Benchmarking Analysis of the Electricity Distribution Sector in the Latin American and Caribbean Region

Final Report

Date

LIST OF ACRONYMS

ABRADEE	*Associação Brasileira de Distribuidores de Energia Eléctrica*
ADEERA	*Asociación de Distribuidores de Energía Eléctrica de la República Argentina*
AEA	*Alianza en Energía y Ambiente con Centroamérica*
AMM	*Administrador del Mercado Mayorista (Guatemala)*
ANEEL	*Agência Nacional de Energia Elétrica (Brazil)*
ARESEP	*Autoridad Reguladora de los Servicios Públicos (Costa Rica)*
ARIAE	*Asociación Iberoamericana de Entidades Reguladoras de Energía*
ASI	*Asociación Salvadoreña de Industriales*
CAPEX	Capital Expenditures
CAVEINEL	*Cámara Venezolana de la Industria Eléctrica*
CCEE	*Câmara de Comercializacão de Energia Elétrica (Brazil)*
CNDC	*Centro Nacional de Despacho de Carga (Nicaragua)*
CNDC	*Comisión Nacional de Despacho de Carga (Bolivia)*
CNE	*Comisión Nacional de Energía (Chile / Honduras / Nicaragua)*
CNEE	*Comisión Nacional de Energía Eléctrica (Guatemala)*
CONELEC	*Consejo Nacional de Electricidad (Ecuador)*
CPI	Consumer Price Index
CREG	*Comisión de Regulación de Energía y Gas (Colombia)*
CRIE	*Comisión Regional de Interconexión Eléctrica*
ECLAC	*Economic Commission for Latin America and the Caribbean*
EIA	*Energy Information Administration of the US government*
ENRE	*Ente Nacional Regulador de la Energía Eléctrica (Argentina)*
EOR	*Ente Operador del Mercado Eléctrico Regional (El Salvador)*
ERSP	*Ente Regulador de Servicios Públicos (Panama)*
FMIK	Mean frequency of Interruption per kVA
FTE	Full Time Employment
FUNDELEC	*Fundación para el Desarrollo del Servicio Eléctrico (Venezuela)*
GWh	Giga Watt Hour
IADB	*Inter-American Development Bank*
IAEE	*International Association for Energy Economics*
IEA	*Internacional Energy Agency*
INE	*Instituto Nacional de Estadística (Bolivia)*
INE	*Instituto Nicaragüense de Energía*
INEC	*Instituto Nacional de Estadísticas y Censos (Nicaragua)*
kVA	kilo Volt Ampere
kWh	kilo Watt hour
LCR	Latin America and the Caribbean Region
MINAE	*Ministerio de Energía y Ambiente (Costa Rica)*
MINEC	*Ministerio de Economía (El Salvador)*
MW	MegaWatt
MWh	Mega Watt Hour
OLADE	*Organización Latinoamericana de Energía*
OPEX	Operational Expenditures
OPSIS	*Oficina de Operación de Sistemas Interconectados (Venezuela)*
OSINERG	*Organismo Supervisor de Inversión en Energía (Peru)*
PPI	Private Participation in Infrastructure
PPP	Private Public Partnership
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index

SEC	*Superintendencia de Electricidad y Combustibles (Chile)*
SIE	*Super Intendencia de Electricidad (Bolivia)*
SIGET	*Superintendencia General de Electricidad y Telecomunicaciones (El Salvador)*
SIRESE	*Sistema de Regulación Sectorial (Bolivia)*
SUI	*Sistema Único de Información de Servicios Públicos (Colombia)*
TOTEX	Total Expenditures
TTIK	Total interruption time per kVA
URSEA	*Unidad Reguladora de los Servicios de Agua y Energía (Uruguay)*

NOTE: For the acronyms of the firms, please refer to Annex 3.

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Investments in infrastructure have been on the development agenda of Latin American and Caribbean (LCR) countries as they move towards economic and social progress. Investing in infrastructure is investing in human welfare by providing access to quality basic infrastructure services. Improving the performance of the electricity sector is an important part of this major infrastructure action and the focus of the benchmarking study. A key initiative for both public and private owned distribution utilities has been to upgrade their efficiency as well as to increase the coverage and quality of service. The report contributes to this initiative by serving as a clearing house for information regarding the regional, country, and utility level performance of the electricity distribution sector. It allows countries and utilities to benchmark their performance in relation to other comparator utilities and countries, filling in knowledge gaps for the identification of the best performers of the region. In doing so, this benchmarking study promotes the improvement of the electricity sector performance.

In order to conduct a benchmarking analysis, the study collected detailed information of 26 countries and 250 utilities in the region. An analytical framework was designed to produce a comprehensive description of the sector as well as a mechanism for ranking countries and utilities for best performance. The data collected for this benchmarking project is representative of 88 percent of the electrification in the region from 1995 until 2005. By serving as a mirror of good performance, the report allows for a comparative analysis and the ranking of utilities and countries according to the indicators used to measure performance. Through in-house and field data collection, consultants compiled data to tell various stories about the distribution sector based on accomplishments in output, coverage, input, labor productivity, operating performance, the quality of service and prices. Based on the results of these performance indicators, the report benchmarks the performance of electricity distribution at the regional, country, and utility-level.

The following four chapters describe the analysis developed to capture the different aspects of the performance of electricity distribution, providing countries and utilities with the knowledge necessary to develop and improve their services:

The **first chapter** provides an assessment of distribution performance at the regional level. The story being told here is one based on the weighted averages of the distribution utilities in order to capture the regional status of the electricity sector. The main finding of this report is the overall improvement across the region during the last decade with significant changes in the following areas: a ten percentage point increase in coverage reaching 94.6 percent in 2005, a rise in private sector participation from 11 percent of electricity connections in 1995 to 60 percent in 2005, labor productivity that more than doubled and an improvement in the quality of service by more than 40 percent. While there were no clear trends in operational expenditures, overall OPEX grew between 40.8 and 44 percent during the last decade. Concurrently, residential and industrial tariffs (in real terms) have increased by 70 – 90 percent since 1995. In contrast, there appeared to be no significant changes in distributional losses.

The **second chapter** focuses on the performance at country level. The analysis is based on the weighted averages of the utilities within each country. It provides a cross-country comparison that identifies and ranks the best performer according to the indicators measured. The countries are ranked according to their aggregated level of output, coverage, labor productivity, input, operating performance, service quality, and prices. According to the analyses, most countries demonstrate a significant overall improvement in the coverage and labor efficiency of electricity services during the last 10 years. Chile is amongst the strongest regional leader with 97 percent electricity coverage, labor productivity that is triple that of the regional average, and the lowest distributional loss. In regards to the average residential tariff,

Argentina and Peru serve their customers at the lowest rate of $38 and $43 per MWh per year respectively while Paraguay provides industrial consumers the lowest regional tariff of $34. When assessing the quality of service by measuring the frequency and duration of interruptions, Mexico takes the lead with a low of 2.19 interruptions per consumer while Ecuador sets the standard for the lowest duration time averaging 2 hour durations. Another regional forerunner is Peru with one of the most notable improvement trends in labor productivity and distributional losses. Finally, Honduras is noted for the lowest operational expenditures followed closely by Paraguay.

In addition, the chapter reports improvements of the underperforming countries as evidenced by the time trends. In summary, for the time period of 1995-2005, the lower performing countries have doubled their electricity coverage and labor productivity, curtailed the frequency of interruptions per connection by 73 percent and the duration of interruptions by 55.9 percent, decreased their total expenditures per connection by 56.2 percent and finally diminished the duration of interruptions by 17.2 percent. As indicated, there has been significant progress made by the majority of the utilities throughout the last decade.

In **third chapter**, the utility is the object of analysis**.** The performance of electricity distribution is assed by evaluating the simple averages for different sub-groups of the 250 utilities included in this study. The method used to benchmark the performance of all the utilities was to rank them according to the top ten percent, middle 80 percent, and bottom ten percent of distribution performance. The best performing utilities are listed in the top or bottom ten percent depending on the indicator being measured. Amongst the characteristics of the top performing utilities are utilities with 100 percent electrification, an average of 897.1 residential connections or 6,402 MWh of energy sold per employee, 6.5 percent distributional losses, and residential prices in the range of $591 per MWh consumed. The story of the last decade is one of universal electrification and significant improvements of the utilities and is better represented by the middle 80 percent. Electrification increased by almost 15 percentage points for the middle 80 percent resulting in 88 percent coverage while the bottom ten percent increased by 20 percentages points resulting in 60 percent coverage by 2005. The chapter offers three main messages: First, there are significant discrepancies amongst utility performance. Second, there has been an overall improvement of the underperforming utilities during the last ten years. Third, there are cases with significant deterioration in distribution performance as reflected by indicators such as the average tariffs and distributional losses.

Considering the major impact of private participation on electricity development, we have dedicated this **fourth chapter** to providing a comparative analysis of private and public distribution utilities. While the previous chapters of this report indicate major improvements in coverage and quality at the regional, country, and utility-levels, this chapter provides insight on utility performance based on the means of ownership. The utilities presented in this chapter fall into the following three categories: public utilities throughout the period of 1995-2005, utilities that privatized before 1995 and remained private throughout 2005, and utilities that privatized after 1995 and remained private throughout 2005. In order to most accurately assess and compare the performance of public and private distribution utilities, we considered the initial conditions in 1995 as well as the overall trend of the last ten years. Finally, we present the variance of change and improvement of the studied indicators. For this comparison, we report the average top ten, bottom ten, and middle eighty percent public and private utilities.

The results indicate that on average, private utilities performed better than public utilities with clear differences after the change in ownership. While there have been modest improvements by public utilities, on average, private utilities surpassed the performance (improvement) of public utilities as is evident by indicators measuring labor productivity, distribution losses, quality of service and tariffs. A key message is that despite the fact that private and public utilities experienced similar initial conditions in 1995, by the end of the decade, the two groups diverged in performance. For instance, when measuring

distributional losses, private and public utilities were separated by a 2 percentage point gap in 1995, yet by the end of 2005, there was a 4 percentage point difference between the two utility types. With respect to labor productivity, in 1995, public utilities resulted with 10.7 percent less residential connections per employee than that of post 1995 privatized utilities, yet by the end of 2005, the labor productivity of post-1995 privatized utilities almost tripled its initial amount, and doubled the amount of the labor productivity of public utilities, which totaled 326 connections per employee in 2005, a 4.5 percent increase over the last decade.

Another interesting result is that for the indicators measuring output, labor productivity and operating performance, the top 10 percent public utilities outperformed the average private utilities and the bottom 10 percent private utilities performed poorer than the average public utilities. Inequality in performance seems higher among private utilities.

Complementary to this report, this benchmarking initiative launched a web site in order to provide access to the data[1] collected and represented here. The website includes features that allow the users to benchmark electricity distribution performance at the utility and country level by choosing which countries or utilities they wish to compare. In addition, the interface presents the data in tables, graphs, and maps available for download.

[1] Accessible through the LAC-Energy site (http://www.worldbank.org/lacenergy) or using the following link: http://info.worldbank.org/etools/lacelectricity/home.htm

INTRODUCTION

BACKGROUND

Since the late 1980s, a wave of reform has transformed the institutional framework, organization, and operational environment of the infrastructure industries, particularly those in the electricity sectors in most developed and developing countries. In addition, other countries are either implementing or evaluating some form of power sector reform. Although the structure of the power sectors and the approaches to reform vary across countries, their main objectives are to improve the efficiency of the sector as well as to increase the coverage and quality of service. Separation of roles, unbundling, competition and private participation were used as key instruments to increase efficiency, improve the government's fiscal position and increase access to electricity service for the poor. In many countries in the region the combination of private participation, competition and better regulation was effective in improving productive efficiency and quality of service.

