DISCUSSION PAPER

Regulation of the Electricity Industry in Bolivia: Its Impact on Access to the Poor, Prices and Quality

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Abstract

This paper takes stock with the results of utility privatization in Bolivia. This paper deals with the process of structural reforms in this country and the specific results that have to date been accomplished in the electricity industry. It is mostly interested in exploring whether the reformation of this industry contributed to lessen poverty levels and whether in light of the obtained results, a reversal or a continuation of the reform process should take place. The paper shows that coverage of electricity users has grown faster in urban areas ever since the establishment of regulation. Although it is not argued that regulation has caused the increase in electricity consumers, the data does show that a comparatively faster urban growth rate of users takes place after 1995. In this sense, it seems plausible that regulation of the electricity industry has indeed lessen poverty levels in urban Bolivia by making this utility more accessible to larger segments of the urban population. The same cannot be said, however, about rural Bolivia. The results show that coverage has remained about the same in the last 10 years, with no discernible improvement after the transformation of the industry in 1995. When rural Bolivia is divided into income groups, the data shows that some of the poorest groups have indeed experienced a decline in coverage during the regulation period, which sheds doubts about the purportedly positive effects that structural changes in this industry were to have in the livelihoods of the poorest people in the country. Alternative ways which may improve the poverty reduction outcome of electricity regulation are explored.

Keywords: Regulation, Poverty Reduction, Bolivia
JEL Code: L51, O20, O54

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1. Introduction

Most Latin American countries have undergone a profound process of structural reforms through the 1980‘s and 1990‘s. These reforms aim to modernize an inefficient and often corrupt public sector; reduce the plight produced by ever-growing public deficits; generate economic growth that may translate into more and better jobs; a diversification of economic activities; and a natural redistribution of the limited wealth of these nations.

Privatization was a key component of structural reforms undertaken and was also part of the so – called “Washington consensus”, a set of policy recommendations that served as a guideline for policy reform in many Latin American countries during the 1990´s. This process resulted in substantial amounts of foreign direct investment (FDI) placed in the hemisphere. Stock of FDI in the electricity, gas, and water sectors was virtually nil in 1988 but reached 27 billion USD in 1999 (UNCTAD 2001), representing 14% of total FDI in the region.

Privatization in the utilities sector implied a new type of regulation, as most of these sectors were considered, at least during some stages of production and distribution, natural monopolies. The processes of privatization and regulation were often carried out as parallel processes, generating insecurity – and surprises – to potential and real investors. The design of privatization processes was many times dominated by the simple objective of generating public funds; it was thought that the legacy of high debt could be alleviated by windfall profits of privatization schemes – Argentina may well fall in this category. In other countries modernization of the sector was the primary goal, as enterprises were sold or the concessions granted to those investors who were willing to invest most in the companies themselves. This was the case in Bolivia’s policy of capitalization, where investors capitalized the enterprises and did not simply transfer a specified amount of funds to the treasury.

During the design of privatization programs little attention was paid to the distributional consequences of the process. Some (Estache, et.al., 2001, among others) would characterize this omission as a lack of welfare considerations in the transfer of public assets to private operators. Direct objectives of privatization were better service and lower costs, but not explicitly poverty reduction. It was assumed that better service and lower costs would also lead to lower tariffs and a general improvement of the incomes of the poor through higher growth, in part triggered by better performance of the newly privatized utilities.

The experience accumulated in Latin America with structural reforms during the 1990´s, when the expression “Washington consensus” was coined, led to a rethinking of what it is that

generates growth not only in this hemisphere but elsewhere in the developing world. Empirical cross – country studies showed that the quality of institutions had more impact on the per capita growth rates than economic policies per se. It seemed that good economic policies are a result of good institutions and hence one ought to concentrate efforts on establishing strong, transparent, and reliable institutions first, rather than designing policies that may just be the result of current conventional wisdom. (Easterly and Levine 2002, Rodrik, Subramanian, and Trebbi 2002). In Latin America, the improvement of institutions was part of so-called ”second generation reforms“ (Naím 1994), and as these public institutions were transferred to the private sector, attention was drawn to the regulatory frameworks that emerged as these newly privatized institutions began to operate.

If the importance of institutions is recognized as vital in generating economic growth, it is also recognized that the institutional environment in many countries is far from optimal – perhaps more so in poorer countries than in richer ones. When a weak institutional environment exists, a different set of economic policies may be advisable than those that would be recommended in healthier settings. For instance, tax policy in low income countries does not seem very effective in achieving redistributional goals. When some economic policies are ineffective, than several first-best solutions may be irrealistic. In the context of regulation of public utilities, the lack of first-best solutions may justify the existence of different types of subsidization schemes, including cross-subsidization, in order to achieve certain goals. As is well known, the welfare maximizing tariffs of a natural monopoly are the so-called Ramsey prices, where the fixed costs are distributed to consumers according to their inverse price elasticity, which may imply some cross subsidization (Krakowski 1988). However, cross subsidization which is not due to Ramsey pricing should not occur because it would lower welfare. When some subsidies for certain consumers are considered desirable by society – for example telephone for the elderly - then direct subsidization should be applied. If a weak institutional environment does not support this kind of first best solution, or if it implies high costs, then maybe a second best solution – like cross subsidization – should be considered.

This kind of reasoning draws attention to welfare considerations of utility privatization and regulation. When the only objective of privatization and regulation is the most efficient provision of a service, than possible negative welfare effects might be remedied by transfers via direct subsidization. When direct subsidization is not feasible, then a wider set of solutions should be contemplated, including subsidization of the poor by other segments of society. Possible subsidization schemes range from general price subsidies to lifeline tariffs, merit-based price discounts, cash transfers, and noncollection. A description, including merits and lack thereof, of these types of subsidization schemes is provided in the appendix to this document.

In this paper, relative coverage according to income deciles is analyzed in order to judge the impact of electricity privatization on the bolivian poor. Along with the aforementioned analysis, the regional dispersion of access indicators is also considered since differences between the headcount index of the poor in urban and rural areas are extremely high (Krakowski, 2003). In light of this reality, it is not surprising that during the process of consultations organized in the framework of the elaboration of Bolivia´s Poverty Reduction Strategy Paper (PRSP), rural electrification was identified in 78% of all municipal workshops as the most important action in combatting poverty (PRSP, p. 64).

Another factor that ought to be considered when analyzing the utilization of subsides in regulated industries is that it has often been used to favor richer categories of consumers. An explicit objective of most privatization schemes has been to end this discriminatory practice, with varying degrees of success. The reality is that special-interest groups, particularly the better funded ones, still influence economic policy in most nations and the survival – indeed, thriving – of subsidization schemes in which poor consumers are not the main beneficiaries is proof of the sustaining power of richer, better organized groups. It may also illustrate a "capture" of regulators by politically – and economically – influential groups.

A related theme is the possible capture of regulatory institutions by private operators (Stigler 1972). As it relates to this paper, the capture would come from operators throughout the electricity industry in Bolivia and might be reflected in failing to achieve privatization targets. A possible consequence of this situation might involve, for instance, the provision of services with quality benchmarks that are too laxed and generous, reflecting a captured regulator.

The results of utility privatization after more than a decade of reforms in many countries are disappointing. Though in most cases they have injected badly needed capital and managerial capabilities into newly privatized and/or capitalized industries, they have not necessarily improved on the levels of efficiency in the delivery of public services. They have often caused worsening, and indeed, growing public deficits; have fallen short of expectations in terms of their ability to generate economic growth; have produced limited diversification of economic activities; and have not contributed – some indeed argue that they have created an even greater divide – to a convergence on the very uneven distribution of wealth that characterizes nations in Latin America.

In light of the apparent poor performance of reforms in most American countries, it is no wonder that they are under increasingly close scrutiny from various quarters. In Bolivia, calls have been made to reverse on the path of the reforms and to nationalize some of the enterprises that were

transferred to the private sector. The so called "Water War" that took place in Cochabamba in 2000, in which the private operator Aguas del Tunari – a consortium led by International Water Limited IWL, and jointly owned by the US construction company Bechtel and the Italian energy company Edison – was in fact renationalized by the State, is a grim remainder that there is indeed a great deal of disillusionment with how reforms have performed in this country Similar demands have occurred in Argentina and, to a lesser extent, in Peru, Brazil, and elsewhere. Under present circumstances, it is almost inevitable that some sort of changes will have to be carried out in order to make the "model" more participatory, more inclusive, and hence better able to deliver on its initial promise.

