, a larger quantity of entrepreneurs are realizing that electricity transmission is a profitable and low risk business. So they

⁹ The percentage of discount is calculated considering the revenue cap expected by ANEEL, which is used as an estimate to the competitors.

are trying harder to enter this market and, as a result, they are bidding lower and lower annual revenues.

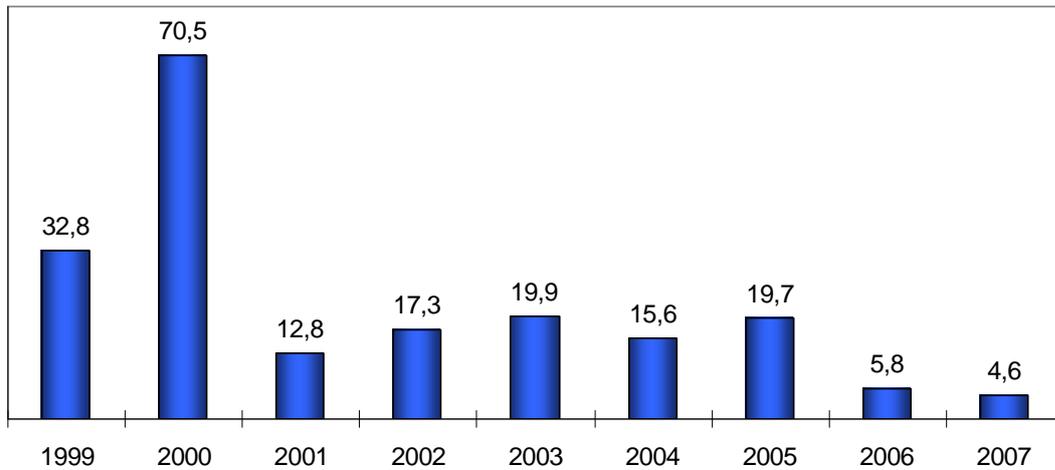
Chart 2.3 – Average discount in revenue offered by competitors in the auctions.



It is important to show the average revenue (RAP) offered by entrepreneurs for each enterprise (Chart 2.4, where values are depreciated to June 1999). Since RAP is directly related to the amount invested in the enterprise, we can see that, in average terms, enterprises bid in 1999 and in 2000 were the biggest ones, while those bid in 2006 and in 2007 were the smallest ones. According to Chart 2.4 and to previous ones, we can affirm that in the past few years entrepreneurs are facing fierce competition to acquire not so big enterprises, maybe as an attempt to take advantage of the economy of scale.

It is also relevant to point out that the decreasing size of the enterprises along the latest years does not mean that Brazil needs only small enterprises from now on. Indeed, the huge lines that will link the Amazon region to the rest of the country will start being offered in 2008, which will certainly bounce this average in the next years.

Chart 2.4 – Average revenue (RAP) offered per enterprise (values in June, 1999).



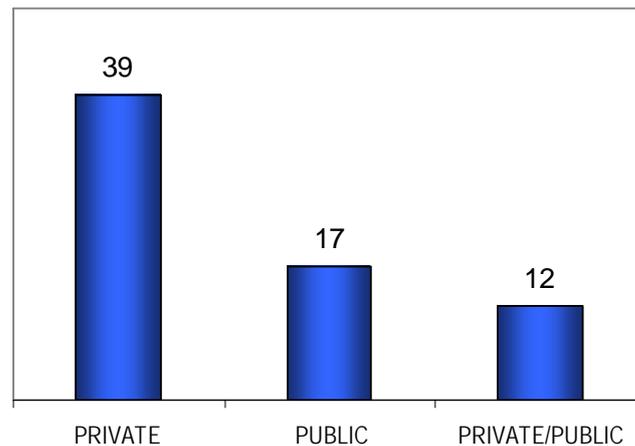
According to the charts above, we can see clear that competition to acquire transmission concessions are fiercer in the latest years. There are several reasons for such phenomenon. In 1999 and in the first years of the decade, the Brazilian economy faced crisis that affected the investment in electricity transmission. Brazilian currency depreciation in the beginning of 1999 and the electricity shortage in 2001 certainly made private investors to become more cautious about investing in the country. Moreover, by 2002, the federal companies were not supposed to become entrepreneurs, since there was a strong incentive for privatization in Brazil.

The whole situation improved significantly from 2003, when the economy started strengthening, as we can see in the increasing average of competitors and of discount per enterprise. Furthermore, we have to emphasize the presence of foreign investors since 2002, which probably was the main reason for such an increase in the auction competition. Spanish firms, in particular, started participating in the auctions in 2001 and happened to become the strongest competitors in the following years.

Actually, the presence of Federal and State firms in the auctions was not predominant at all. Chart 2.5, shows that, from 1999 to 2007, private investors

acquired 39 enterprises, public firms got 17 and consortia of private and public firms acquired 12. As explained above, the majority of capital in these consortia is private.