The last decade has witnessed significant progress in the power sector of Latin America and the Caribbean. While there are differences between countries, overall supply has increased substantially and with it access to electricity. The best electricity distribution performer is Uruguay with 97.5 percent coverage followed by Costa Rica, Brazil, Argentina, Chile, and Mexico with more than 95 percent coverage. However, equally important is to consider the overall improvement in coverage as reflected in the growth rate of countries such as Peru, Paraguay, Honduras, and El Salvador demonstrating an average growth of 19.7 percentage points in the last 10 years.

Despite the fact that electricity coverage in LCR increased from 84.7 to 94.6 percent in 2005, evidence suggests that the poor and rural areas were not the main beneficiaries of the improvements in productive efficiency and coverage.[2] According to the LCR Energy Strategy (2007), in many countries, industrial consumers and high income residential consumers were the main beneficiaries of competition and rebalancing of tariffs, which reduced substantial cross-subsidies of the pre-reform period. However, it is also true that privatization and cost-covering tariffs ensured the financial feasibility of efficient electricity providers, which were able to expand access and improve the quality of service to a large number of consumers in urban and peri-urban areas, including poor people.

WHY BENCHMARKING MATTERS

Benchmarking the electricity distribution segment in the Latin American and Caribbean Region (LCR) is a means of providing countries and utilities with a point of reference regarding their performance. Considering the changes that have shaped the power sector during the last decade, this benchmarking report provides country and utility level direction and a framework of comparison for identifying where they stand in relation to the others, detecting their strengths and weaknesses, and setting goals for improvement.

The purpose of benchmarking the power sector is to provide a detailed description of the

[2] The coverage figures presented in this report reflect that of the 250 utilities measured in our sample set.

electricity distribution segment in the Latin American and Caribbean Region and to identify and rank the best performers in the region. A number of empirical studies have used benchmarking methods within the electricity supply industry. These studies have traditionally focused on generation or on vertically integrated utilities; however, probably due to regulators' demand, the interest on benchmarking the natural monopoly segments (i.e., transmission and distribution) has recently increased. Surveys of the benchmarking literature (Jamasb and Pollitt [2001], Mota [2004])[3] have concluded that, due to issues of data standardization and currency conversion, international benchmarking has not been widely used. When international efficiency comparisons have been used, they have traditionally focused on developed countries.

This report is designed to be solely factual, aimed at describing electricity distribution performance at the regional, country, and utility levels and does not assume, at this stage, an analytical or explanatory role. Additionally, this study will contribute towards a more consistent benchmarking analysis in the electricity distribution segment and serves as a path-breaker for other regional benchmarking initiatives.

This benchmarking initiative contributes primarily with the collection and analysis of detailed data for 26 countries and 250 utilities that represent 88 percent of the electricity connections in the Latin American and Caribbean region[4]. An analytical framework was designed to produce a comprehensive description of the sector as well as a mechanism for ranking countries and utilities for best performance. By serving as a mirror of good performance, the report allows for a comparative analysis and the ranking of utilities and countries according to the indicators used to measure performance. Through in-house and field data collection, we compiled data on the electricity distribution sector based on accomplishments in output, coverage, labor productivity, input, operating performance, service quality and prices. Based on the results of these performance indicators, the report benchmarks the performance of electricity distribution at the regional, country, and utility-level.

WHERE WE ARE

This report is organized to tell multiple stories of the substantial improvement in the electricity distribution sector by documenting the changes and progress made during the last decade. The objective of this report is to fill in the knowledge gaps that exist regarding the status of electricity distribution by benchmarking utility performance at the regional, country, and utility level. This report serves as a standard reference for and defines good and poor electricity distribution performance in Latin America and the Caribbean.

The following four chapters benchmark and serve as a guide to the sector evolution of 250 utilities in 26 LCR countries according to indicators of output, coverage, labor productivity, input, operating performance, service quality, and prices.

The **first chapter** provides a description of the performance of electricity distribution utilities at the regional level based on the weighted average of the utilities in the region, highlighting time trends and the overall electricity distribution status. The **second chapter** presents and ranks the best performing

[3] Jamasb and Pollitt (2001) is a survey of the electricity supply industry (all segments), whereas Mota (2004) concentrates on the electricity distribution segment.

[4] Accessible through the LAC-Energy site (http://www.worldbank.org/lacenergy) or using the following link: http://info.worldbank.org/etools/lacelectricity/home.htm

countries of electricity distribution using the simple average across countries as well as the weighted averages within countries for each indicator which allows for comparability across variables. In addition, the use of weighted averages delineates the leader country in the region as well as the dispersion of levels across time. Through a comparative analysis, the chapter establishes the top countries in electricity distribution with sensitivity to size and location. The **third chapter** benchmarks electricity distribution performance by ranking utilities according to the top ten percent, bottom ten percent, and the simple average of the rest of the 80 percent performers. Best performing utilities are listed in the top or bottom ten percent depending on the variable at hand. While the best performer for electricity coverage is listed in the top ten percent, the best performer for distribution losses would form part of the bottom ten percent. Finally, the **last chapter** depicts the progress made by both public and private utilities and provides a comparative analysis of public utilities throughout the period of 1995-2005, utilities that privatized before 1995 and remained private throughout 2005, and utilities that privatized after 1995 and remained private throughout 2005. In order to most accurately assess and compare the performance of public and private distribution utilities, we considered the initial conditions in 1995 as well as the overall trend of the last ten years. Finally, we present the variance of change and improvement of the studied indicators. For this comparison, we report the average top ten, bottom ten, and middle eighty percent public and private utilities.

1. A REGIONAL ASSESSMENT FOR ELECTRICITY DISTRIBUTION

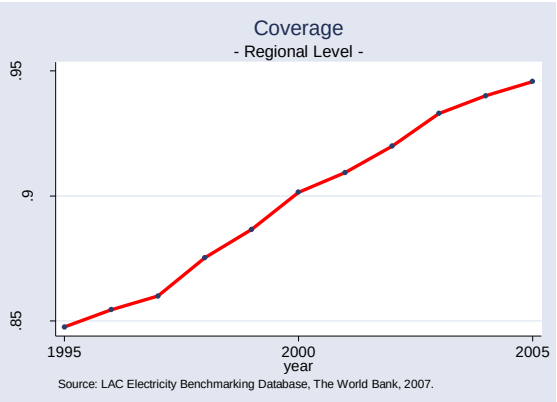
The objective of this chapter is to provide a description of the performance of electricity distribution utilities at the regional level, detailing the sector evolution according to indicators of output, coverage, labor productivity, input, operating performance, service quality, and prices. The following results are based on the weighted average of the utilities in the region and reflect the performance of the 26 countries and 250 utilities used in the benchmarking study for the period of 1995-2005, highlighting time trends and the overall electricity distribution status. This chapter synthesizes the results from the methodology used in the benchmarking study to relate the story of electricity distribution in the region in light of the reforms and other sector changes.

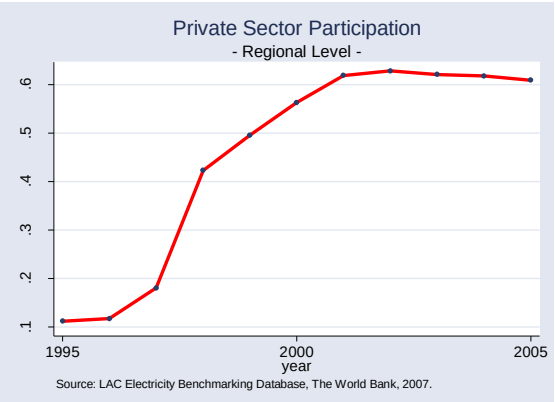
1.1 MAIN FINDINGS

This chapter benchmarks electricity distribution in Latin America and the Caribbean region and depicts the progress made in the last ten years. The main finding of this chapter is one of overall improvement across the region during the last decade with significant changes in the following areas: a ten percentage point increase in coverage reaching 94.6 percent in 2005, a rise in private sector participation from 11 percent of electricity connections in 1995 to 60 percent in 2005, labor productivity that more than doubled and an improvement in the quality of service by more than 40 percent. While there were no clear trends in operational expenditures, overall OPEX grew between 40.8 and 44 percent during the last decade. Similarly, residential and industrial tariffs (in real terms) doubled since 1995. In contrast, there appeared to be no significant changes in distributional losses.

1.2 COVERAGE AND PRIVATE SECTOR PARTICIPATION

During the last 10 years, electrification in the LCR increased significantly at an annual growth rate of 1.1 percent, from 84.7 percent coverage in 1995 to 94.6 percent in 2005. The growing trend in electricity coverage reflects a high demand for access to the electricity network by a growing number of residential, non-residential, and rural users.





As demand for electricity increased, so has private participation in electricity distribution throughout Latin America and the Caribbean Region. Private participation has grown substantially since 1990, and especially between 1995-1998. While in 1990 there was little significant participation of the private sector in electricity distribution, by 1995, 11.1 percent of electricity connections in the region were served by the private sector. By the end of our period of analysis, 60 percent of electrical connections were supplied by private utilities. Based on the data from the Private Participation in Infrastructure (PPI) Project Database, during the last 15 years, US$ 102.6 billion was invested in 384 private electricity projects in LCR. Most Latin American countries have introduced private participation in electricity as part of broader reforms attempting to establish a more competitive market structure. However, in the last four years private participation has remained mostly stagnant with low levels of investments. It is worth considering this phenomenon when analyzing the regional performance of the electricity distribution in the following sections.

Despite the fact that electricity coverage in LCR increased from 84.7 to 94.6 percent in 2005 there are still many people, almost all poor and in rural areas, without electricity.[5] There is still a strong need to expand electrification in rural areas in LCR countries since these areas lag behind. For example, large increases in electricity coverage in Argentina are related to the normalization of illegal connections in urban slums rather than the expansion of electricity service to rural areas. Private investors were effective in connecting consumers in urban and rural areas near the power grid but are reluctant to extend access to rural areas where electricity service is not financially viable. In Bolivia and Nicaragua, countries that privatized distribution, only 30% of rural population has access to electricity. Further increases of coverage in rural areas usually require substantial investment subsidies and strong government support. The government of Chile, a leader in reform and privatization, provided investment subsidies of about US$1500/household to increase electricity coverage in rural areas from 62% to 92% in 1995-2005.[6]

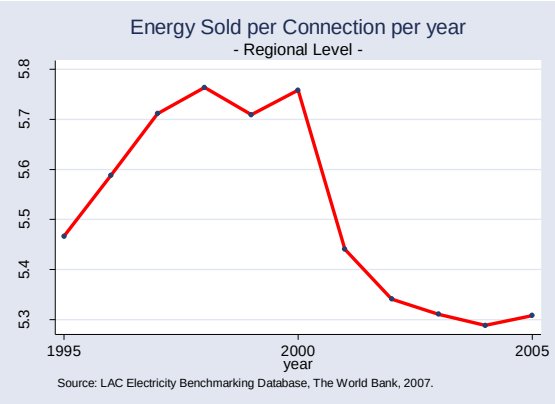
Rural electrification is not only directly linked with poverty reduction and economic development, but forms a necessary response to strong social pressures in client countries. Access to electricity is an essential element in improving quality of life, access to basic services such as good education, health care, and opportunities for economic development. In surveys of rural and marginalized urban communities, electrification is consistently indicated to be among the top five infrastructure priorities, usually immediately following roads and water supply. While this report does not focus on rural electrification, it attests to the need for increased support of developing rural energy programs.