Hence it seems pertinent to take stock with the results of utility privatization in Bolivia. This paper deals with the process of structural reforms in this country and the specific results that have to date been accomplished in the electricity industry. It is mostly interested in exploring whether the reformation of this industry contributed to lessen poverty levels and whether in light of the obtained results, a reversal or a continuation of the reform process should take place. To that end, the paper is divided as follows: the first part presented the introduction; section 2 describes the regulatory system in Bolivia; in section 3 the electricity industry is described and analized, as is its evolution from 1990 onwards. The impact of reforms on poverty and quality is assessed as well, as is the the extent of possible capture of the regulatory institutions by the industry. The final section draws some conclusions and recommendations.

2. The Sectorial Regulatory System (The SIRESE[1] System)

The regulatory system in Bolivia is the result of the capitalization process[2] (privatization, bolivian style) of the mid 1990's that transferred most public utilities companies to the private sector. This regulatory body was named the SIRESE System and its main objective is to regulate, control and monitor activities in the water, electricity, hydrocarbons, telecommunications and transport sectors of the economy. As stated in its first article, implicit in this objective is that the activities under its jurisdiction operate efficiently, contribute to the development of the national economy and enable all country's inhabitants to have access to services covered by the system. The system is also meant to serve as a liason among consumers, regulated enterprises and the

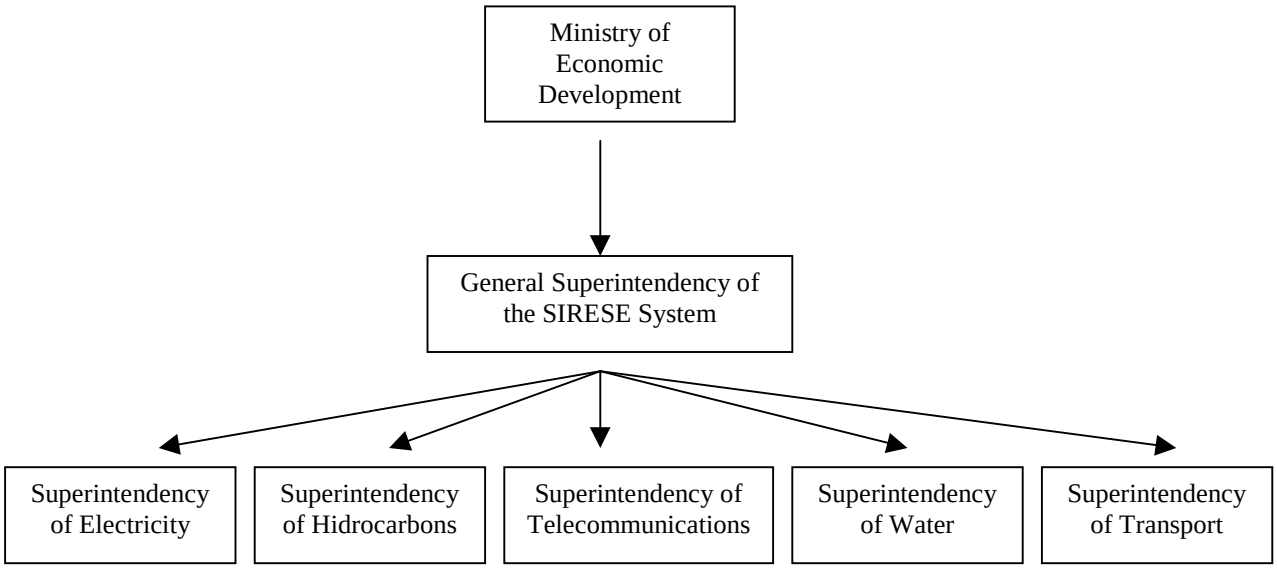
[1] SIRESE is the Spanish acronym for *Sistema de Regulacion Sectorial*, as is known the regulatory system in Bolivia. It came into being with the passage of Law 1600, in October of 1994.

[2] Capitalization of a government enterprise occurs when, instead of paying a certain amount of money to the Treasury in exchange for this company – as would occur with standard privatization schemes – the capitalizer invests at least the market value of the company into the company, thereby assuring management control of it. With his investment, the capitalizer may own up to 50% of the stock of the enterprise. The remaining shares are to be managed by private pension funds, on behalf of the bolivian people, who are in name the proprietors of this stock.

State, and hence it plays – in theory - the role of serving everyone's interest without any particular bias of its own.

The institutional framework of SIRESE is simple. It is placed under the supervision of the Ministry of Economic Development as part of the executive branch of government. It is headed by a General Superintendent in charge of the General Superintendency of the SIRESE system. There are in turn 5 sectorial superintendencies, each headed by its own Sectorial Superintendent in the areas under the jurisdiction of the system. As is the case with the General Superintendency, each sectorial superintendency is an autarchic organ with national jurisdiction and with technical, administrative and financial autonomy. Figure 2.1 illustrates the SIRESE system.

Figure 2.1
The SIRESE System[3]



The five areas under the jurisdiction of the SIRESE system have their own sectorial laws.[4] Besides specific attributions established in each one of them, the competencies of sectorial superintendencies include the granting of concessions, licenses, authorizations, and registers; monitoring over the correct delivery of services and compliance with contractual obligations by the regulated companies; the approval and dissemination of prices and tariffs; application of sanctions when regulated enterprises breach agreed obligations specified in contracts; processing

[3] The Superintendency of Water is now called Superintendency of Basic Sanitation.
[4] As of June 2003, sectorial laws in the telecommunications, electricity and hydrocarbons industries were in place. The transport and water sectors were still without a competent law and hence the activities of their sectorial superintendencies were confined to the general prescriptions stated in Law 1600.

of complaints filed by consumers, regulated companies and State entities; and resolving of interposed first-instance appeals (revocatory recourse)[5].

Main attributions of the General Superintendency are to pronounce upon second-instance appeals (hierarchic recourses)[6] interposed against resolutions of the sectorial superintendencies, and to supervise and issue opinions on the effectiveness and efficiency of the sectorial superintendencies‘ management.

As to regulation of the electricity sector proper, the new Electricity Law[7] approved after the completion of the capitalization process, disaggregated the highly vertically integrated public industry into three different, separated areas: generation, transmission and distribution. It placed restrictions on joint ownership of enterprises in different stages of electricity production and consumption, and established different regulatory mechanisms for each of the three areas.

The generation part was considered competitive, and hence Law 1604 creates incentives for the existence of several electricity generating companies throughout the country. The pricing mechanism follows the concept of most efficient, or marginal cost pricing, and reflects the induced competition allowed in this part of the process[8].

The transport of electricity – the transmission area – is, on the other hand, thought of as a natural monopoly and hence only one company with an “open access“ clause is allowed to exist. In this stage of the process, pricing caps – or more specifically, income caps – are utilized to regulate prices paid by the generators to the enterprise carrying electricity to the distributors.[9]

[5] Revocatory recourse is the first administrative instance established for any person or enterprise, public or private, that considers its legitimate interests or rights injured by a resolution of a sectorial superintendency.

[6] Hierarchic recourse is the second administrative instance established for the appellant who considers that the resolution of the Revocatory Recourse is still injuring his interests or rights. If still unhappy with the decision taken by the General Superintendency on the interposed hierarchic recourse, the appellant has a last recourse with the Judicial instance, which is a demand before the Supreme Court of Justice. Its decision is final.

[7] Law 1604, approved in December of 1994. With the passage of this law commences the era of regulating industries in Bolivia, in accordance with the framework established in Law 1600 (SIRESE Law).

[8] Node prices will take into account projected demand for the next 48 months; the optimum operation program which minimizes operating costs; anticipated values of marginal cost for the energy system for block schedules established by the Superintendency of Energy; the basic energy price for block schedules as the weighted average of the marginal costs calculated before the projected demand values, discounted by the a discount rate established by the Superintendency; the basic peak power price; and a power loss factor and and energy loss factor. Maximum node prices will be readjusted every month, applying the applicable indexation formulas established by the Superintendency.

[9] Maximum transmission prices paid by the generators connected to the Main Interconnected System shall cover the total cost of transmission, which includes the annualized cost of investment, operation, maintenance and management costs of an economically adjusted transmission system.