Chart 2.5 - Quantity of enterprises each kind of entrepreneur acquired in auctions from 1999 to 2007



In fact, the dominant presence of private investors is more evident if we calculate the average Revenue (RAP) bid by private entrepreneurs compared to public ones. Chart 2.6 shows the average RAP for private, public and consortia. The average Revenue private investors will get from each enterprise is around R\$ 26.1 millions, which is much higher than the average amount for public firms, R\$ 7.4 millions. Therefore, it's obvious that private entrepreneurs acquired bigger enterprises and public firms got the smaller ones.

Finally if we multiply this average and the number of enterprises, it will end up with the total amount of Revenue all the private and public entrepreneurs are obtaining from their transmission assets acquired in auctions since 1999. Table 2.1 shows these amounts.

Chart 2.6 - Average revenue offered in auctions by each kind of entrepreneur from 1999 to 2007 (values in June, 1999)

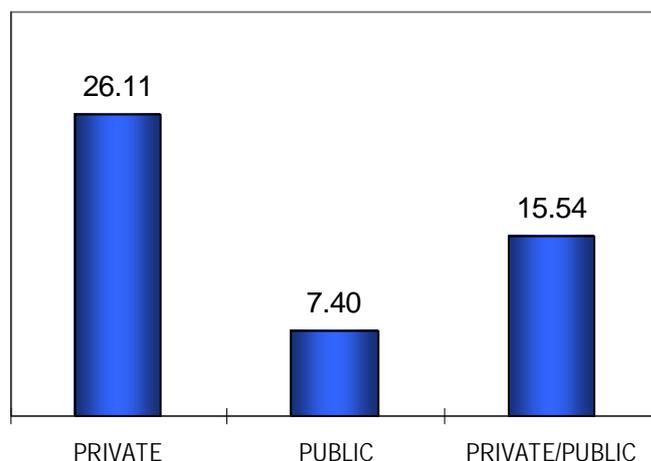


Table 2.1 - Total amount of Revenue (RAP) entrepreneurs receive from transmission assets acquired in auctions since 1999

Entrepreneurs	Total Amount of RAP (R\$ x1,000)*	Percentage (%)
Private	1,018.3	76.5
Public	125.8	9.5
Consortium	186.5	14.0
Total	1,330.6	100.0

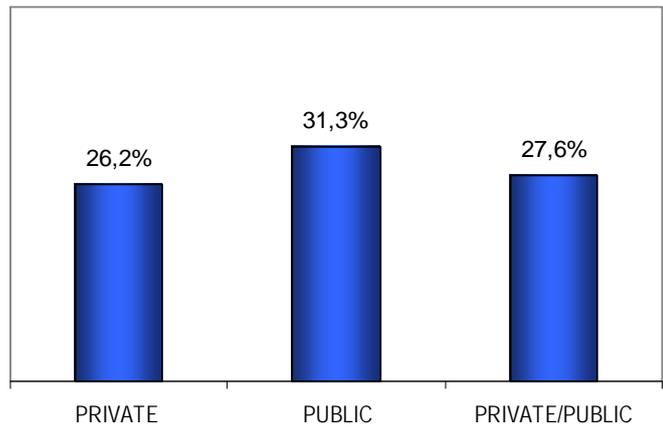
* Values in June, 1999

The amounts showed above confirm the massive presence of private investors in the auctions, since they receive more than 75% of the total Revenue (RAP). If we add consortia's RAP, this percentage would increase at least 7% (unreal and extreme assumption that all consortia is half private half public), reaching more than 83% of the total RAP to private companies.

It's also important to take a look at RAP discount level that was bid in the auctions by private, public and consortia entrepreneurs. Chart 2.7 shows the average discount in the Revenue offered in the auctions to acquire the concessions. We can see that public firms bid an average of discount of 31%, higher than private

firms with 26% and Consortia with 27%. It probably means that, due to fierce competition with private investors, public ones had to be really aggressive, pushing up the discount level, in order to win an auction.

Chart 2.7 - Average discount in the Revenue (RAP) offered by each kind of entrepreneur in auctions since 1999



It is essential to recall that ultimately the auctions brought benefits to consumers, since the increasing competition resulted in lower revenues (RAP) offered by the entrepreneurs, which correspond to lower consumer electricity fares. But it's also important to check if firms are doing well when they start operating their transmission lines. Next Chapter regards the performance of transmission firms in terms of operational and financial costs.

Chapter 3. Transmission Firms' Cost Analysis

The cost analysis developed in this Chapter is an attempt to make clearer how private and private transmission companies are running their businesses. It's a comparative analysis within the firms' cost structure, so neither the absolute amount is revealed, nor the companies are named. We used the following methodology:

- The financial and operational costs were extracted from the firms' financial statements delivered periodically by the concessionaires to ANEEL, the regulatory agency¹⁰;
- The transmission costs will be shown for three different groups of firms: federal government owned companies, State government owned companies and private companies¹¹;
- The samples address 4 federal firms, 4 State firms¹² and 6 private firms. The latter ones had already had their cost structure stabilized in 2004¹³;
- Firms' costs were collected from 2004 to 2007. So we calculate the percentages of each kind of expense in relation to its total for each firm in each year. For instance, the percentage of Eletronorte's financial expense in relation to its total expenses in 2004;

¹⁰ Concessionaires' financial statements are delivered monthly to ANEEL, as a report called Monthly Standardized Financial Statement (Balancete Mensal Padronizado – BMP).