1.3 OUTPUT

The energy sold per connection per year exhibits an increasing trend until 2000 with a total increase of 0.29 MWh sold per connection, after which there is a sudden drop in sales that continues to decrease until the end of 2005, with a total reduction in MWh sold per connection of 2.9 percent. During the last 10 years, the average energy sold per connection is 5.5 MWh. Albeit a 45 percent increase in the number of connections from 1995-2005, the total amount of energy sold per connection has declined. When considering the evolution of energy sold, the fluctuating values of the energy sold per connection may be attributed to the increase in residential and industrial tariffs and thus a decrease in demand.

[5] The coverage figures presented in this report reflect that of the 250 utilities measured in our sample set.

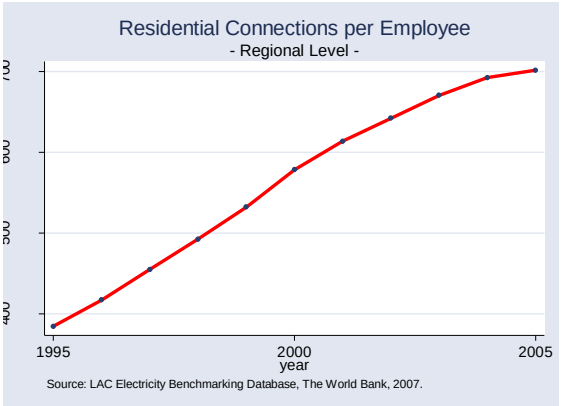
[6] ESMAP Study Latin American and the Caribbean Region (LCR) Energy Strategy, 2007.

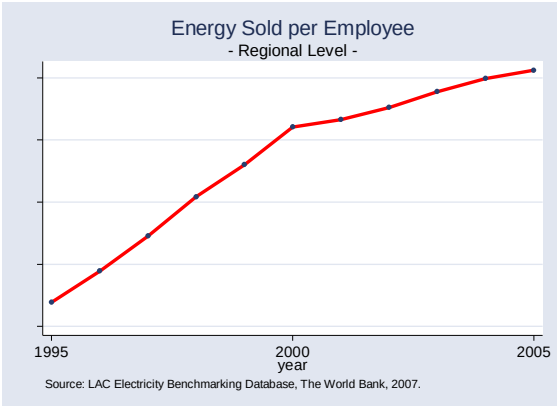


1.4 LABOR PRODUCTIVITY

Amongst the measures used for estimating labor productivity is the number of residential connections per employee. During the 1995-2005 timeframe, this value has doubled from 384 residential connections in 1995 to 701 in 2005. The natural growth trend in population (approximately 1.1 percent per year) accounts for the suggestive "natural" growth in the number of connections contributing at most for one fifth of the improvement in labor productivity. A second contributing factor is the substantial improvement in electricity coverage. The final concurrent factor that drives this change is the reduction of the labor force in the sector. Based on this analysis, there was a 23.2 cumulative percent reduction in the number of employees for the period analyzed.

In the same vein, an analysis of the regional labor productivity tells a story of results that doubled throughout the decade. Labor productivity, measured as the energy sold per employee increased gradually from 2,194 MWh sold per employee in 1995 with a peak of 4,060 MWh in 2005, totaling a 85.1 percent growth for the last decade.



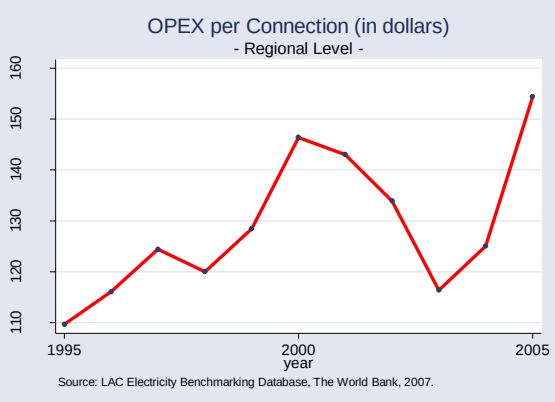


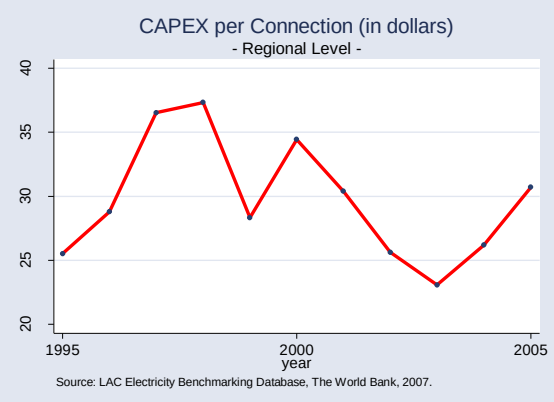
1.5 INPUT INDICATORS

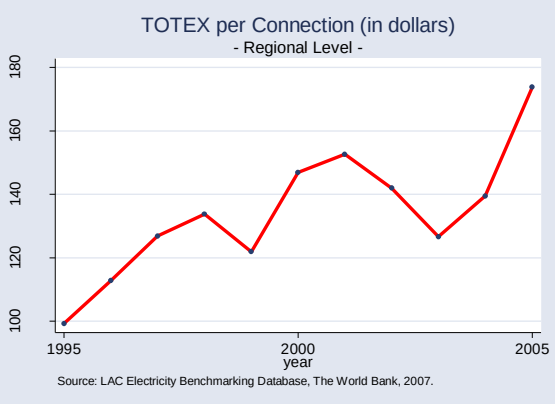
With respect to input indicators, the region has witnessed fluctuating values of expenditures with more prominent changes towards the end of the decade. Operation expenditures per connection have

increased 40.8 percent throughout the decade. Despite the irregular activity between 1995-2005 with unexpected changes in expenditures between 2000 and 2003, the regional average for OPEX was $128 with an average 3.5 percent increase per year. Similarly, results for the capital expenditures per connection were also characterized by sharp increases and decreases between 1999 and 2005. Throughout the decade, capital expenditures have increased by 20.3 percent with an average change of 1.9 percent per year. CAPEX per connection peaked in 1998, with a weighted average of $37.3 per connection, and reached its nadir in 2003, with just $23 spent per connection. It is believed that the drop in 1999 is due to the January 1999 Brazilian financial crisis, because this drop does not appear when CAPEX is measured in local nominal currency.

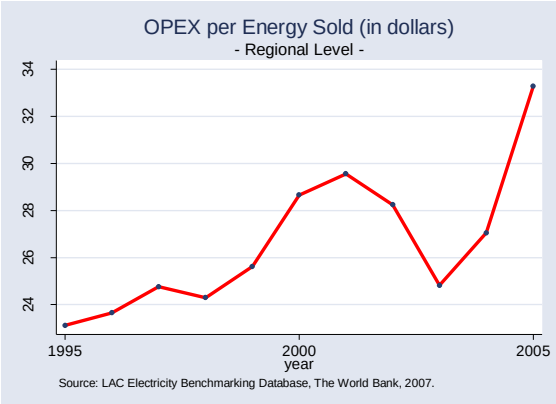
The results for TOTEX per connection express the overall direction of operational and capital expenditures for LCR in the last decade. Defined as the total operation and capital expenditures, TOTEX exhibits a steady increase with the exception of a drop between 1998-1999 and 2001-2003. By the end of 2005 total expenditures reached $173.7 per connection, from $ 99, a two-fold increase since 1995.

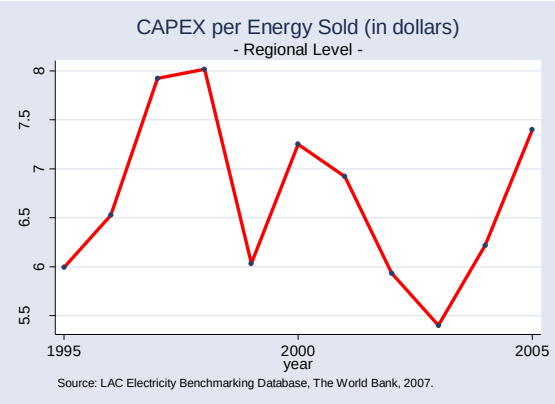


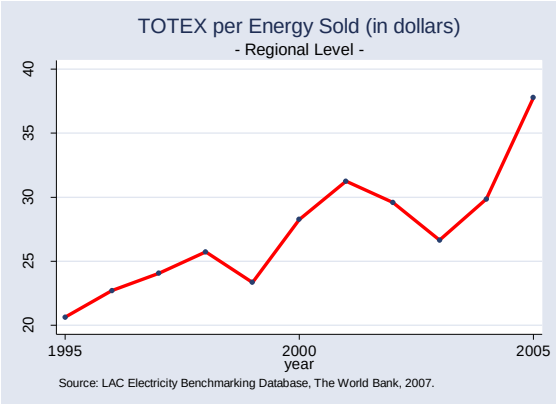




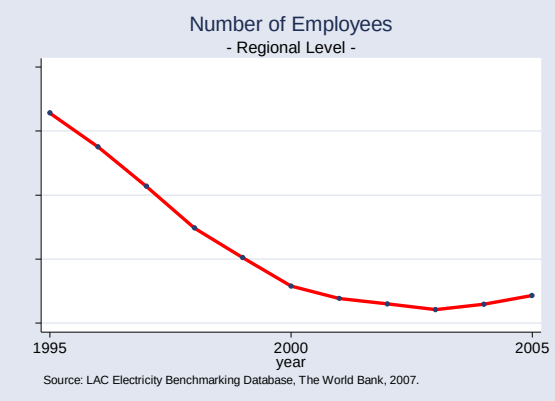
The results for OPEX and CAPEX per MWh energy sold show a similar tendency to that of OPEX and CAPEX per connection. OPEX per energy sold demonstrates a 44 percent increase throughout the last 10 years with an annual growth rate of 3.7 percent. With respect to the regional average of $26.6 per connection, OPEX reached $33.28 per connection by 2005. On the same note, CAPEX, which on average is a fourth of OPEX reached $7.39 per connection by 2005. With a regional average of $6.69 per connection, CAPEX experienced an average growth rate of 2.1 percent per year.







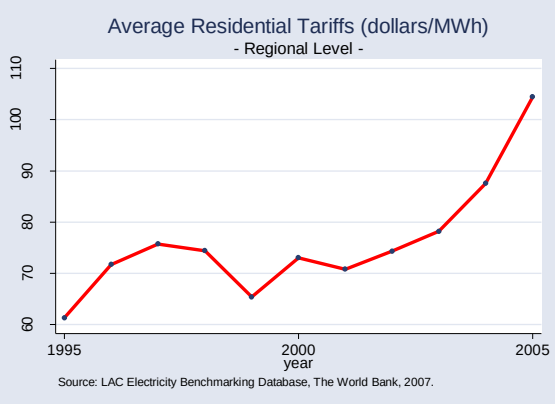
The decrease in the number of employees through the past ten years is inversely related to the rise in private participation. The 23.2 percent reduction in employees is visible in the trend between 1995 and 2000, when privatization reached its peak. For the last five years the database suggests that no significant changes in the regional level of the labor force have occurred, consistent with decreased private participation levels.