Finally, on the distribution end of the process, distributors serving different regions of the country are considered variants of natural monopolies – until technology improvements dictate otherwise – and are allowed to price discriminate based on categories of consumers. Presently, six consumer categories are recognized: the residential, or household, market; the general market, comprising the commercial, services and government sectors; the industrial market, which accounts for all enterprises in the industrial production business; the mining sector; street lighting; and the "other" market, which encompasses army barricades, trading areas, and other consumers unaccounted elsewhere. Distribution prices were historically regulated on rate of return principles, but after a transition period it was established that regulation would follow the "base tariff" scheme whereby prices would be set in accordance to average economic costs which in turn consider the rate of return on the equity of the concession calculated on the basis of rates of return of public companies listed in the New York Stock Exchange. This tariff scheme is utilized today.[10]

An interesting and somewhat odd aspect of the SIRESE system is that it includes – Title V of Law 1600 – antimonopoly provisions. It establishes that enterprises within the five areas under its jurisdiction must carry on their activities ensuring free competition and avoiding any acts that hinder, restrict or distort it. It prohibits anticompetitive agreements such are joint price fixing by companies, and the establishment of limitations, division or control of production, markets and supply sources or investments. Abusive practices whose purpose or effect is to damage competitors, customers and/or users, are also outlawed. Such abusive practices may consist of the direct or indirect imposition of purchase or sale prices on suppliers and customers; the limitation of production, supplies sources, markets or technical development to the detriment of consumers; the application of unequal conditions for equivalent operations; the subordination to the subscription of agreements to the acceptance of additional obligations; and demanding that whoever requests the provision of a service must assume the status of a partner or shareholder. Mergers are prohibited also, when as a result of such merger a "sufficiently" dominant position is attained.

[10] Base tariffs are calculated taking into consideration the following aspects: the cost of electricity purchases, operation, maintenance and management expenses, interest, fees and taxes that by law burden the Concession, annual rates of depreciation of tangible assets, amortization of intangible assets, and the profit resulting from the application of the rate of return on the equity established by law; projected electricity sales to consumers; and the anticipated revenues from the sale and transportation of electricity, use and maintenance of service elements and compensation received by the company on any other means from the property subject to the Concession. The rate of return on equity of the Concession used to determine the profit for the calculation of the base tariff shall be the arithmetic mean of the annual rates of return on the equity of the group of companies listed in the New York Stock Exchange and included in the Dow Jones index of public utilities companies in the last three years.

The odd part of antimonopoly provisions within the regulatory framework of SIRESE – and for that matter, of any regulatory institution with similar provisions – is that it actually grants monopoly rights for activities to be carried out in the sectors that fall under its jurisdiction. In most countries where regulatory and competition institutions have a longer tradition, these two activities have been kept separate because it is assumed that regulating industries and enforcing antimonopoly provisions are two very different things which in many cases will run counter to each other. Where as regulating, say, the electricity industry will in many instances involve granting of concessions – i.e., granting a monopoly right – enforcing competition provisions will inevitably dismantle the rights obtained under that concession. It is a matter of current debate whether SIRESE has been successful at balancing its regulation and antimonopoly responsibilities in an efficient and impartial way.

3. The Electricity Industry Before and After Regulation

The electricity industry in Bolivia has traditionally been the most developed among so called public utilities. It is also the one with the longest experience with regulation, and hence a convenient benchmark to analyze the Bolivian regulatory experience thus far. Despite these accomplishments, and as Table 3.1 suggests, Bolivia is not only among the least developed economies in the Americas, it is also among the least electricity-producing and consuming countries of the region.

Table 3.1
Selected Indicators for a Sample of American Countries, Year 2001

	Pop (M)	GDP Per Capita	Electricity Production per Person (kWh)	Electricity Consumption per Person (kHw)	Eletricity Trade Surplus per Person (kWh)	Fossil Fuel Electricity (%)	Hydro Electricity (%)	Other Electricity (%)	Electricity Prices for Households ($/kHw)
Argentina	37.38	12,900	2,061.99	2,062.63	(0.64)	60.30	30.70	9.00	0.141
Bolivia	8.30	2,600	436.72	404.84	31.88	56.61	41.60	1.79	0.063
Brazil	174.46	6,500	1,934.10	2,027.15	(93.05)	5.28	90.66	4.06	0.128
Chile	15.32	10,100	2,485.05	2,311.12	173.93	61.00	35.00	4.00	0.090
Colombia	40.35	6,200	1,079.92	1,004.53	75.39	22.27	76.19	1.54	0.077
Ecuador	13.18	2,900	763.43	711.92	51.51	29.51	70.49	0.00	0.049
Paraguay	5.73	4,750	8,990.71	333.96	8,656.75	0.07	99.79	0.14	0.057
Peru	27.48	4,550	687.17	639.10	48.07	23.04	76.43	0.53	0.095
USA	278.06	36,200	13,227.41	12,407.44	819.97	69.64	8.31	22.05	0.081
Uruguay	3.36	9,300	1,697.57	1,752.92	(55.35)	3.86	95.44	0.70	0.151
Venezuela	23.91	6,200	3,395.73	3,158.03	237.70	32.16	67.84	0.00	0.010
Americas	**835.12**	**14,617**	**2,860.27**	**2,407.07**	**na**	**58.83**	**37.80**	**3.37**	**0.090**

Source: Globastat
The Americas entry for all except population represents a simple average for North, Central, South American and Caribbean countries.
The population entry for the Americas represents Total Population
Electricity prices correspond to the year 1999
na: not applicable

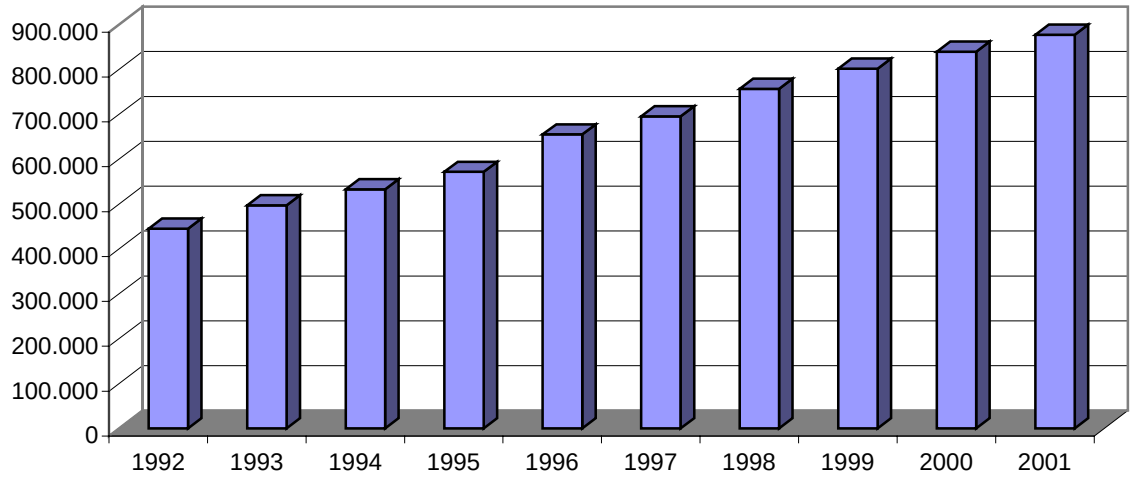
In line with the objective of the paper, the evolution of the industry is analyzed in terms of its contribution to lessen poverty levels in the country, where poverty is understood as a lack of access to basic public services, such is electricity. It should be noted that the paper does not intend to establish a causal relationship between the evolution of the electric industry and a lessening of poverty indicators in the country, but rather to analyze, in a qualitative manner, if access (coverage) and accessibility (prices) to this basic utility have increased. Quality of service will also be touched, though it will not be tied to poverty considerations. Throughout this section it will be assumed that the period “before regulation“ comprises the year 1995 and all those before it. The “regulation“ period, then, is represented by all years after 1995.

Access[11]

A first raw indicator of the evolution of the industry is provided in Figure 3.1. It shows the total number of electricity consumers in the country for the period 1992-2001. Total number signifies consumers within the National Interconnected System (NIS)[12] and those not part of the NIS.

Figure 3.1

Total Number of Residential Consumers



Source: National Institute of Statistics of Bolivia (INE)

As shown in figure 3.1 above, a growth rate of over 97% on electricity consumers is experienced between 1992 and the year 2001. Closer inspection of the yearly evolution of electricity consumers shows that the growth rate after the year 2001 should decrease due to the fact that urban consumption will peak soon – data above corresponds to approximately 90% urban coverage – which would force rural growth to take over in the not so distant future. Since rural Bolivia is, on average, poorer than urban Bolivia, overall growth rates are expected to slow down.