¹¹ At first it was not expected that federal and State firms would have such a significant difference in their cost structure. However, the results showed clearly that those companies had to be analyzed separately; otherwise some conclusions would not be observed.

¹² CTEEP was considered a State-owned firm during the whole period (from 2004 to 2007), although it was privatized in the end of 2006. This consideration may cause a distortion in the results, but less serious than considering it a private firm in 2007. As figures show, along 2007 CTEEP implemented a cost reduction program.

¹³ According to Serrato, 2006, new transmission firms take months, or even a couple of years, in order to have their expenses stabilized. During this initial period, costs are erratic, so they would distort the results in the present analysis if they were considered.

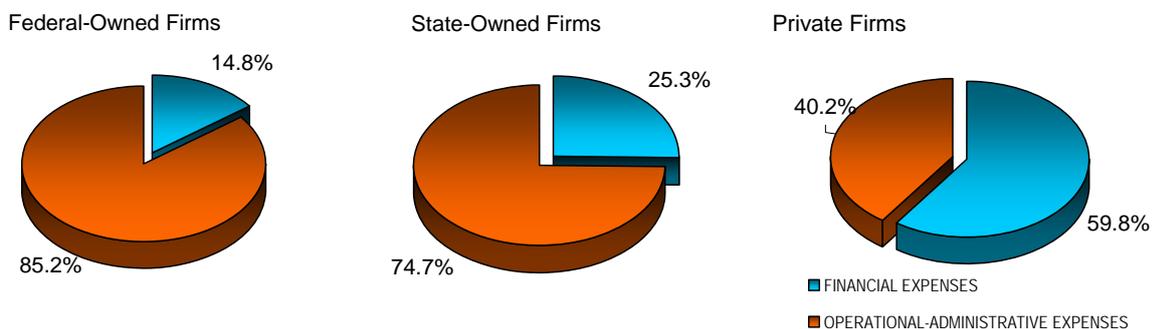
- Once all the percentages were done, we calculated the average of the percentages for each group of firms for four years;
- Therefore, each percentage shown in this chapter is the result of an average of the following quantity of observations¹⁴:

Firms	Quantity of firms studied	Quantity of years observed	Quantity of observations
Federal-Owned	4	4	16
State-Owned	4	4	16
Private	6	4	24

Chart 3.1 shows the transmission companies' costs divided into:

- *Financial costs* – the total financial incumbencies of the firms¹⁵;
- *Operational-administrative costs* – those related to operation and maintenance of the transmission lines and all the corresponding administrative expenses¹⁶.

Chart 3.1 – Firms' total costs divided into financial and operational-administrative expenses



¹⁴ Some outliers identified in the analysis were eliminated, which reduces the quantity of observations in some average calculation. Eliminating outliers does not invalidate the results, but rather makes it more consistent.

¹⁵ In this analysis, *financial costs* do not comprise monetary variations of international currency debts.

¹⁶ For obvious reasons, *operational and administrative costs* do not comprise expenses due to operation and maintenance of lines that belong to other firms.

We can see a clear difference between the three groups. In general, financial expenses are much lower in public companies than in private ones. Federal companies spend just about 15% of their total expenses with the financial incumbencies, while state companies spend one quarter (25.3%) and private ones spend almost 60%.

Such big difference between public and private companies performance is not surprising at all. First of all, private transmission companies have started operating not longer than 6 years ago, when they borrowed large amounts of money from banks to build their assets. It was expected these new companies to present a heavy financial burden in the first years of operation.

On the other hand, federal government has hold back their companies from borrowing money, in order to keep their debt as lower as possible, because federal-owned firms' debt is considered federal government's debt itself. State companies don't seem to have been committed to such a strict debt control, since their percentage (25.3%) is higher than those observed in federal firms (14.8%). Moreover, federal and state-owned companies were not major investors in transmission concessions in recent years, as we could see in Chapter 2.

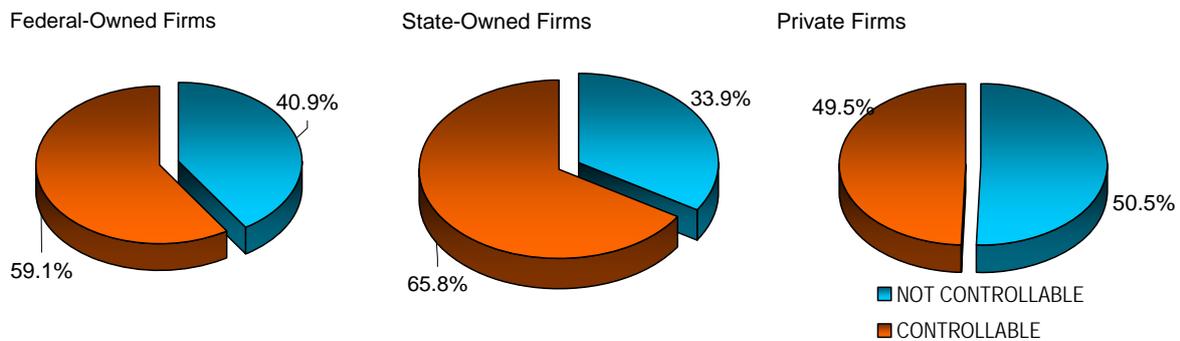
Chart 3.2 presents the amount of operational-administrative expenses, shown previously in Chart 3.1, divided into two parts:

- *Controllable expenses*, which comprise personnel, equipment and general purchases, subcontracts, rental and others. These expenses are classified as controllable because the company can deliberately increase or decrease its expenditures.

- *Not-controllable* expenses are those which the company has no control in changing, just as federal and state taxes and electricity sector tributes.

We can see that, even though all transmission firms have the same tax and contribution obligations, private companies spend approximately 49.5% of their administrative and operational cost with controllable expenses, while public companies spend higher percentages (59.1 to 65.8%) with the corresponding expenses.

Chart 3.2 – Operational-administrative costs divided into not-controllable and controllable expenses

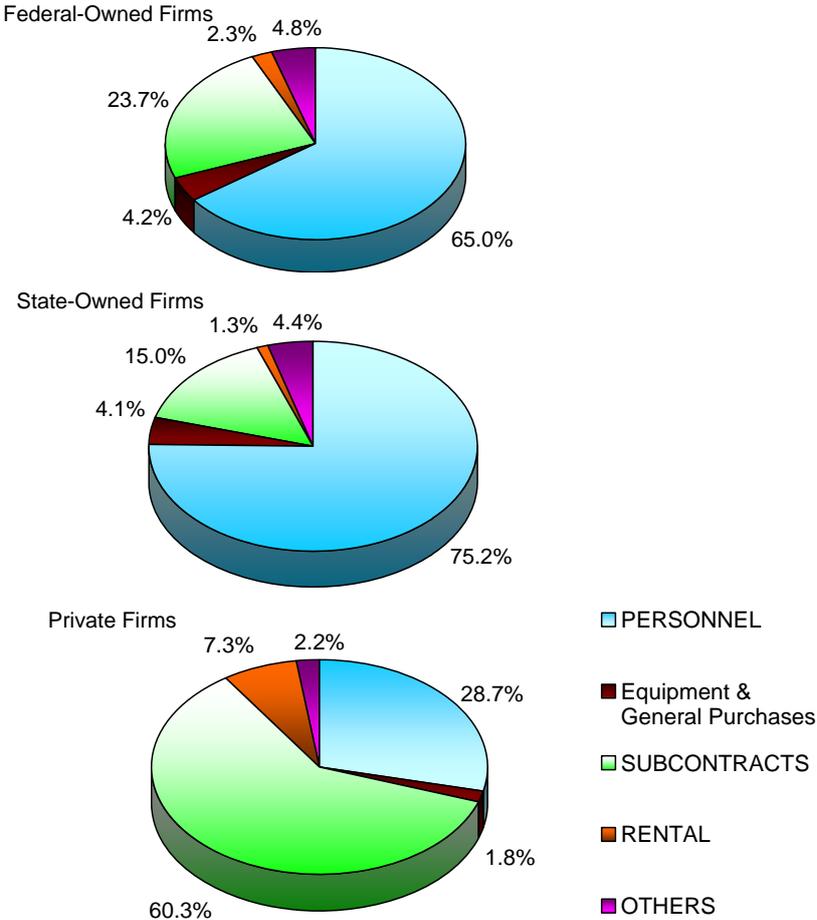


The difference of 10 to 15% in controllable costs is partly because public firms are operating for a much longer time. First public employees must be earning higher wages and benefits. Second, federal and state-owned firms' assets are much older compared to private ones, so expenditures with equipment and general purchases must be proportionally higher in public firms. Nonetheless, these technical factors may not explain the whole gap observed in the controllable costs between public and private firms. Inefficiency may also be taken into account, although we can not calculate its proportion.

If we get down to the controllable costs, dividing it into those 5 kinds of expenditure (personnel, equipment and general purchases, rental, subcontracts and others), we have a better picture of the companies' performances. Chart 3.3 shows

clearly how differently private and public firms manage their transmission businesses. The first thing that stands out is the proportion of subcontracts expenses: federal firms spend 23.7% and state firms spend 15.0% of their controllable cost with subcontracts. On the other hand, private transmission companies spend 60.3% with that.

Chart 3.3 – Controllable operational-administrative costs divided into personnel, equipment and general purchases, subcontracts, rental and others



This difference is entirely thanks to a managerial option done by private companies. To seek lower costs, most of them subcontract transmission federal-owned companies to execute maintenance activities in their lines¹⁷. Therefore, instead of hiring their own staff and spend money to get them trained, private

¹⁷ It's essential to reinforce that the public firms' expenses in maintenance activities executed in private companies' lines were suppressed from operational-administrative costs of the public firms, so the results shown in this study were not distorted by the bilateral subcontracts done by private and federal firms.