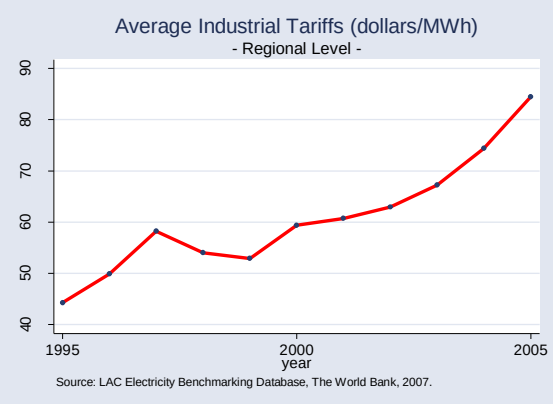


1.6 PRICES: AVERAGE RESIDENTIAL AND INDUSTRIAL TARIFFS

Average end-user tariffs for electricity (dollars/MWh) supplied to residential connections show an

overall increase with the exception of 1999, with a 12 percent decrease, mainly caused by the crisis in Brazil. By the end of 2005, the average residential tariff was $104 per MWh, a 70.3 percent accumulative increase over 1995's $61.33 average residential tariff. Following the same pattern, the average industrial tariff increased by 90.8 percent since 1995. While the weighted average in 1995 was $44.28, in 2005 the weighed industrial tariff reached $84.48. The figure shows a steady increasing trend with the exception of the period between 1997 and 1999 where there was a slight decrease in prices.



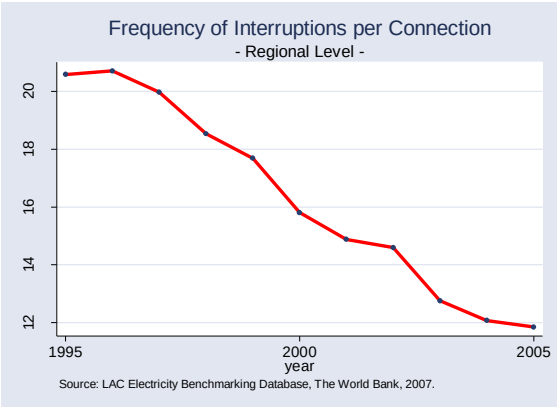


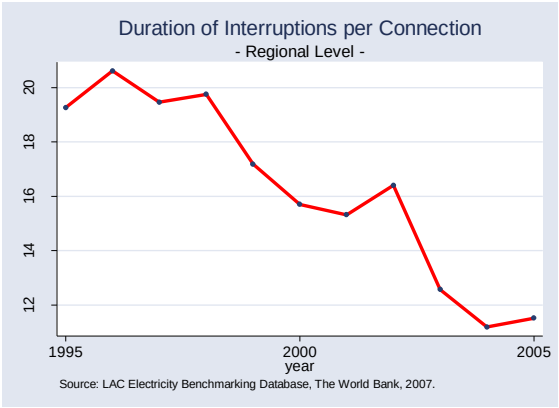
1.7 OPERATING PERFORMANCE

When assessing regional distribution losses, there is no apparent trend but rather sporadic increases and decreases throughout the 10 year period. The lowest distributional loss was observed in 2001, with a 0.9 percentage point decrease over 1995's 14.5 percent distributional loss. Since 2001, the region has experienced a one percentage point increase, resulting in a 14.7 percent distributional loss in 2005.

1.8 QUALITY OF SERVICE

A look at the quality of electricity distribution in Latin America and the Caribbean Region allows one to qualify the region as improving in the delivery of its services. In the last ten years, the frequency of interruptions in the region has decreased by almost half, with a 42.4 percent drop in the frequency of the interruptions and 40.2 percent decrease in the duration of the interruptions per connection per year.





When measuring the quality of service, there has been a steady decline in the number of interruptions per connection. While the average number of interruptions per connection was 20.5 times in 1995, this dropped to 11.8 times in 2005, a reduction of 5.4 percent per year, totaling a 42.4 percent reduction in ten years. A second indicator used to measure quality of the service is the average number of hours the customer did not have service. The last decade presents a generally downward trend with a 40.2 percent decrease in the duration time per connection. The indicator presents a remarkable increase in 2002 in the duration of interruptions. As explained in the next chapter, Brazil and Paraguay are the main contributors for the 1996 increase while the peak in 2002 is explained by the hurricanes that affected the quality of service in Mexico. These two indicators successfully encapsulate two root causes of interruptions: the reduction in the number of outages per connection shows managerial improvement, while the duration of the interruption serves as a proxy for natural events or disasters that affect service.

1.9 CONCLUSIONS

Electricity distribution is at the forefront of infrastructure improvement in LCR with 95 percent coverage and a ten percentage point increase by 2005. Since 1995, most countries in the region have made considerable progress in expanding access to electricity and improving the quality of their service. In the period covered in this report, private sector participation increased from 11 percent to 60 percent of electricity connections and labor productivity doubled since 1995. In addition, the results of this chapter exhibit improvements in the frequency and duration of interruptions per connection showing a 42.2 and 40.2 percent reduction accordingly. While there are no clear trends in operational expenditures, these values have grown between 40.8 and 44 percent in the last decade. Furthermore, there are no considerable changes in distributional losses and tariffs have grown steadily with a cumulative increase of 70.3 and 90.8 percent for residential and industrial users, respectively.

The following chapter continues to present the evolution of electricity distribution at the country-level and provides a comparative analysis amongst countries.

2. A COUNTRY-LEVEL ASSESSMENT OF ELECTRICITY DISTRIBUTION

The objective of this chapter is to present the best performing countries of electricity distribution in Latin America and the Caribbean region. For this, we present the simple average across countries as well as the weighted averages within countries for each indicator which allows for comparability across variables. In addition, the use of weighted averages delineates the leader country in the region as well as the dispersion of levels across time. The countries are ranked according to a set of indicators that show output, coverage, labor productivity, input, operating performance, service quality, and prices. Through a comparative analysis, the chapter establishes the top countries in electricity distribution with sensitivity to size and location. The 26 countries are classified according to the following four categories: countries with a population above 25 million, countries with a population below 25 million in South America, the countries of Central America, and the countries of the Caribbean. The countries with a high population, labeled Group 1, consist of Argentina, Brazil, Colombia, Mexico, Peru, and Venezuela. The countries with a lower population, marked Group 2, consist of Bolivia, Chile, Ecuador, Paraguay, and Uruguay. The countries of Central America are: Costa Rica, Belize, El Salvador, Guatemala, Honduras, Nicaragua, Panama, and the Dominican Republic[7]. Finally, the Caribbean countries that form part of this benchmarking study are: Antigua and Barbuda, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines.

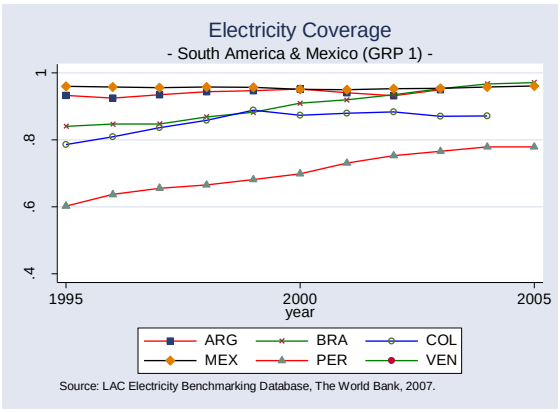
2.1 MAIN FINDINGS

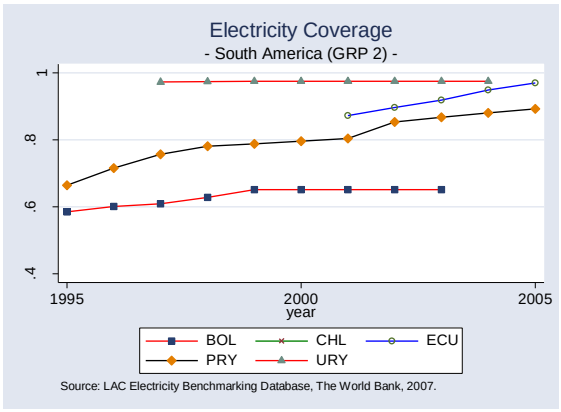
The following sections present the best electricity distribution performers in Latin America and how they rank in comparison to their fellow neighbors. According to the analyses, most countries demonstrate a significant overall improvement in the coverage and labor efficiency of electricity services during the last 10 years. Chile is amongst the strongest regional leader with 97 percent electricity coverage, labor productivity that is double the regional average, and the lowest distributional losses. In regards to the average residential tariff, Argentina and Peru serve their customers at the lowest rate of $38 and $43 per MWh per year respectively, while Paraguay provides industrial consumers the lowest regional tariff of $34. When assessing the quality of service by measuring the frequency and duration of interruptions, Mexico takes the lead with a low of 2 interruptions per consumer, while Ecuador has the lowest duration time averaging 2 hours per connection. When considering the countries exhibiting the greatest improvement trends, Peru is the regional forerunner with notable improvement trends in labor productivity and distributional losses. Finally, Paraguay is noted for the lowest operational expenditures followed closely by Honduras. While these assessment figures are only glimpses of the country-level performance of electricity distribution, the following sections are a more detailed account of the changes since 1995.

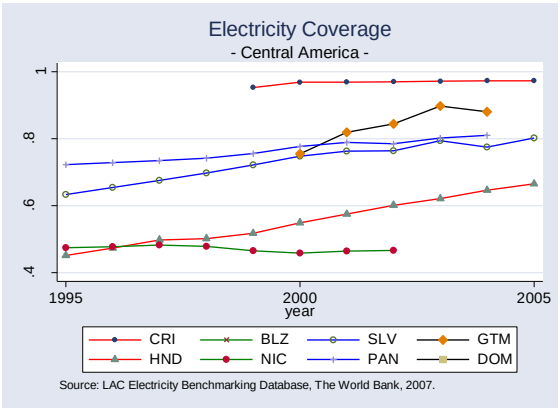
2.2 COVERAGE AND OUTPUT

[7] Note we decided to include Dominican Republic in this group given its size and comparability with the countries in this group.

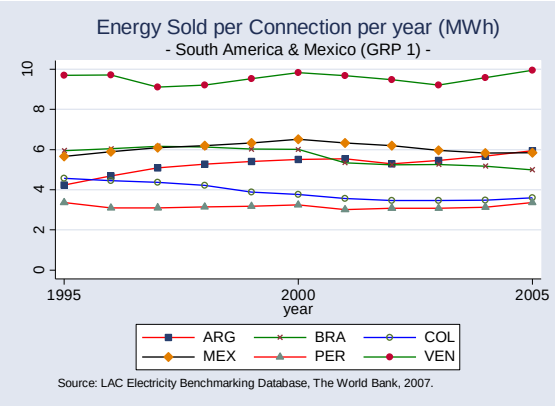
Electricity coverage for most of the countries in the region exhibits a steady increasing trend with the exception of Argentina, Mexico, Chile, Uruguay, Nicaragua, and Costa Rica which have remained at a constant level. All these countries except Nicaragua have attained at least 95 percent electricity coverage. The simple average across the countries in the database experienced a 16 percentage point increase in electrification and a 2 percent annual growth rate; placing it at a simple average of 80.1 percent coverage in 2005. In light of the regional average, the best performer is Uruguay with 97.5 percent coverage followed by Costa Rica, Brazil, Argentina, Chile, and Mexico with more than 95 percent coverage. The overall improvement in coverage is reflected in the growth rate of countries such as Peru, Paraguay, Honduras, and El Salvador demonstrating an average growth of 19.7 percentage points in the last 10 years. It is important to consider that cross country differences in the evolution of connections may be a result of initial coverage conditions and therefore the time trends are an equally important indicator of a country's coverage and efficiency.