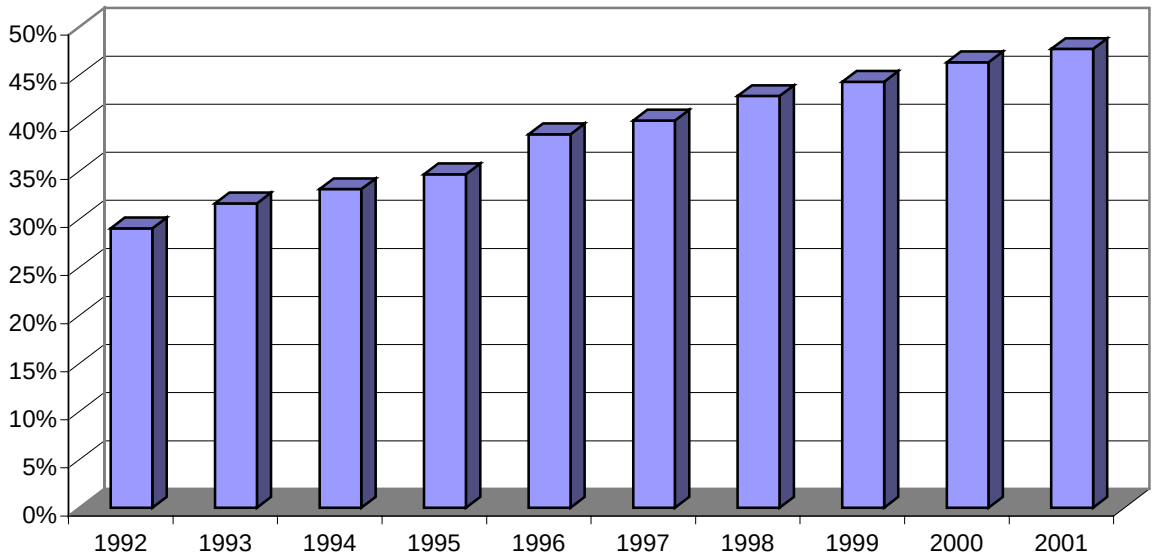
[11] There are small discrepancies in data obtained from different sources – between bolivian institutions and with sources outside Bolivia. This is particularly evident for prices. While discrepancies are small, the reader should note that they exist.

[12] The National Interconnected System (NIS) is the interconnected electric system that supplies electricity to the Departments of La Paz, Cochabamba, Santa Cruz, Oruro, Chuquisaca and Potosi. Bolivia is divided into 9 Departments – just like other countries are divided into States or Provinces – hence the NIS covers 6 of the 9, which are considered to be the biggest users of electricity in the country.

As to actual coverage, the perceived effect of regulation is a bit clearer. In this paper, coverage is defined as the percentage of electricity consumers in a population. Figure 3.2 shows national coverage for the period 1992 – 2001. An increase of 19% coverage is observed between these two years, with an average yearly growth rate of around 2.1% for the period. There is a jump in coverage of 4 percentage points between 1995 and 1996, which might be attributed to initial compliance of newly privatized enterprises with agreed-upon contract clauses that required a broadening of services throughout the country. The increase in coverage between the two end years represents around 430 thousand new homes with access to electricity, which, according to national statistics, represents approximately 1.9 million new people with access to this basic commodity.

Figure 3.2

National Coverage



Source: INE

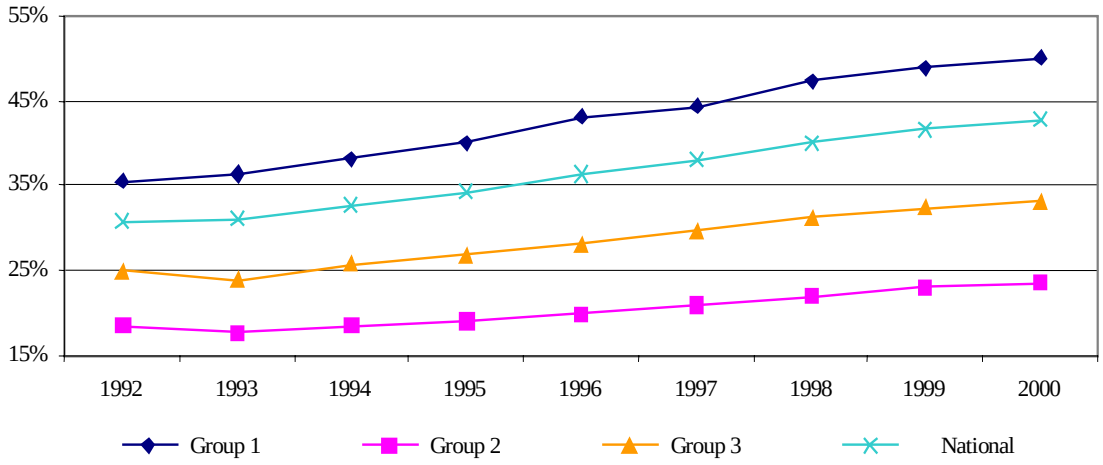
A more interesting result occurs when disaggregation of national data takes place. Growth rates in coverage are now calculated for three different groups of deparments. The first group (Group 1) includes La Paz, Cochabamba and Santa Cruz, the biggest and, on aggregate terms, the ones that contribute most to national income. The second group (Group 2) – which may also be referred to as the "stagnant group" – includes the departments of Chuquisaca, Oruro and Potosi, and it represents middle-sized deparments whose economic performance has been comparatively poorer than the rest of the country. The final group (Group 3) is composed of Tarija, Beni and

Pando, and it represents the seemingly less-developed, less-populated departments of the country and the ones that have traditionally contributed less, on aggregate terms, to national income, but whose economic performance have improved in the last years. The evolution of coverage for these three groups as well as for the country as a whole are presented in Figure 3.3.

As shown in figure below, there are significant differences among the three groups. While in 2000 coverage reached 50% for Group 1, only around 23% was experienced for Group 2. Group 3, which includes departments not considered in the NIS system, had over 32% coverage. In all cases, however, coverage increased, albeit at varying rates.

Figure 3.3

Evolution of Coverage, National and Groups



Source: Superintendency of Electricity

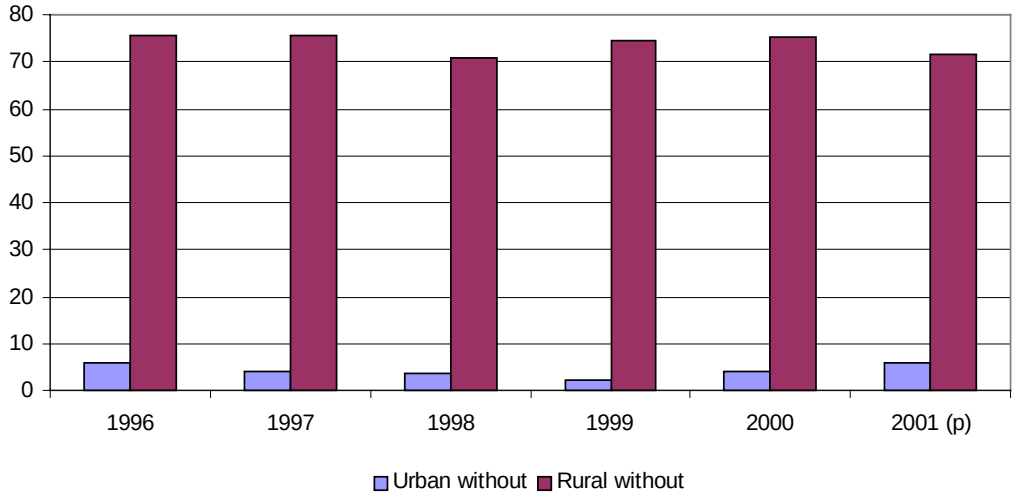
In terms of the difference between the "before regulation" period and the "regulation period", coverage growth rates for all groups were more pronounced the latter part of the decade – the regulation period. For Group 1, a growth rate of 4.6% was experienced between 1992 and 1995. After 1995 the growth rate increased to 6%. Similarly, Groups 2 and 3 experienced growth rates of 0.6% and 1.9% respectively for the "before regulation" period, and growth rates of 3% and 4.2% for the years after 1995.