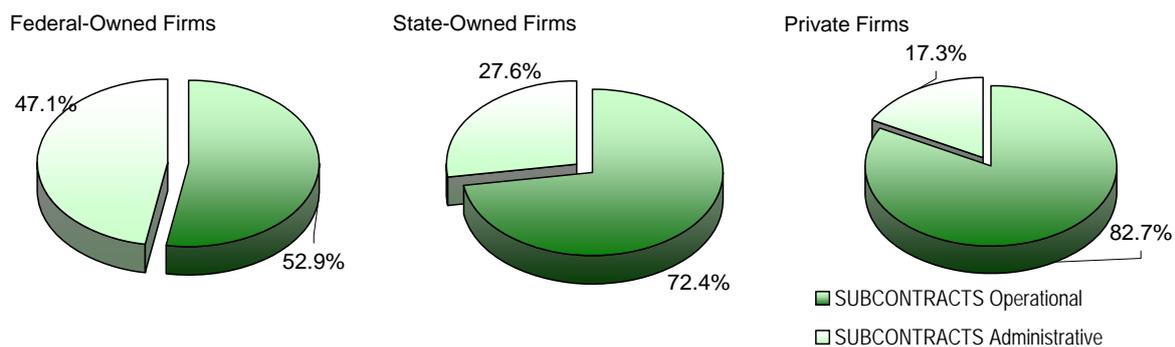
companies take advantage of public firms' expertise in line maintenance. In turn, federal public firms found this business convenient because they have enough employees to cope with private firms' lines and most of the private lines are located close to their assets.

Subcontracts expenditure can also be divided into operational and administrative costs, as shown in Chart 3.4. As we can see, 82.7% of private companies subcontract expenditure is committed in operational activities. Since 60.3% of their controllable costs are due to subcontracts, so approximately half (49.9%) of their controllable budgets is spent in subcontracting operational activities, most of it is surely subcontracts with federal-owned firms to maintain their lines.

Calculation:

$$\begin{aligned}
 &60.3\% \quad (\text{subcontract percentage in controllable costs}) \\
 &\times 82.7\% \quad (\text{operational subcontract percentage in total subcontracts}) \\
 &= 49.9\%
 \end{aligned}$$

Chart 3.4 – Firms' subcontract costs divided into operational and administrative expenses



If we observe Chart 3.3 again, the question that remains unclear is why subcontract expenses in federal companies (23.7%) are proportionally higher than in state ones (15.0%), while their personnel expenses (65.0%) are lower than state ones (75.0%). These two groups of expenditure seem to be quite complementary

since they sum up nearly 90% in both cases. So there must be different strategies for federal and state firms regarding subcontract and personnel expenses.

The answer for this question is probably the expenditure related to administrative labor force subcontracted by many federal-owned firms. According to Brazilian laws, public firms can hire employees only by official examination, but for many years federal government did not allow their companies to carry out any examination process to hire new employees. To overcome this restriction, federal-owned firms started to get new workers, including skilled technicians, by general labor force subcontracts. Brazilian Justice has already ordered them to break up these contracts and to lay off those workers; thus some federal companies have already set examination processes to hire their own staff. Chart 3.4, shown above, reinforces this observation, as we can see that federal firms do spend nearly half of their subcontracts expenses with administration (47.1%), compared to only a quarter (27.6%) in state firms.

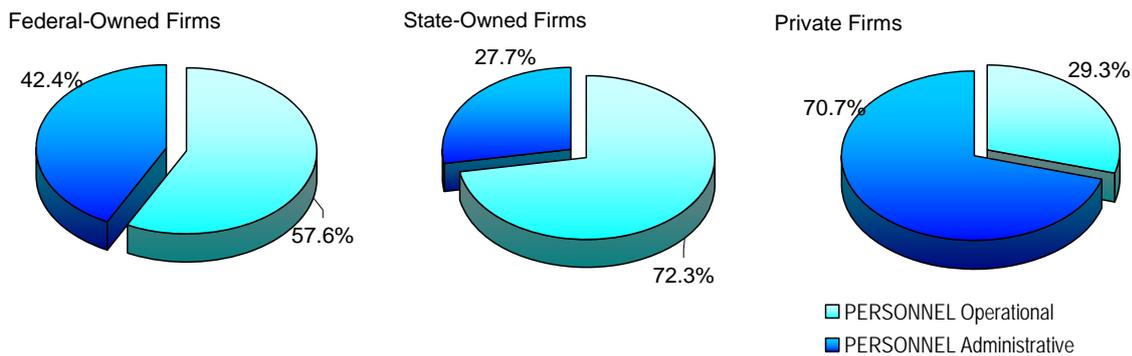
Considering total controllable costs, federal firms spend proportionally much more in subcontracting administrative labor force (11.2%) than state firms do (4.2%). That's a difference of 7%. On the other hand, subcontract expenses with line maintenance and operation are quite the same for federal and state companies (12.5% and 10.9%, respectively). Table 3.1 shows all these figures:

Table 3.1: Percentages of operational and administrative subcontract expenses in controllable costs.