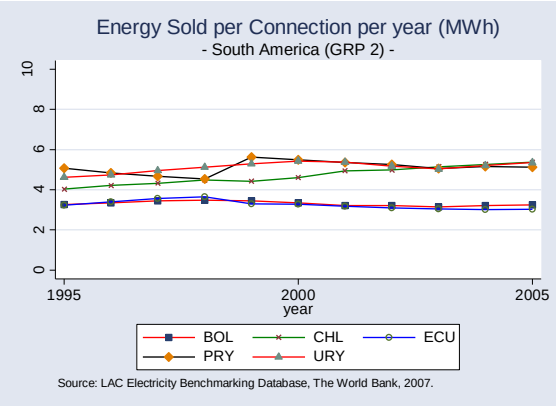


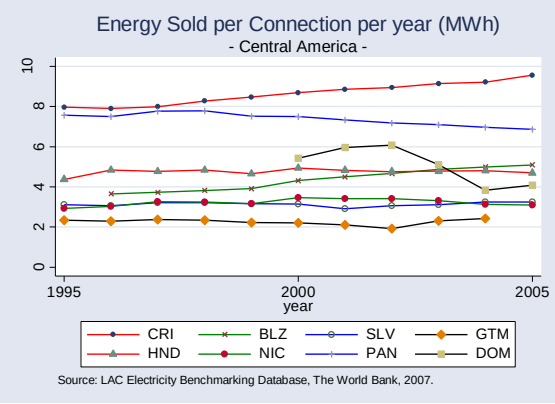


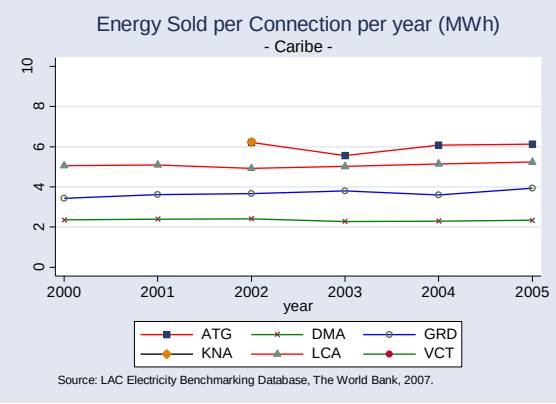


Parallel to the increase in electricity coverage, there is a slight increment of energy sold per connection. The greatest amount of energy sold per connection was in Venezuela with 9.95 MWh per year double the regional average of 4.9 MWh annually. The same high level of consumption characterizes Costa Rica with 9.6 MWh energy sold per connection in 2005, followed closely by Panama with 6.9 MWh. The rest of the region ranges between 2 and 6 MWh per year and even a 4:1 ratio as in the case of Guatemala and Venezuela. Possible reasons for the linear trend of consumption in the majority of the countries include: an overall decrease in the average consumption per household, increase in prices, and a reduction in distributional losses.



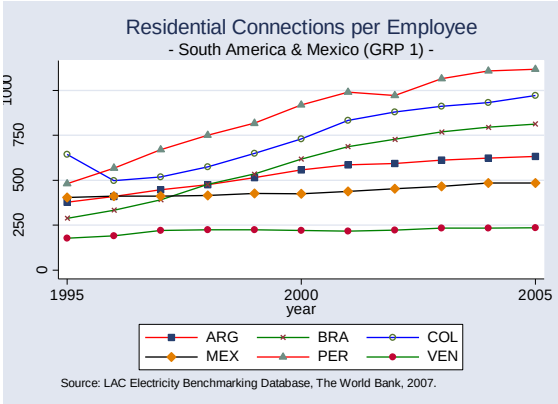


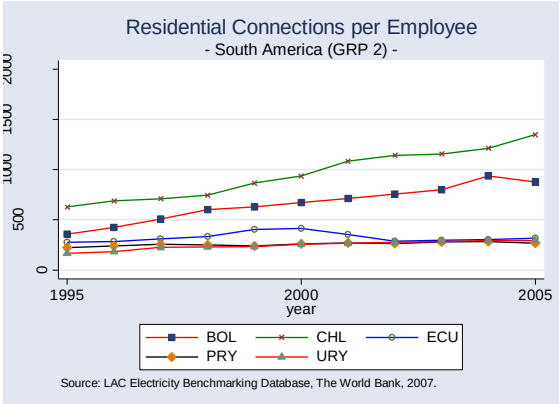


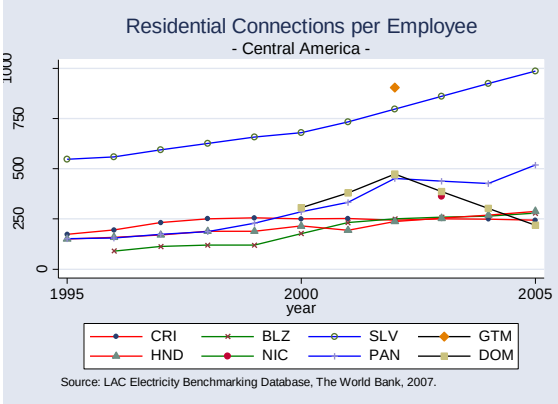


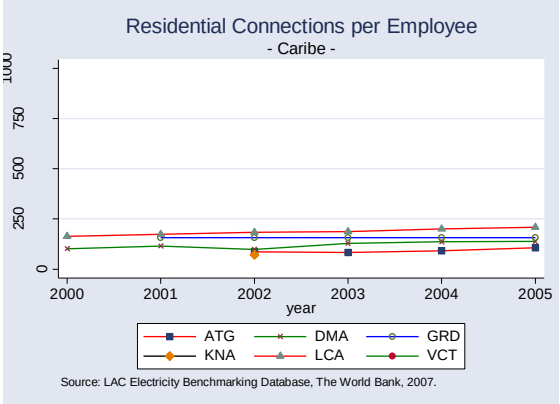
2.3 LABOR PRODUCTIVITY

Two variables are used to measure the labor productivity of distribution utilities: residential connections per employee and the energy sold (MWh) per employee. During the last decade, the region has experienced an impressive 46.2 percent increase in labor productivity in terms of residential connections per employee and a 55.7 percent accumulative growth in the energy sold per employee. The leading country in labor productivity defined as residential connections per employee is Chile with 1,349 connections per employee in 2005 followed closely by Peru with 1,118 and Colombia, El Salvador, and Bolivia yet performing only at about half of Chile's productivity level. Chile's labor productivity is over three times the regional simple average of 416 connections per employee while most South and Central American countries operate between 250 and 1000 residential connections per employee. There is also a significant amount of disparity between countries of the same size as in the case of South America and Mexico where Peru proves to be up to 5 times more productive than similar countries such as Venezuela. In addition, Chile has the highest rate of growth during the last decade with 720 additional connections, followed closely by Peru with 637 additional connections. When assessing the labor productivity of Central American countries, El Salvador leads with 987 connections per employee, almost double the labor productivity of the rest of the comparable countries. When analyzing these results, it is worth noting that the size of the utilities within each country contributes to the level of productivity. While explaining this factor is beyond the scope of this section, the following chapter will touch upon this aspect.



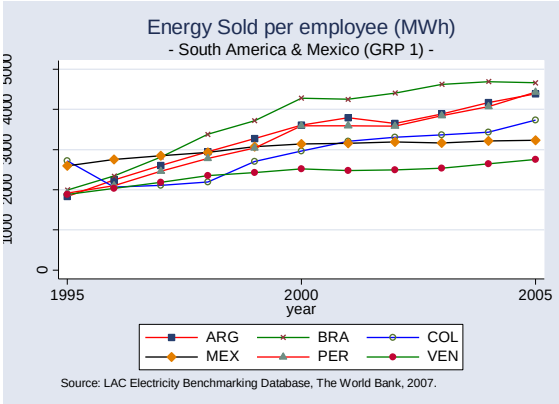


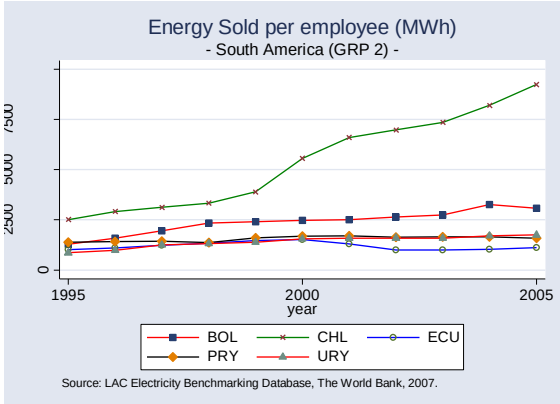


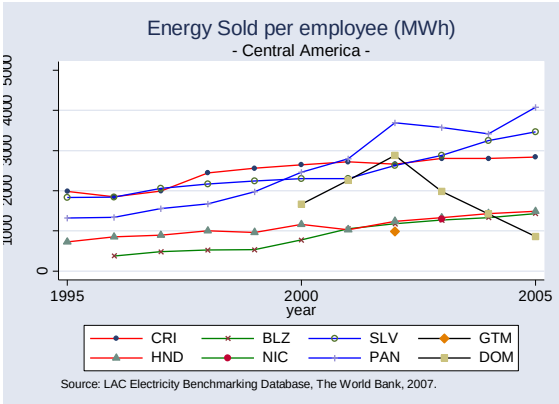


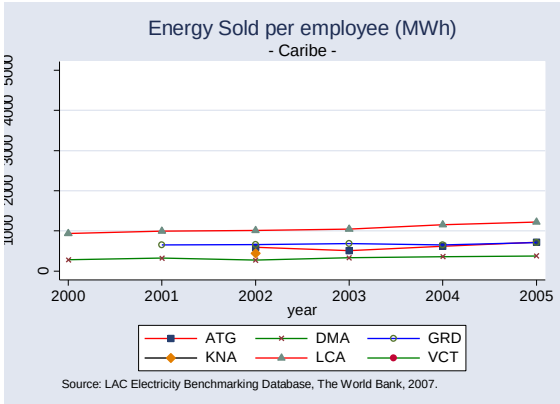
In the case of labor productivity defined as the energy sold per employee, the best performer is once again Chile with 9,248 MWh in 2005, which is more than 4 times the regional simple average of 2,196 MWh per employee. The rest of the countries in South America operate with half of the labor productivity of Chile ranging between 2,000 and 5,000 MWh of energy sold per employee. When considering the labor productivity of utilities in Central America and the Caribbean, Panama leads with 4,081 MWh per employee followed by El Salvador with 3,464 MWh. By 2005, the Caribbean countries range between 376 and 1,222 MWh per employee.

Similar to the trends for residential connections per employee, the results for the energy sold per employee indicate overall growth. It is worth noting however, that labor productivity represented by the residential connections and energy sold per employee is affected by factors such as increased private participation and population growth in the case of residential connections per employee, and distributional losses when assessing energy sold per employee.