It must be noted that urban coverage is significantly higher than rural coverage, and no particular improvement has been experienced in the last few years. Figures 3.4 below illustrates this point and it is immediately apparent that neither the transfer of electricity operation to the private sector nor the establishment of a regulatory framework for the industry has generated any significant

improvements on access to rural areas. Households without access to electricity in rural Bolivia still stands at well over 70%, and it has not changed much since 1996.

Figure 3.4

Urban and Rural Residents Without Electricity (%)

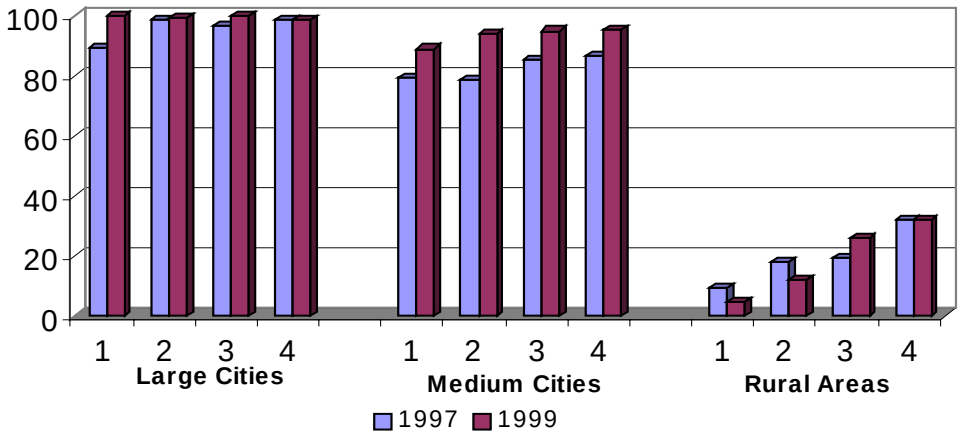


Source: INE

When income considerations are included to analyze coverage in different areas of the country, patterns of behaviour in both urban and rural Bolivia are confirmed. Specifically, urban coverage seems to be increasing throughout, even for the poorest groups, while rural coverage – for the most part – declines or remains stationary, especially in the poorest sectors. Figure 3.5 below illustrates access to electricity between the years 1997 and 1999 for the four lowest income groups in both urban and rural areas.

Figure 3.5

Access to Electricity in Large, Medium Cities and in Rural Areas in 1997 and 1999, by Four Lowest Income Deciles (%)



Source: World Bank

In graph 3.5 above, large cities refer to the capitals of all 9 departments plus the city of El Alto, adjacent to La Paz. Medium cities comprise smaller cities different from the 10 largest. Income groups are divided in deciles – the results for the four lowest income deciles are presented above, where 1 represents lowest and 4 highest among the income groups presented.

The improvement in access in large and medium cities is apparent. For all income deciles there are substantial gains between 1997 and 1999. The same cannot be said about rural areas where there is a worsening in coverage for the two lowest income groups – 1 and 2 – a slight improvement in decile 3 and no change in coverage for decile 4. It is worth noting that the data presented here occurs during the so called "regulation period" (no comparable data has been compiled for other years), time in which one would have expected increasing coverage throughout, regardless of region of the country. The fact that coverage in rural areas declines for the poorest groups of people confirms previous analysis presented in this document in the sense that transformation of the industry did not produce – in rural areas – the positive impacts many people had expected.

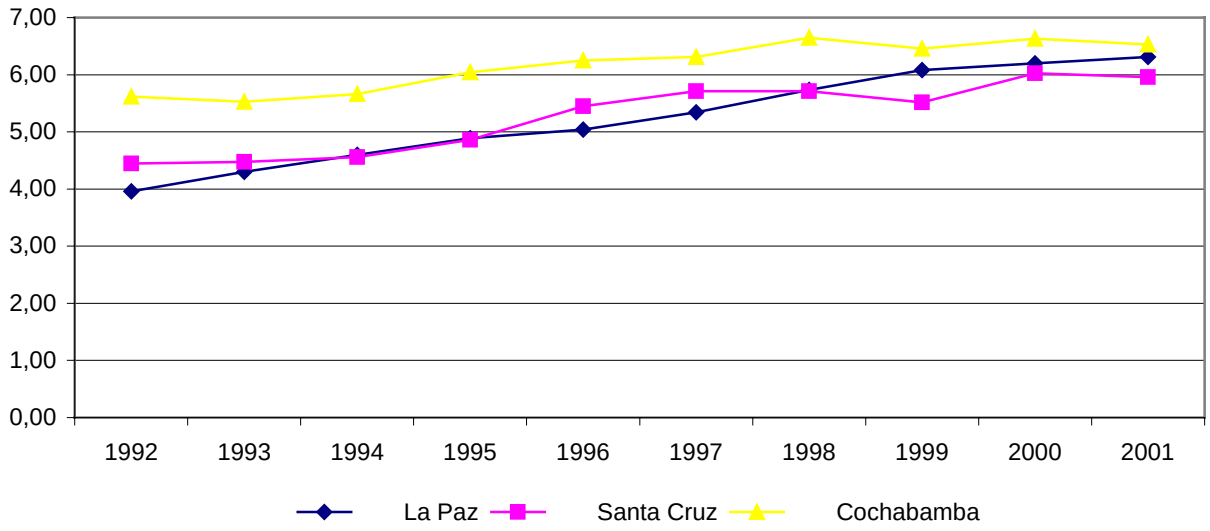
Prices

As for prices (tariffs), the concentration in this paper is in distribution prices – and more specifically, residential (household) prices – since the main interest lies in what the final

consumer pays for the commodity. Figure 3.6 illustrates the evolution of prices in the three major departments of the country, La Paz, Cochabamba and Santa Cruz.

Figure 3.6

Average Household Prices in La Paz, Cochabamba and Santa Cruz (cents $/kWh)



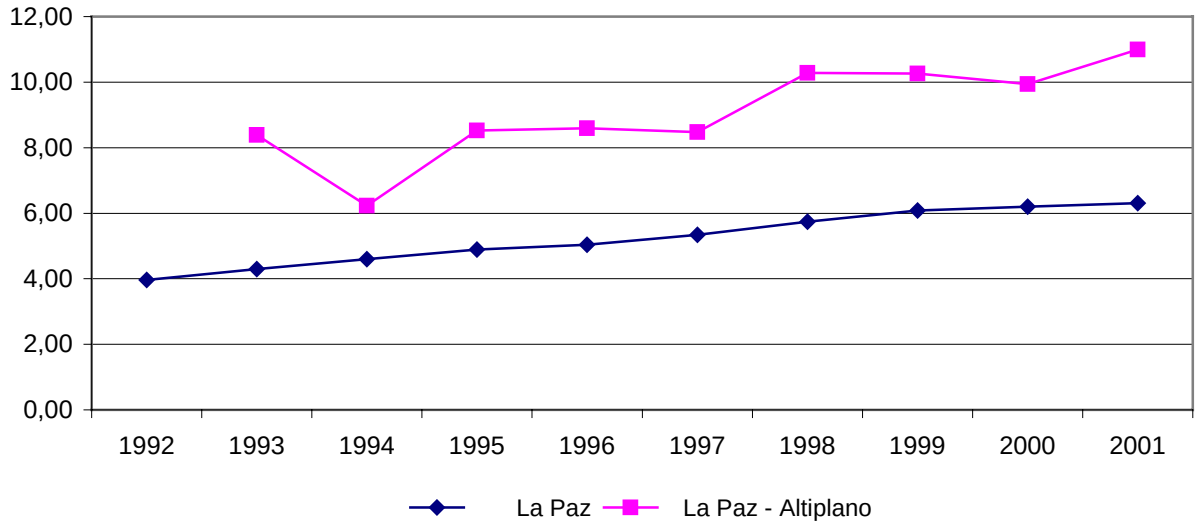
Source: INE

There is a convergence of prices paid by households in these three departments as they continuously more upwards. The increase in tariffs during the regulation period is expected because even though transformation of the industry may have caused (i) greater productive efficiency; (ii) the appearance of scale economies; and (iii) utilization of better technology, subsidies (direct or otherwise) were bound to be phased out in order to assure a more efficient allocation of resources, which would put upward pressure on prices. The newly private companies would also be expected to charge tariffs that would guarantee their financial viability and would induce them to expand service coverage to previously unattended areas. However reasonable the arguments behind the continuous increases in prices, it does not change the fact that they have indeed increased continuously throughout the period analyzed.