Firm	Operational	Administrative
Federal-owned	12,5%	11,2%
State-owned	10,9%	4,2%
Private-owned	49,9%	10,4%

As we have already discussed, private firms prefer to subcontract operational labor force, particularly from federal-owned firms. This option must lead to a smaller proportion of personnel expenditure in private firms compared to (28.7%) federal firms (65%) and state firms (75%) do. We can check this observation in Chart 3.3 above, where we see the corresponding percentages. Similarly, we can expect most of the private firms' own employees to be in charge of administrative activities, instead of maintaining and operating the lines. That's clearly noticed in Chart 3.5, where we observe that 70.7% of personnel expenses of private firms are due to administration costs and only 29.3% are related to operational activities.

Chart 3.5 - Firms' personnel costs divided into operational and administrative expenses



Similarly, we could reasonably expect federal firms to have less personnel administrative expenses in comparison to state firms, since they have much higher expenses with administrative subcontracts, due to labor force subcontracts. Nevertheless, this is not observed in Chart 3.5. Despite the fact that federal companies subcontract labor forces, they still spend proportionally more than state companies with their own administrative staff (42.4% compared to 27.7%). Table 3.2 shows the proportion of each activity in terms of total controllable costs, so we can observe that federal firms spend almost 7% more than state firms with their own administrative personnel (27.6% minus 20.8%). If this value is accrued to those 7%

difference in administrative subcontracts (Table 3.1), the conclusion is that federal-owned firms spend about 14% more than state firms with administrative personnel and subcontracts.

What is the reason for such a difference? First it is reasonable to accept that administrative costs are higher in federal firms because they have a much larger operative area than state firms do. Their transmission lines are spread all over Brazil and are not so concentrated as state firms' ones, what makes them need proportionally more employees. Second, we have already seen that federal companies subcontract workers, a fact that can ultimately result in higher expenditure to these firms. Notwithstanding, it is important to point out that part of those 14% may be due to cost inefficiency as well.

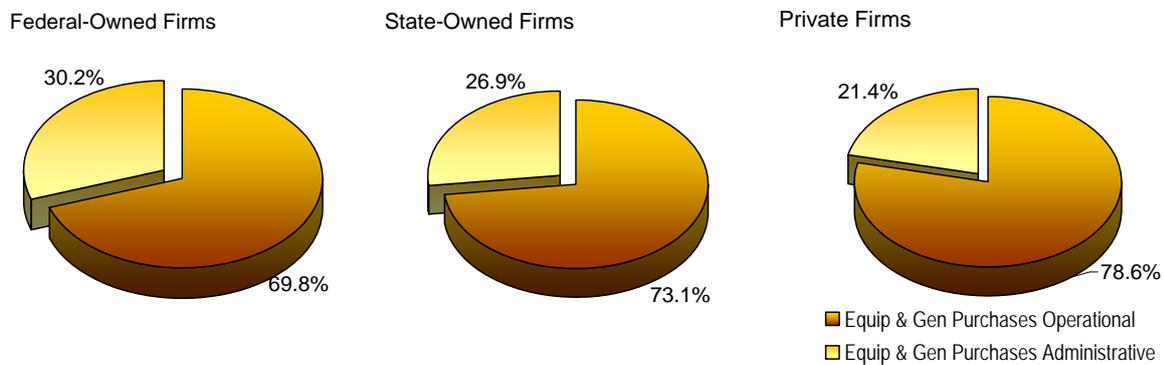
Table 3.2 - Percentage of operational and administrative personnel expenses in controllable costs.

Firm	Operational	Administrative
Federal-owned	37,4%	27,6%
State-owned	54,4%	20,8%
Private	8,4%	20,3%

As we have mentioned above, we can expect public firms to spend more with equipment and general purchases than private ones do. That is exactly what we see in Chart 3.3 above, which shows that federal and state firms spend almost the same proportion of their controllable costs with equipment and general purchases (about 4%) and private firms spend approximately half as much (1.8%). Dividing these figures into operational and administrative expenses, we obtain the proportions showed in Chart 3.6, where it is clear that, since federal firms have a bigger administrative structure, they spend proportionally more with administrative

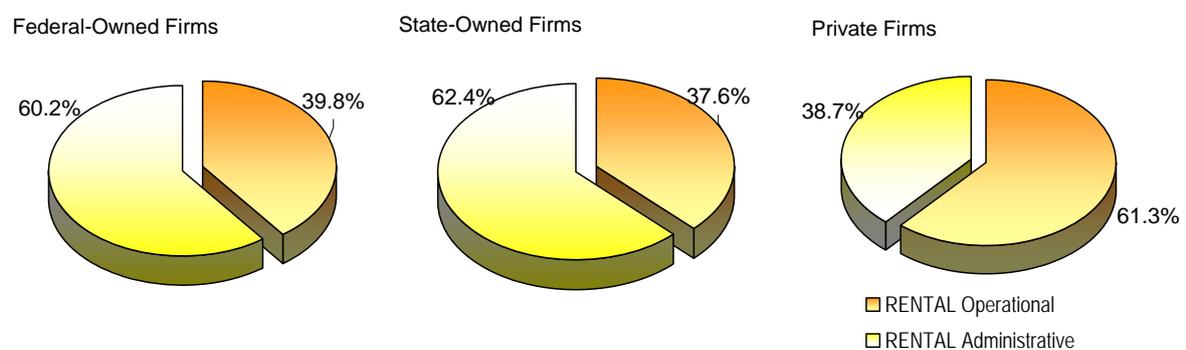
purchases (30.2% to federal firms compared to 26.9% and 21.4% to state and private firms).