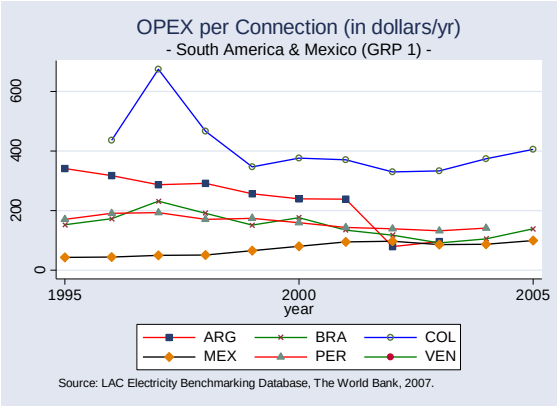


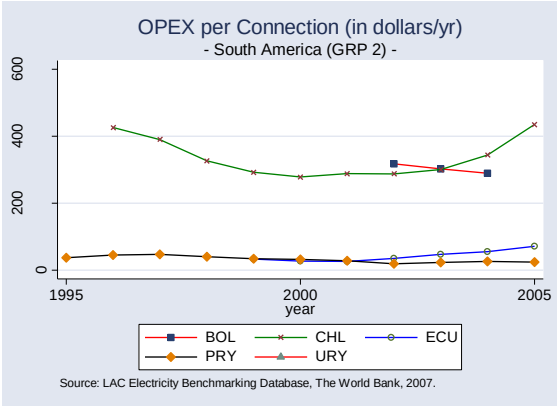


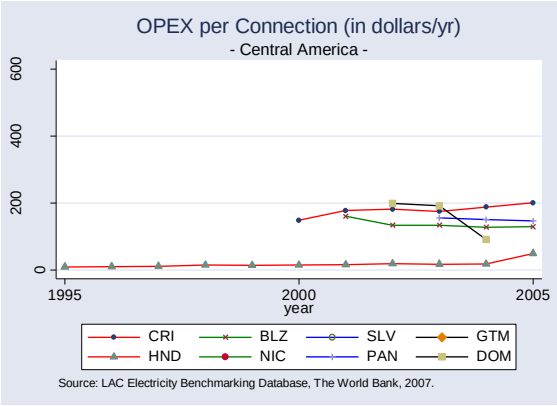
2.4 INPUT INDICATORS

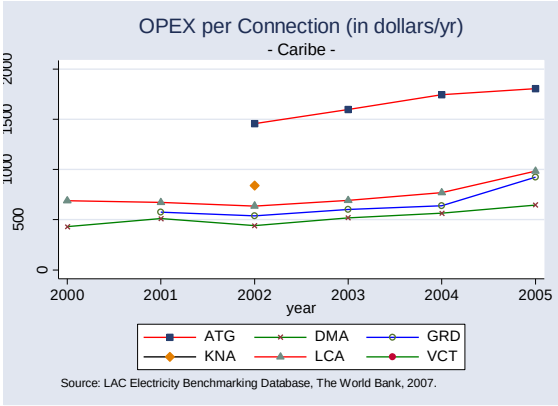
Measuring the input of electricity distribution at the country-level calls for close attention to the operation expenditures of utilities. According to the data collected the simple average across countries of operation expenditures (OPEX) is $275 per connection. During the last decade, the region showed inconsistent values of OPEX and several extreme increases and decreases. The countries with the lowest operational expenditure are Paraguay and Honduras with $49 and $24 respectively. The highest values of OPEX are found in the Caribbean countries which operate between $400 and $800 per connection with the exception of Antigua and Barbuda in 2004 averaging an unusual $1,805 per connection, more than 6 times greater than the simple average in the region. In contrast, the rest of the region performs at a lower level of OPEX per connection with the exception of Colombia with $406 per connection. Overall, the total average change in operation expenditures is a three-fold increase throughout the last 10 years.

Similar to operation expenditures, capital expenditures per connection do not display a consistent trend throughout the decade. With a regional average of $74 per connection, capital expenditures are a fourth of operation expenditures and have increased 3.5 times during the last decade. For more detailed information on capital and total expenditures per connection, refer to Annex 4.



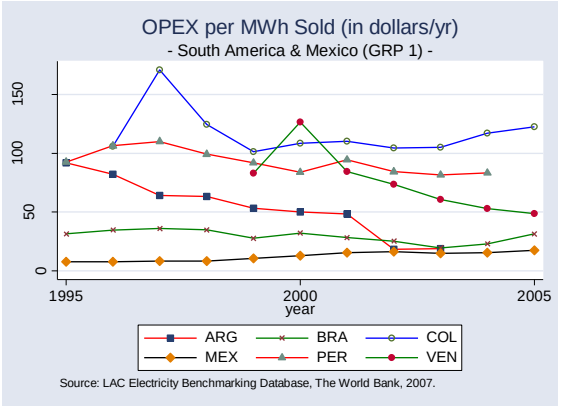


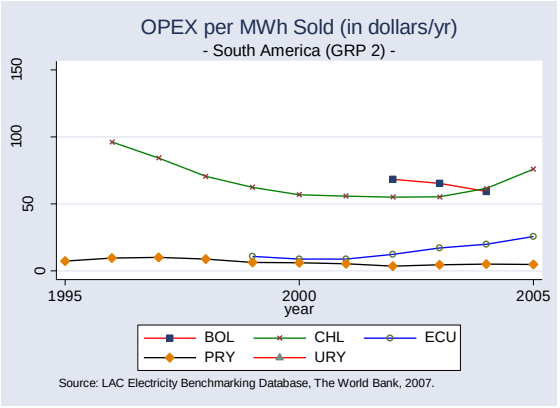


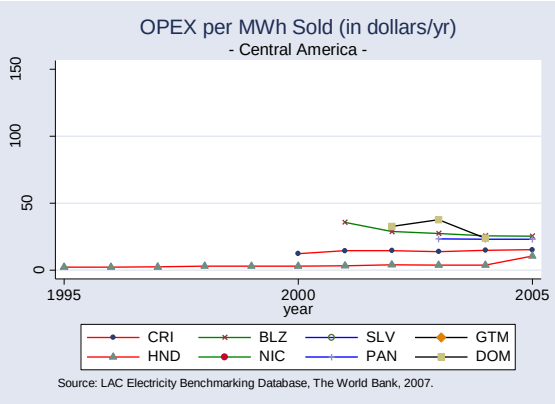


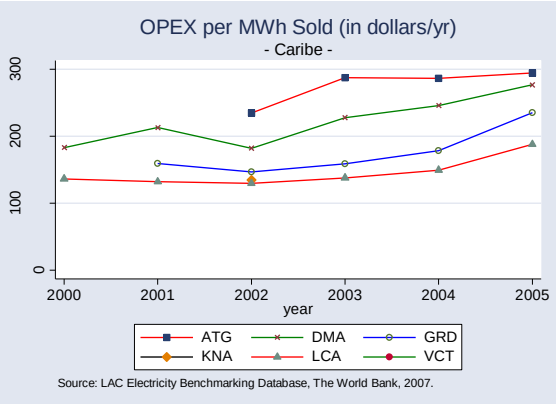
With respect to OPEX per MWh sold, the regional average is $65 per MWh sold. Similar to OPEX per connection, Honduras and Paraguay have the lowest operation expenditures per MWh sold. There is no apparent trend delineating the performance of the region with the exception of the Caribbean countries which exhibit growth. Comparable to OPEX per connection, the scale for the Caribbean countries is quite above the regional range with OPEX in Antigua and Barbuda as high as $294 in 2005. The rest of the region remains at a constant level.

The regional average for capital expenditures per MWh sold is $17.5, which is a third of the operation expenditures per MWh sold.



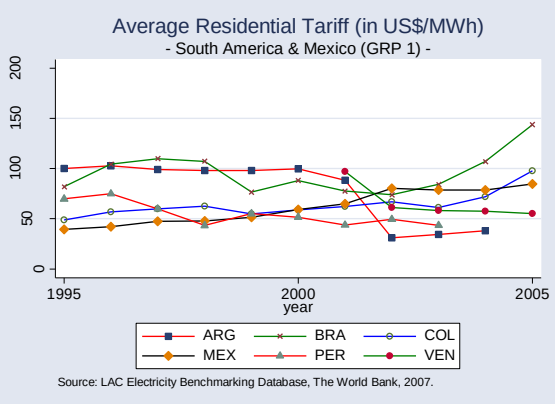


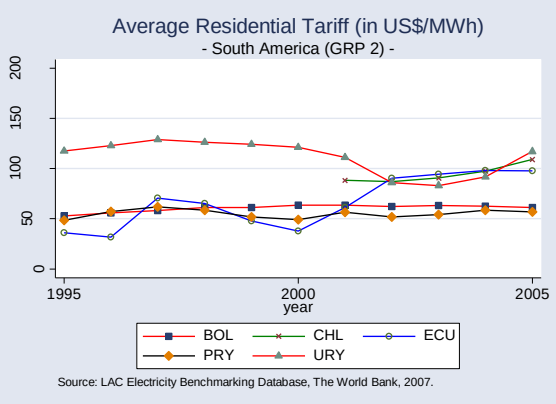


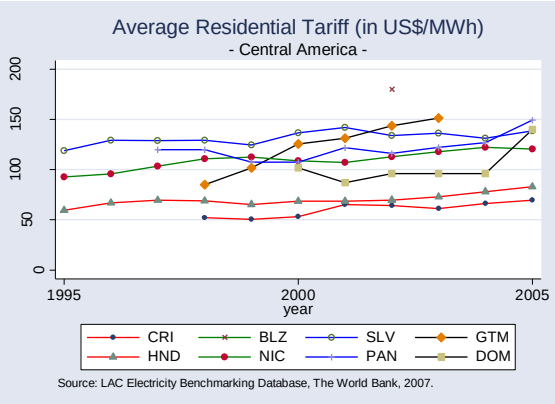


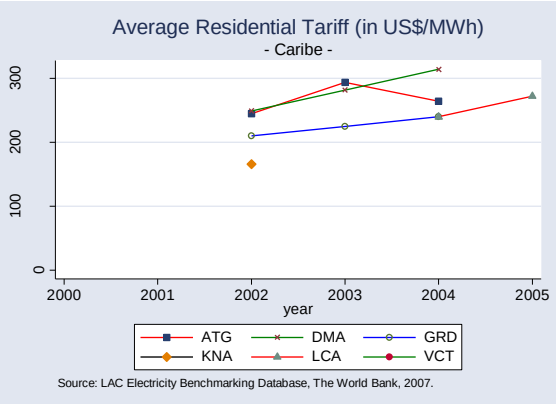
2.5 PRICES: AVERAGE RESIDENTIAL AND INDUSTRIAL TARIFFS

Amongst the most indicative features of distribution performance is the price at which it operates and serves its clientele. The analysis shows that tariffs throughout the region have slightly increased in some countries and slightly decreased in others but with no significant price growth pattern. The regional average residential tariff is $95 per MWh with most South American countries falling within the range of $50 and $150. Argentina serves its residential customers at the lowest average tariff of $38. On the contrary, the end-user price charged in most Central American and Caribbean countries is above the average price reaching as high as $151 in Guatemala and $314 in Dominica. When evaluating the evolution of the average residential tariffs in Argentina the economic crisis accounts for the sudden drop in tariffs in 2002 to one third of the levels (in dollars) in 2001.