A more interesting picture is observed when one compares the evolution of prices during the same period for parts of urban and rural Bolivia. Figure 3.7 below illustrates household prices for urban and rural La Paz.

Figure 3.7

Average Households Prices for Urban and Rural (Altiplano) La Paz (cents $/kWh)



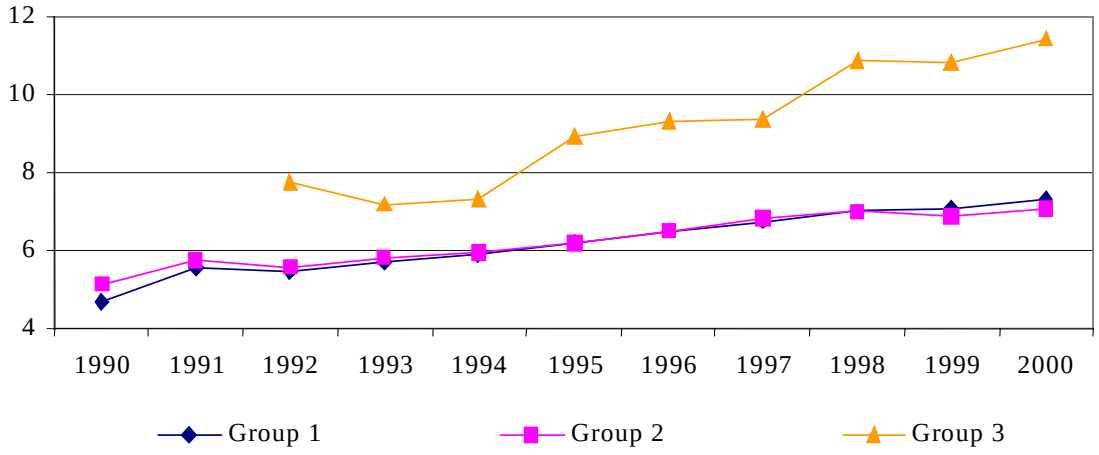
Source: INE

The pattern of behaviour above in terms of the evolution of urban and rural prices is the same in other departments of the country. Consistently, rural prices tend to be higher and grow at a faster rate than urban prices, regardless of whether one is analyzing the period before or after regulation. This situation suggests that while there might have been positive marginal effects on coverage and prices of privatization and regulation in urban Bolivia, rural Bolivia has basically remained the same after the transformation of this industry. This finding is consistent with previous studies that showed rural Bolivia stagnant, with no clear downward trend on poverty indicators due to greater access, at cheaper prices, of basic services such is electricity. Greater coverage, along with more affordable prices of this commodity, is something that has simply not happened in rural Bolivia, and it feeds on the belief that privatization and regulation of public utilities – electricity, in the present case – have hurt the poor.

Even when the analysis above is disaggregated by operator throughout the country, the same pattern of behaviour remains, as is clear in Figure 3.8 below, where the evolution of tariffs for different groups of operators[13] is illustrated.

[13]Group 1 includes the biggest distributors of electricity in the country. Their abbreviated names and serving areas (in parenthesis) are as follows: Electropaz (La Paz), Cre (Santa Cruz), and Elfec (Cochabamba). Group 2 is composed of

Figure 3.8
Average National Tariff by Groups of Operators
(cents $/kWh)



Source: Superintendency of Electricity

Figure 3.8 above shows that Groups 1 and 2 experienced basically the same evolution of tariffs over the period analyzed. Group 3 operators on the other hand, serving rural and poorer Bolivia, experienced a significant increase of tariffs between 1992 and the year 2000. In all, Group 3‘s tariffs increased by 47% between the two end years, whereas Group 1‘s and Group 2‘s tariffs increased, respectively, by 34% and 28%.

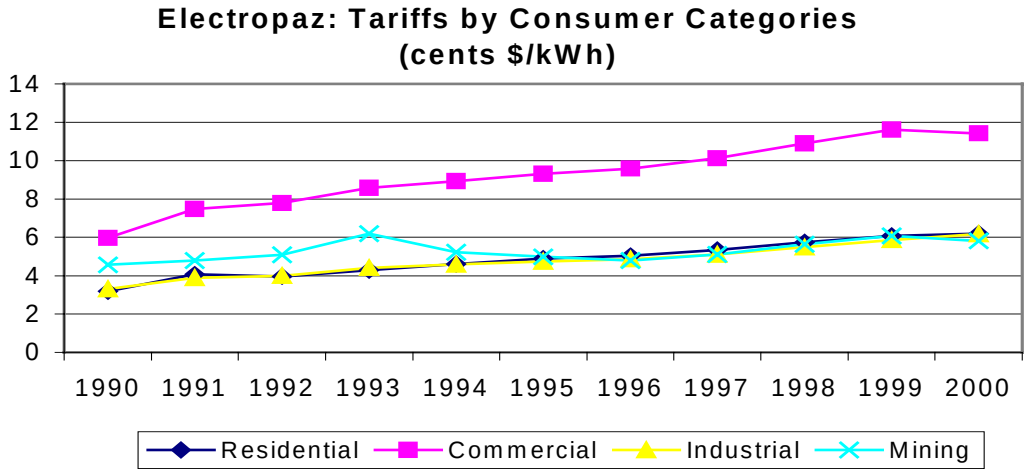
One reason for the overall increase in tariffs is that Bolivia’s electricity industry, like others in the world, has been characterized by cross-subsidization schemes that were to be phased out after the passage of the electricity law in 1994. In reality and since 1994, some reduction on the levels of cross subsidization has indeed occurred, though it is still widely used to ensure cheaper prices for, basically, residential consumers. With the gradual phasing out of cross subsidization, it should come as no surprise that those areas with comparatively larger residential consumers and smaller or non existent commercial activity, would also be the ones with the deepest increases in rates, since subsidization from the latter to the former is decreasing. The observed pattern of behaviour of tariffs illustrated in figure above seems to follow that line of reasoning.

A somewhat clearer picture on prices due to less cross subsidization is observed when prices for different categories of consumers are plotted for different operators serving different departments. It would be expected that as subsidization is phased out, prices for the subsidized category would begin to increase while prices of those categories utilized to subsidize other sectors would fall. Figure 3.9 below shows time-series price data corresponding to electricity

Elfeo (Oruro), Cessa (Chuquisaca) and Sepsa (Potosi). Group 3 includes all rural operators within the National Interconnected System (NIS).

operator Electropaz for residential, commercial, industrial and mining consumers in the Department of La Paz. The pattern of behaviour of prices in this department does fit the expectations regarding subsidization.

Figure 3.9

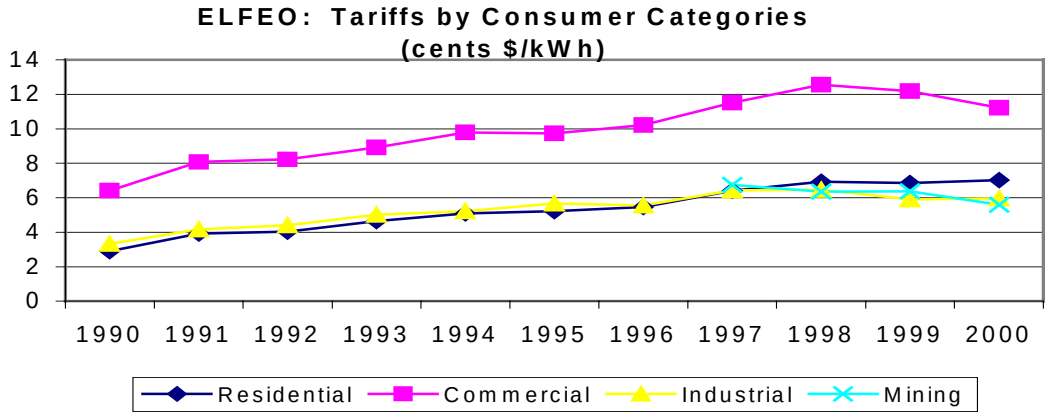


Source: Superintendency of Electricity

With the gradual phasing out of subsidies, tariffs in the commercial sector do begin to decrease – close to 2% between 1999 and 2000 – while those of the residential sector continuously increase throughout the decade – to around 2% between 1999 and the year 2000.