Chart 3.6 – Equipment and general purchase costs divided into operational and administrative expenses



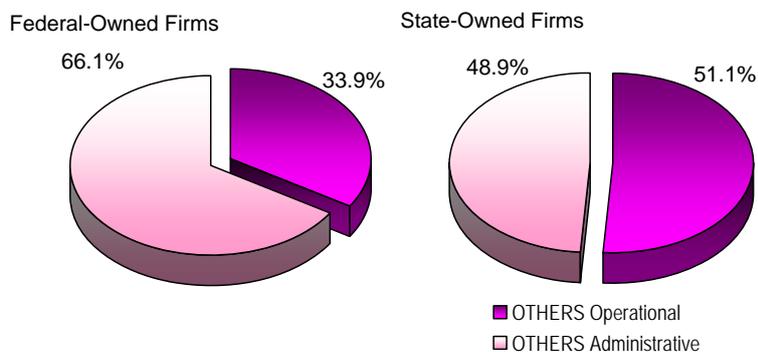
Another activity that differentiates public firms to private ones is rental expenditure. As we saw in Chart 3.3 above, private firms prefer to rent assets than to acquire them, in a similar strategy applied to personnel, so they spend 7.3% of their controllable costs in comparison to less than 2.3% spent by public firms. In relation to operational and administrative expenditure (shown in Chart 3.7), federal and state firms spend basically the same way, a little more than 60% of their controllable costs with administrative rental. On the contrary, private firms uses rental mainly for operational activities and spend 38.7% with administrative rental expenses.

Chart 3.7 - Rental costs divided into operational and administrative expenses



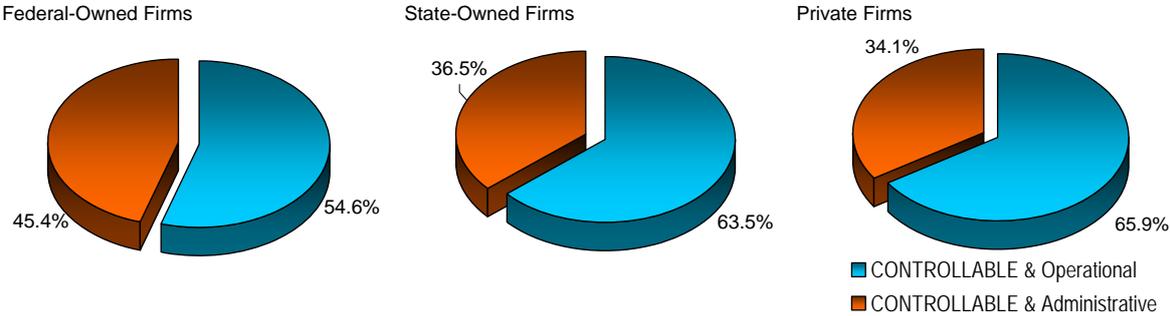
We also show the expenses so-called as “Others”, which comprise all expending that are not related to personnel, equipment and general purchase, subcontracts and rental. Chart 3.3 above shows that public firms spend from 4.4% to 4.8% with Others, while private ones spend proportionally less, 2.2%. To the latter, it was not available the division between operational and administrative expenses, so Chart 3.8 shows only this division for public firms. As we can see, once again federal firms spend more in administrative activities (66.1% compared to 48.9%).

Chart 3.8 – Other costs divided into operational and administrative expenses



Summing up all the operational and administrative expenditures parts, related to controllable costs, we end up with Chart 3.9. As a consequence of higher expenses with administration, we can see that federal firms spend proportionally less with operational activities than state and private firms do. Federal firms spend 54,6% of their controllable expenses with the core of their business, which is to operate and to maintain their lines, while state and private firms spend 63.5% and 65.9% of their controllable costs with it.

Chart 3.9 – Total controllable costs divided into operational and administrative expenses



Chapter 4. Conclusion

This paper showed that public firms are still the major players in the transmission market. They have not been privatized in the nineties and early 2000, so they still own huge transmission assets as well as enormous hydropower production capacity. Nonetheless, these companies are facing increasing competition to acquire new transmission concessions and compete with private entrepreneurs.