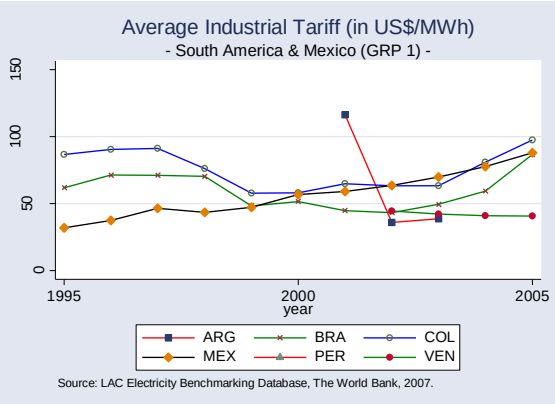


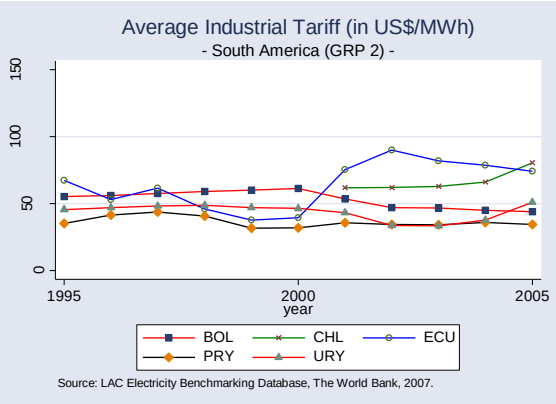


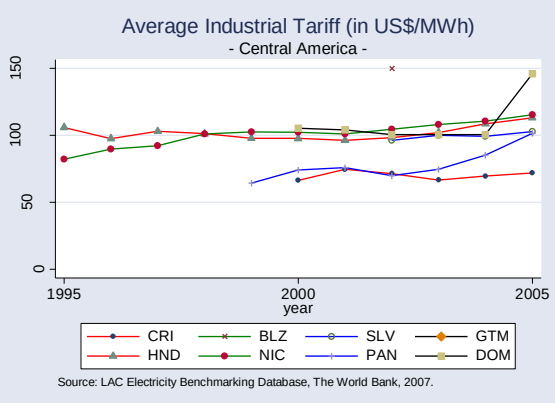


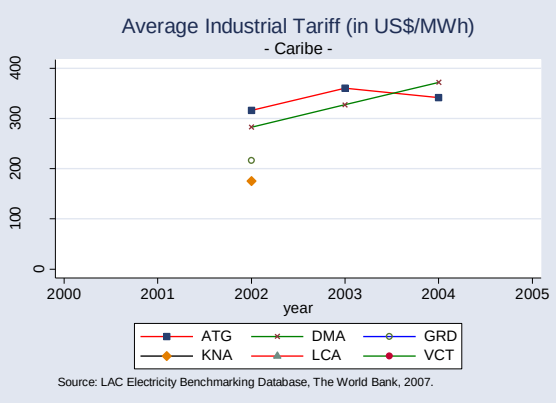


In regard to the average industrial tariffs, there is a similar tendency to that of residential tariffs. Most industrial tariffs in South America fall between $40 and $100, including Argentina despite the 2002 drop explained by the monetary devaluation during this period. Like the residential tariffs, Central America and the Caribbean are above the regional average tariff of $81. By the end of 2005, Dominica had the highest industrial tariff of $372 while Paraguay maintained the lowest tariff of $34. It is worth noting that the overall average residential tariffs are 14 percent higher than the average industrial tariffs and have increased by 24.7 percent.





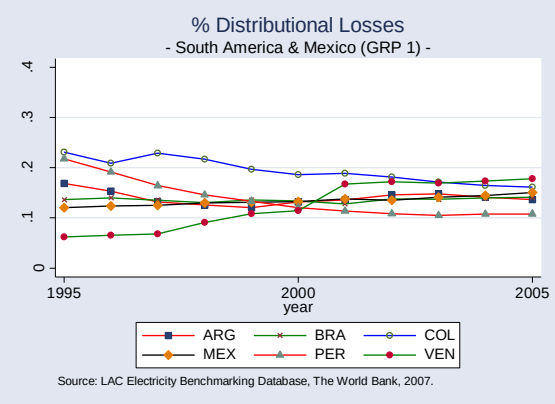


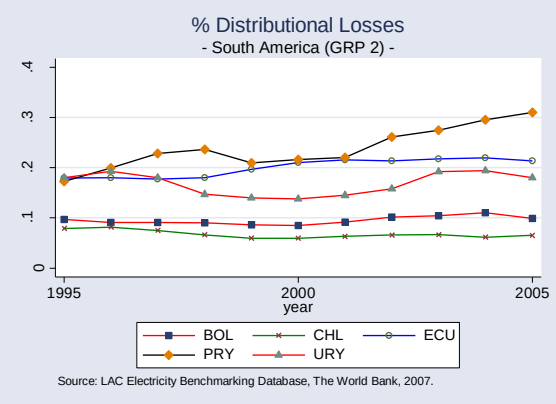


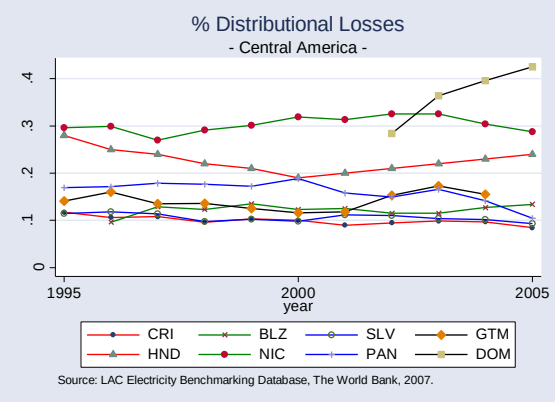
2.6 OPERATING PERFORMANCE

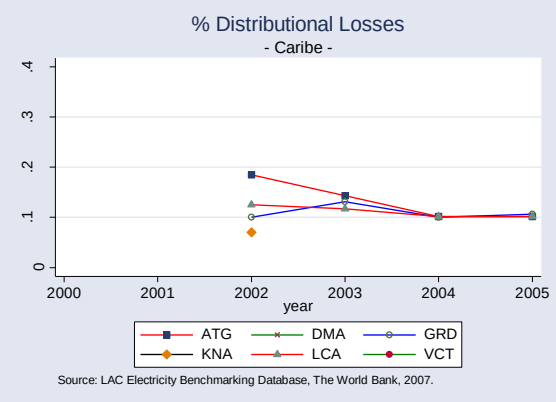
Throughout the last decade, distributional losses have either slightly increased or decreased but for

the most part have remained close to the simple average across countries of 15.7 percent. According to the following figures, the country with the lowest amount of distributional losses was Chile with 6.5 percent by 2005. The country with the largest reduction in losses was Peru with an 11 percentage point drop during the last decade, followed by Colombia with a 6.9 percentage point drop. While more countries experienced a reduction in distributional losses, there were several that encountered significant increases. These include Venezuela, Paraguay, and the Dominican Republic.



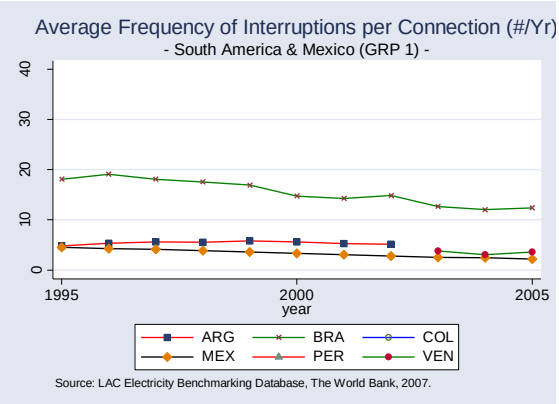


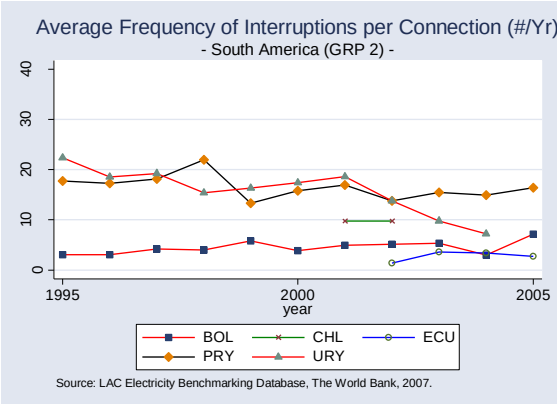


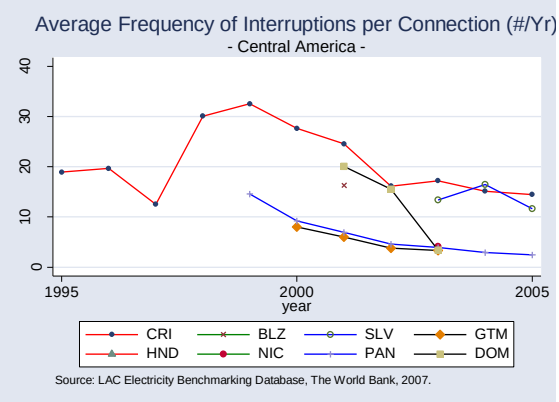


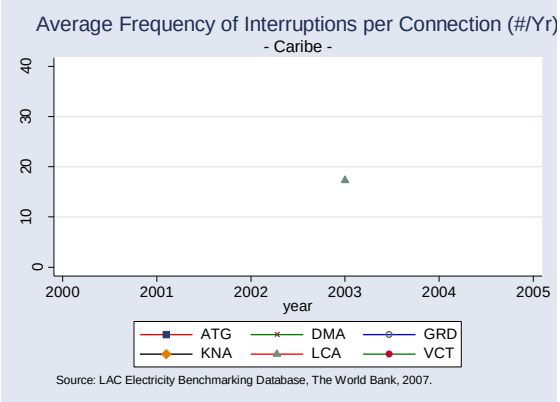
2.7 QUALITY OF SERVICE

The quality of electricity distribution is measured by the average frequency and duration of interruptions per connection. While the following graphs indicate a slight reduction in the average frequency of interruptions per connection, there is no consistent trend for most countries but rather fragmentary results. The regional simple average for the frequency of interruptions per connection is 19.8 per year and Mexico leads the region with the lowest frequency level of 2.19 in 2005 followed by Panama and Ecuador with 2.4 and 2.7 respectively. Paraguay has experienced the greatest quality deterioration with the highest frequency of interruptions, namely 16.4 in 2005. On the contrary, Costa Rica shows the greatest improvement with a 56 percent reduction from 1999-2005.

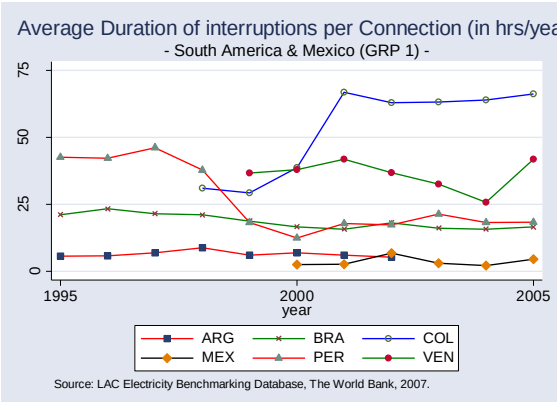


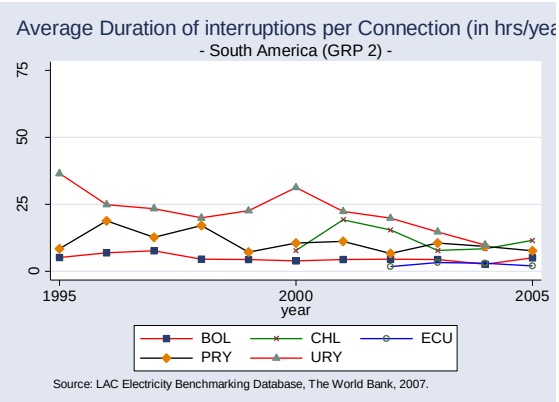


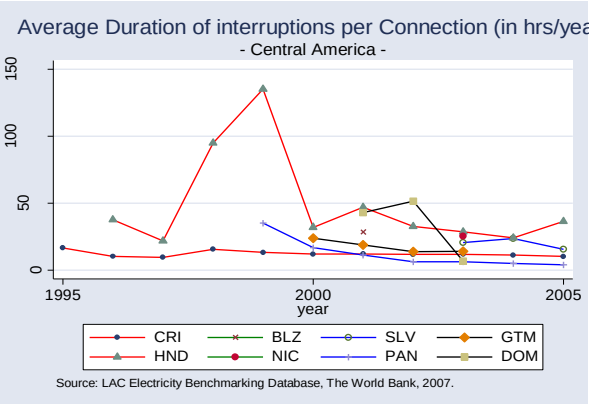




In comparison to the average frequency of interruptions, the results for the average duration of interruptions are even more erratic. The average duration of interruptions per connection was calculated in terms of hours that service was discontinued per connection per year, and the simple average across the region for the period covered in this report was 21 hours per consumer per year. The country with the least time of interruption is Ecuador with 2 hour durations. The country with the highest duration of interruptions by the end of 2005 was Venezuela with 42 hours per connection.