A similar pattern of behaviour is observed in other departments. Figure 3.10 below shows the case of Oruro, a department traditionally dependent on its mining and commercial sectors.

Figure 3.10



Source: Superintendency of Electricity

The electricity operator in this department is Elfeo. Residential prices level off after 1998 while commercial prices drop more than 10% between this year and 2000, illustrating the dwindling effect of subsidization as it is used less intensively in Oruro and throughout Bolivia.

As stated earlier, some phasing out of cross subsidization has indeed occurred. However, a complete termination of this practice has not happened due to public outcry at the possibility of higher tariff rates for a commodity the bolivian population (i.e., households) has grown accustomed to get very cheap.

Some authors (Salamanca, J., 2001, Estache, A., et.al., 2001) have shown evidence that supports the widely held belief that subsidies of public utilities do not necessarily benefit the poor but rather the middle class. A significant degree of cross subsidization in distribution tariffs among consumer categories in the city of La Paz has been in place for years, but it is the smaller, well-off residential consumer, that is being subsidized by medium-sized commercial businessess. It is also generally the case that in many countries subsidization of electricity consumption increases as the income of households rises, a situation that has been referred to as "regressive" in nature.

A final note about subsidies: reliable data on the scale and amount of subsidies utilized by every operator over time is hard to come by, not least because since the passage of Law 1604 the Superintendency of Electricity has as one of its explicit principles "efficiency in the assignment and utilization of resources for the supply of electricity at minimum cost" (Article 3, clause b of the Electricity Law). Implied in this principle is that subsidization ought to be discontinued in order to make efficient use of resources in the industry. Since neither the Superintendency nor the operators have any incentives to explicitly show that in their respective ways they are not conducting themselves efficiently, it is not surprising that the amount and scale of subsidy utilization does not appear neither in the financial statements of the operators nor in those of the Superintendency.

Quality[14]

Quality indicators are a new development in Bolivia's electricity industry. They appeared when the Superintendency of Electricity started requiring operators to comply with a set of specified guidelines. Because of the late start, data on the subject is recent. Here, data from the so-called "transition period"[15] will be utilized, which comprises observations for 4 different semesters:

[14] This section draws heavily on analysis carried out by KPMG Bolivia during 2002.
[15] The transition period refers to the 2-year period (1998-2000) in which the industry agreed on across-the-board quality indicators and when the enterprises began to comply with the agreed quality guidelines.

1st Semester: May 1998 – October 1998
2nd Semester: November 1998 – April 1999
3rd Semester: May 1999 – October 1999
4th Semester: November 1999 – April 2000

Again, and since the main focus here is on how the final consumer is directly affected by the provision of electricity, the concentration will be on two particular indicators of quality: average frequency of interruptions per consumer and total time of interruptions per consumer. To this end, quality guidelines approved by the Superintendency of Electricity establish the allowed limit values shown on Table 3.2.

Table 3.2

Allowed Limit Values

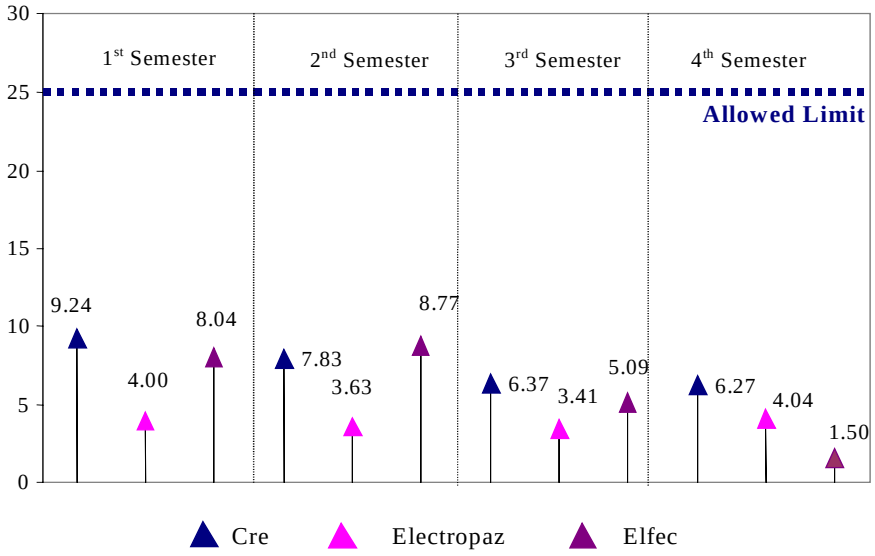
Number of consumers per System	Frequency (number)	Time (hours)
More than 100,000	25	20
More than 50,000 & less or equal to 100,000	30	25
More than 10,000 & less or equal to 50,000	35	35
Less or equal to 50,000	45	60

Source: Superintendency of Electricity

The frequency indicator measures the average number of interruptions experienced by every consumer in each of the 4 semesters of the transition period. Results are reported for two diffent groups of operators: the first group is comprised of Cre (Santa Cruz), Electropaz (La Paz) and Elfec (Cochabamba), the biggest distributors in the country. The second group is composed of Elfeo (Oruro), Cessa (Chuquisaca) and Sepsa (Potosi), medium-sized distributors of electricity. According to the frequency values of Table 3.2, the first group has an allowed limit value of 25 and the second group an allowed limit value of 35.

The first group results are summarized in Figure 3.11 below.

Figure 3.11
Average Frequency of Interruptions



Source: Superintendency of Electricity

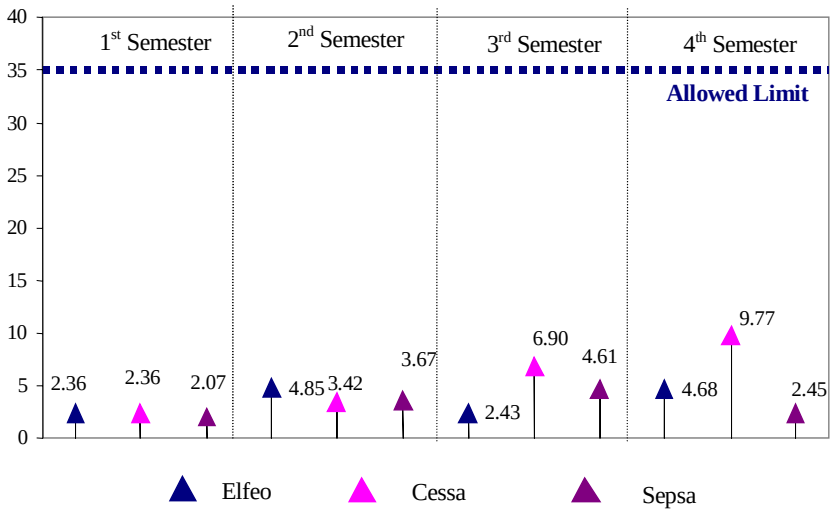
As illustrated, none of the operators even came close to the allowed limit, which raises the question on whether the permissible limits are inducing quality – as they should be – or not inducing anything. Generally, all three companies did well, though Cre, serving Santa Cruz, and especially Elfec, serving Cochabamba, did a comparatively better job than Electropaz, serving La Paz, at improving performance.

Since the results just presented show a recurring pattern of behaviour in terms of quality guidelines that seem to be over generous, it is relevant to question whether these guidelines are portraying an industry that has been successful in influencing the behaviour of the agency purportedly there to regulate it. Though a "capture" of the regulator might not be the most appropriate term in light of only 4 observations, it does seem the case that the quality guidelines are too lax and unable to induce "virtuous" behaviour from the part of operators in the industry.

As for the second group, Figure 3.12 summarizes their performance over the two-year period. Here there is a more erratic pattern of behaviour for all three companies. Generally speaking, this indicator of quality seems to worsen for the group as a whole. Sepsa, serving Potosi, is the one with the better performance, and Cessa, serving Chuquisaca, the one with the worst. With this

group, the agreed performance guidelines seem to have produced a moral hazard kind-of-situation, where the worst type of behaviour emerged in all companies due to the aforementioned lax and over-generous permissible quality parameters.