The auctions results, organized in an annual basis since 1999, showed that transmission market is becoming more and more competitive. In the beginning of this decade, some economic factors caused a reduction in the average of competitors and in the average of discount offered by competitors. However, since 2002, these figures have increased steadily, which suggest that transmission market has become more attractive for investors in terms of return and risk. The main reasons for this increase are the better economic situation of the country and the presence of foreign investors, particularly from Spain, that have been investing massively in the electricity transmission market. As a result, they have been forcing public firms to raise discount in annual revenue (RAP) and/or to participate in the auction as a consortium with private firms.

Aggregating the amount invested from 1999 to 2007, private investment in new transmission concessions was much higher than public one. Besides, considering the total revenue bid by the auction winners during the same period, private firms were responsible for more than 75% of this amount. Private capital share in consortia's investment would increase even more this percentage to approximately 82%. The auction results showed in this paper reinforce the fact that

the transmission market in Brazil has become highly competitive and attractive to private capital. Moreover, they reflect the success of the model applied to transmission sector by the Brazilian government.

This paper also shows that public and private transmissions firms have different cost structures due to technical constraints as well as managerial decisions. According to the analysis developed in chapter 4, we can observe that the proportion of private firms' financial expenses (about 60%) is higher than those observed in public firms. Obviously, that's because private entrepreneurs, that have been operating their transmission lines for a relatively shorter time, had to borrow financial resources to build their assets and now they are paying their debts. However, federal and state-owned firms also present different figures among themselves (about 15% and 25%, respectively). This difference must be due to the government decision to hold back federal firms from increasing their debts, while state firms were not committed to such a strict control.

The results also showed that controllable costs are proportionally higher in public firms than in private ones. Since all firms have the same legal obligations (tax and contributions), it suggests that federal and state government are less cost efficient in managing their firms. However, such assumption must be pondered by some factors observed in public firms such as inevitable higher labor costs, older assets that require much more maintenance and local condition in which federal firms operate.

Another difference observed between private and public firms regards the subcontract expenses. The unequal proportions showed by these groups reflect perfectly the managerial decision made by private firms to subcontract federal-owned firms to maintain their transmission lines. It is clearly demonstrated that

private firms depend heavily on subcontracts to their operational activities (it represents approximately 60% of their controllable costs). Federal and state-owned firms have a much lower subcontract expense proportion (about 24% and 15%, respectively), but these figures also indicate that they manage their business differently. Indeed, federal-owned firms subcontracted labor force to their administrative activities as a distorted way of hiring technicians with no official examination and that is reflected in a higher percentage in comparison to state-owned firms.

A surprising result came out when administrative personnel expense was analyzed. Once again, federal firms showed a much higher percentage than state ones (about 42% and 28%, respectively), although they subcontract many administrative workers, as seen in the paragraph above. Part of this difference may be due to technical factors (larger operational area, lines are spread out around the country, etc). However, once again, we can suspect that cost inefficiency is one of the reasons.

While public firms spend proportionally more with their own operational personnel rather than with their administrative staff, private firms do the opposite. The latter group spends proportionally more with their own administrative staff rather than with their own operational team, since, as we have seen, they chose to subcontract labor force to cope with the operational tasks.

As a consequence of a larger administrative structure, federal firms also spend proportionally more than state one with administrative equipment and general purchases, as well as other administrative expenses. In administrative rental, their figures are quite the same. Private firms, on the other hand, seem to be more focused on operational activities, so their operational spending in equipment,

general purchases, rental and others are proportionally higher than those of public firms.

In fact, the results actually indicate that federal-owned firms can be less cost efficient than state ones, although it's hard to measure exactly the proportion of this inefficiency. In turn, private firms have a completely different cost structure than public firms, but this structure seems to be rational, focused on operational activities and reflects exactly the managerial decisions these firms have done.

References

1. ANEEL – Agência Nacional de Energia Elétrica, technical information available under [http:// www.aneel.gov.br](http://www.aneel.gov.br).
2. BALANÇO MENSAL PADRONIZADO- BMP. Brasília: ANEEL, Monthly . ANEEL's internal report with restrict access
3. ONS – Operador Nacional do Sistema Elétrico, technical information available under [http:// www.ons.org.br](http://www.ons.org.br).
4. SERRATO, E. Fronteiras paramétricas de eficiência para o segmento de transmissão de energia elétrica no Brasil. Master Degree Dissertation in Public Sector Economics in University of Brasilia, 2006
5. BRASIL, CONGRESSO NACIONAL. Law no 8,666/93. Diário Oficial da União - Seção 1 - 22/06/1993 , Página 8269. available under <http://www2.camara.gov.br/legislacao>.
6. BRASIL, CONGRESSO NACIONAL. Law no 9,074/95. Diário Oficial da União - Seção 1 - 08/07/1995 , Página 10125. available under <http://www2.camara.gov.br/legislacao>.
7. BRASIL, CONGRESSO NACIONAL. Law no 9,648/98. Diário Oficial da União - Seção 1 - 28/05/1998 , Página 1. available under <http://www2.camara.gov.br/legislacao>.
8. BRASIL, CONGRESSO NACIONAL. Law no 10,848/04. Diário Oficial da União - Seção 1 - 16/03/2004 , Página 2. available under <http://www2.camara.gov.br/legislacao>