Figure 3.12
Average Frequency of Interruptions

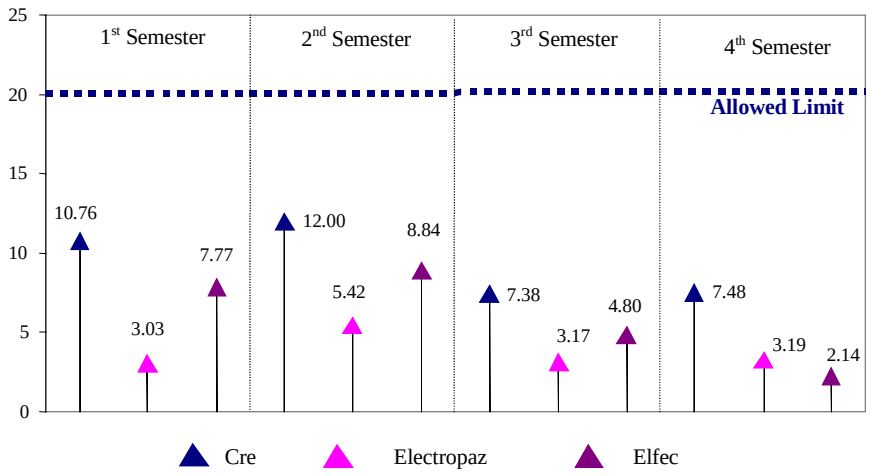


Source: Superintendency of Electricity

As for the second indicator of quality, total time of interruptions per consumer, it measures the average time that every consumer is deprived of electricity during a semester. In line with the first quality indicator, results are presented for the 2 groups of operators already defined.

The first group (Cre, Electropaz and Elfec) has an allowed time limit of 20 hours. This limit was not surpassed by any of the companies in the 4 semesters analyzed. Figure 3.13 summarizes results for this second indicator of quality.

Figure 3.13
Total Time of Interruptions per Consumer



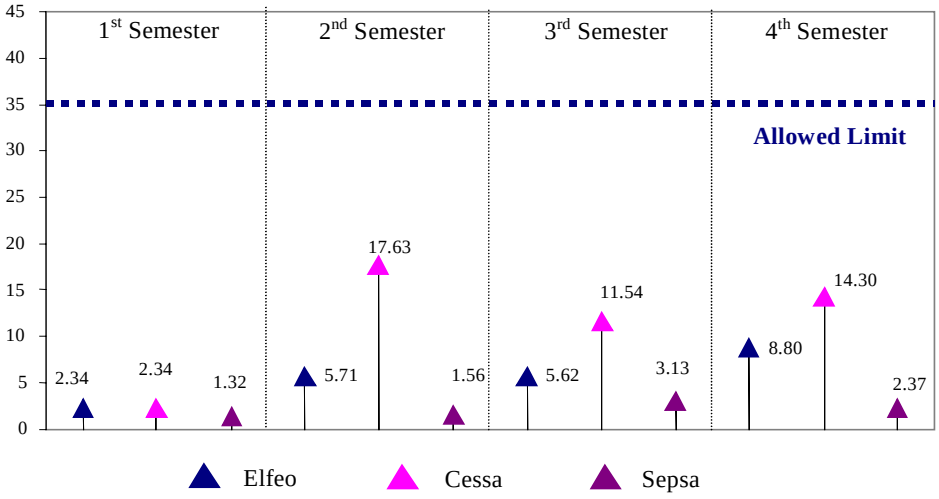
Source: Superintendency of Electricity

As is clear from figure above, there is a general improvement in all companies. Elfec, however, is the company with the greatest improvement over the 4-semester period – its indicator is reduced in more than 5 hours compared to its initial standing. Elfec ends the final evaluation as the best company of the group in this quality indicator.

The second group has an allowed limit of 35 hours. The results are shown in Figure 3.14.

Figure 3.14

Total Time of Interruptions per Consumer



Source: Superintedency of Electricity

As with the previous group, in this one none of the companies surpassed the allowed time limit. The general conclusion, however, is that there is worsening behaviour in all companies, including Sepsa, the one that has the best performance throughout the 4-semester period. With this group, the pattern of behaviour with this quality indicator is very much the same as with the first indicator, showing that the quality guidelines established by the Superintendency apparently do not meet the challenge of inducing better behaviour of the regulated enterprises.

4. Conclusions and Recommendations

An important first conclusion is that the SIRESE system is still very young and so it is too early to assess final verdicts on its performance. It can be stated, however, that antimonopoly provisiones within its regulatory framework seem to be out of place, and hence the possibility of taking them out should become a valid discussion point.

Coverage of electricity users has grown faster in urban areas ever since the establishment of regulation. Although it is not argued that regulation has caused the increase in electricity consumers, the data does show that a comparatively faster urban growth rate of users takes place after 1995. In this sense, it seems plausible that regulation of the electricity industry has indeed lessen poverty levels in urban Bolivia by making this utility more accessible to larger segments of the urban population.

The same cannot be said, however, about rural Bolivia. The results show that coverage has remained about the same in the last 10 years, with no discernible improvement after the transformation of the industry in 1995. When rural Bolivia is divided into income groups, the data shows that some of the poorest groups have indeed experienced a decline in coverage during the regulation period, which sheds doubts about the purportedly positive effects that structural changes in this industry were to have in the livelihoods of the poorest people in the country.

It has also been shown that the cost of the service has increased throughout Bolivia – at a faster rate during the regulation period, though the same caveat applies here regarding the causality between regulation and higher tariffs. The increase in rates in rural Bolivia has been faster and more steep than in urban areas, which may partly be the result of less cross subsidization between categories of consumers. Regardless of the reason, and as it refers to pricing of the commodity, rural consumers have again not benefitted in any discernible way from the transformation of the industry.

As for quality of service, the results achieved for the four semesters studied are insufficient to conclude with any degree of certainty whether operators have provided a “good“ service or not. What can be stated, however, is that the quality guidelines designed by the Superintendency of Electricity are overly generous and should be reassessed in order to send the right messages to operators and induce them to improve on the quality of the service provided.

In light of the results presented and particularly from the perspective of the poorest – which are concentrated in rural areas – it is difficult to portray the transformation of the electricity industry in Bolivia as “pro poor“. It has had discernible, positive effects in urban areas, particularly in terms of coverage, but its effects on prices – both in cities and in the country – has been less than ideal. While aware of the distortions created by subsidies, and continuining with the process of reforms in the industry, it seems that tariff schemes whereby urban, wealthier consumers subsidize rural consumers should be taken into consideration in order to make the industry more beneficial to those that need it most. They could take the form of “rising block tariffs“ – also known as lifeline subsidies – where the unit price of the service is cheaper for the first units of consumption, up to levels considered sufficient to cover basic needs of poor households, and subsequent blocks are charged their true economic cost or higher, to finance the poorest block. Though far from the ideal solution, subsidization of the poorest seems to be a second-best solution that applies just right to a country like Bolivia, where poverty indicators are so acute despite remarkable structural reforms across the board.

Appendix[16]
Subsidy Mechanisms

1. **General Price Subsidies:**
   - It involves keeping electricity prices below costs for all residential consumers. For the electricity industry, where a network is required, the coverage and the cost of the subsidy would be considerable. Expected benefits for the poor are high, though they would tend to create distortions in the price regime resulting from wasteful consumption practices among consumers. Easy to administer.

2. **Lifeline Subsidies:**
   - These subsidies are restricted to an initial block of consumption, equivalent to what is considered a basic-need level. Its effectiveness depends on the share of the poor with access to electricity. Targeting of the poor improves as the size of initial block declines since more consumption is usually associated with greater income. May become very costly.

3. **Merit-Based Price Discounts:**
   - Sometimes based on normative qualifications of poverty – for instance, only rural women under 30 qualify for discounts. Can be very difficult to target and may create significant distortions. Limits on the levels of consumption where discounts are applied may reduce moral hazard. May also be quite expensive to administer.

4. **Burden Limit:**
   - Total payment for service is limited based on an income test or similar measure of energy spending as a share of household income. Tends to show low coverage for the poor and not well targeted. Low targeting ratio occurs due to weak correlation between per capita household income and the share of energy spending within the household income. Thought to be the most distorting of all subsidy mechanisms. Can be quite costly to administer.

5. **Noncollection:**
   - Refers to non-enforcement of disconnection penalties for unpaid bills. It occurs when government pressures private operators not to disconnect people due to unpaid bills. Coverage of the mechanism is low. It creates significant price distortions and results in inefficient consumption.

6. **Cash Transfers:**
   - Not constrained by the share of poor households not connected to the service. Least distortionary since households can spend cash support as they wish. Fiscal burden created by it might be considerable.

[16] A fuller description of the subsidy mechanisms presented here appears in the PRSP Sourcebook draft document of the World Bank.

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