2.8 CONCLUSIONS

The main results of this chapter exhibit overall improvements across the region during the last decade with various best performers for each indicator provided. In light of the simple averages across countries presented in this chapter, there are several countries that stand out as best performers. When assessing labor productivity, Chile takes the lead with 1,349 connections per employee, 3 times above the regional average. Venezuela is the country with the most energy sold per connection averaging 10 MWh per year, almost double the regional average. In regards to losses, Chile had the lowest level of distributional losses averaging 6.5 percent by the end of 2005. However, Peru was most successful in reducing distributional losses by 11 percentage points during the last ten years. Furthermore, Mexico came out on top for the best quality of service with a frequency of 2 interruptions per year while Ecuador sets the standard for the lowest duration of interruptions. Finally, Argentina and Paraguay provide their residential and industrial customers with the lowest tariffs in the region. While this analysis is only a part of the electrification story in Latin America, we conclude that there have been uneven, but significant improvements in the past ten years in most of the countries.

3. A UTILITY-LEVEL ASSESSMENT OF ELECTRICITY DISTRIBUTION

The objective of this chapter is to benchmark the performance of 250 electricity distribution utilities in the LCR. We rank them according to the top ten percent, bottom ten percent, and the simple average of the rest of the 80 percent performers. The utilities are evaluated based on their achievements in coverage, labor productivity, output, input, operating performance, service quality, and prices. Best performing utilities are listed in the top or bottom ten percent depending on the variable at hand. While the best performer for electricity coverage is listed in the top ten percent, the best performer for distribution losses would form part of the bottom ten percent. In addition, it is worth noting that for certain indicators such as operation and capital expenditures, ranking in the top or bottom ten percent is not necessarily a benchmark of good performance.

3.1 MAIN FINDINGS

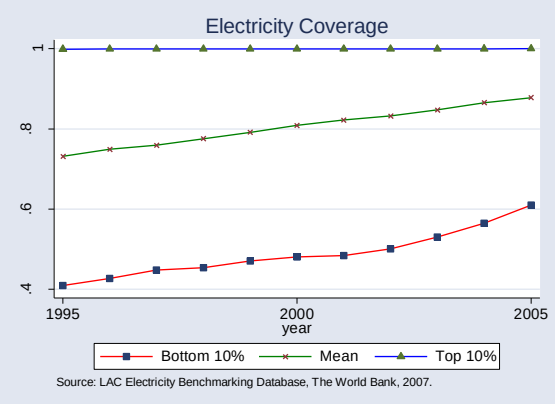
The best performing electricity distribution utilities are ranked either in the top ten or bottom percent depending on the indicator being benchmarked. The best performers in our database are characterized by 100 percent electrification, an average of 871.6 residential connections and 5,127.7 MWh of energy sold per employee, 6.4 percent distributional losses, and residential prices in the range of $51 per MWh, amongst other indicators. Although there are some variations within and between countries, in general, several companies in Brazil lead with best performance in terms of labor productivity, distributional losses, OPEX, and coverage. In addition, Costa Rica sets the standard for good performance in coverage, OPEX, and tariffs. Finally, several utilities in Chile produced leaders for the indicators measuring labor productivity and technical efficiency.

Compania Eléctrica del Rio Maipo of Chile and *Manaus Energía S.A.* of Brazil led the region with more than 3 times the labor productivity of the average utility in the middle eighty percent. With regards to operation expenditures per connection *Compañía Nacional de Fuerza y Luz* and *Junta Administradora de Servicios Eléctricos de Cartago* of Costa Rica incur the least expenses and operate at 2 percent of the costs of the utilities in the top ten percent. When assessing the best utility performer for the lowest capital expenditures per connection, *Electro Sur S.A.* of Peru has averaged $3.01 per connection for the last 10 years. Furthermore, *C.A. Electricidad de Valencia* provides its residential customers with the lowest tariffs, 4 times less than the utilities in the top ten percent. Finally, *Compañía Força e Luz do Oeste and Empresa Força e Luz de Urussanga Ltda* of Brazil stand out for the least distributional losses. *Empresa Eléctrica Esmeraldas S.A.* of Ecuador provides its customers the best quality of service in the region with 0.96 when measuring the frequency of interruptions while *Empresas Públicas de Medellín E.S.P.* lead with the lowest average duration of 0.54 hours per connection.

The following sections serve as a guide for assessing the best utility performers in the LCR and demonstrating the improvements from 1995-2005.

3.2 COVERAGE AND OUTPUT

The best performers when measuring electricity coverage form the top ten percent with 100 percent electrification. Several utilities in Brazil, Chile, Colombia, and Costa Rica lead the region with the highest percentage electrification. Most of the utilities in the top ten percent are on average 19 percentage points above the 80.5 percent mean of the middle group and double the coverage of the bottom ten percent with 48.9 percent electrification. Throughout the last 10 years, there has been an overall 11.6 percentage point increase in electrification with considerable improvement amongst the bottom ten percent increasing 20.1 percentage points from their initial coverage of 40.9 percent electrification in 1995. Concurrently, the utilities in the middle group have risen from 73.1 percent coverage to 87.8 percent during the last decade.



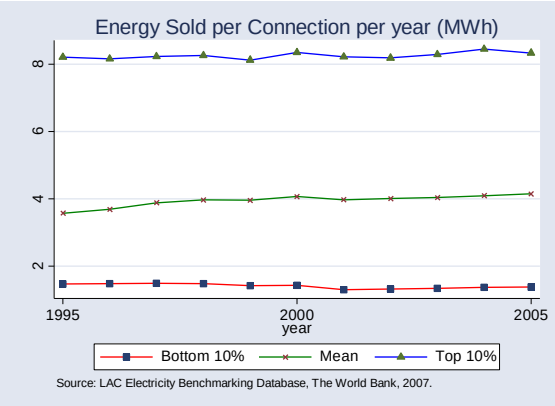
Coverage

Year	Bottom 10%	Mean	Top 10%	Total
1995	0.409	0.731	0.999	0.713
1996	0.427	0.749	0.999	0.725
1997	0.448	0.759	0.999	0.735
1998	0.454	0.776	0.999	0.743
1999	0.471	0.792	0.999	0.754
2000	0.481	0.809	0.999	0.763
2001	0.484	0.822	0.999	0.768
2002	0.501	0.832	0.999	0.777
2003	0.530	0.847	1.000	0.792
2004	0.564	0.865	1.000	0.810
2005	0.610	0.878	1.000	0.829
Total	0.489	0.805	0.999	0.765

COVERAGE

Country	Name	Mean 95-05
Brazil	Espírito Santo Centrais Elétricas S/A.	1.000
Brazil	Companhia Energética de Minas Gerais	0.994
Brazil	Companhia Energética de Brasília	0.999
Brazil	Empresa Elétrica Bragantina S.A.	1.000
Brazil	CNEE - Companhia Nacional de Energia Elétrica	1.000
Brazil	Companhia Paulista de Força e Luz - Piratininga	0.998
Brazil	Departamento Municipal de Energia de Ijuí	1.000
Brazil	Centrais Elétricas de Carazinho S/A.	1.000
Chile	Empresa Eléctrica de Magallanes S.A.	0.994
Colombia	Empresas Públicas De Medellín E.S.P.	1.000
Colombia	Electrificadora del Huila S.A. ESP	0.994
Costa Rica	Instituto Costarricense de Electricidad	1.000
Costa Rica	Compañia Nacional de Fuerza y Luz	1.000
		0.998

With respect to the amount of energy sold (MWh) per connection there are significant variations across the groups. While the utilities in the top decile reported an average of 8.25 MWh per connection per year, those in the bottom percent only sold 1.41 MWh per connection. There are no remarkable changes across time within groups though the middle group underwent a 20 percent increase in the energy sold per connection between 1995 and 2000. Despite this increase, the values remained fairly constant. Low selling utilities were not concentrated in one country, but rather dispersed throughout the region.



Energy Sold per Connection (MWh)

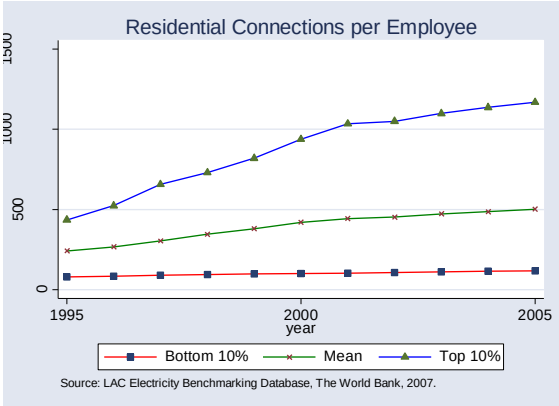
Year	Bottom 10%	Mean	Top 10%	Total
1995	1.48	3.57	8.21	4.42
1996	1.48	3.69	8.16	4.44
1997	1.50	3.88	8.23	4.53
1998	1.48	3.97	8.26	4.57
1999	1.42	3.96	8.12	4.50
2000	1.43	4.07	8.35	4.61
2001	1.30	3.98	8.22	4.50
2002	1.32	4.01	8.19	4.50
2003	1.34	4.04	8.29	4.56
2004	1.37	4.09	8.45	4.64
2005	1.38	4.15	8.33	4.62
Total	1.41	3.95	8.25	4.54

Energy Sold per Connection (MWh)

Country	Name	Mean 95-05
Bolivia	Servicios Eléctricos Tarija S.A.	1.74
Brazil	Companhia Força e Luz Cataguazes - Leopoldina	0.29
Chile	Empresa Eléctrica de Casablanca S.A.	1.78
Chile	Empresa Eléctrica de la Frontera S.A.	1.73
Chile	Compañía Eléctrica del Litoral S.A.	1.28
Colombia	Centrales Eléctricas del Cauca S.A. ESP	1.80
Colombia	Empresa de Energía de Putumayo S.A. ESP	1.46
Colombia	Centrales Eléctricas de Nariño S.A. ESP	1.80
Ecuador	Empresa Eléctrica Riobamba S.A.	1.36
Ecuador	Empresa Eléctrica Regional Sur S.A.	1.34
Ecuador	Empresa Eléctrica Ambato S.A.	1.75
Ecuador	Empresa Eléctrica Azogues S.A.	1.54
Ecuador	Empresa Eléctrica Bolivar S.A.	0.94
Guatemala	Distribuidora de Electricidad de Occidente	1.03
Guatemala	Distribuidora de Electricidad de Oriente	1.47
Peru	Electro Centro S.A.	1.51
Peru	Electro Norte S.A.	1.48
Peru	Electro Oriente S.A	1.76
Peru	Electro Puno S.A.A.	0.69
Peru	Electro Sur Este SA	0.96
Peru	Proyecto Especial Chavimochic	1.80
El Salvador	Distribuidora Eléctrica de Usulatan S.A.	1.70
		1.42

3.3 LABOR PRODUCTIVITY

The utilities that form the top ten percent in labor productivity had an average of 871.6 residential connections per employee which is approximately nine times the productivity of the utilities included in the bottom ten percent. Unlike coverage, labor productivity tripled between 1995 and 2005 for the top ten percent utilities, while there was little improvement for the bottom ten percent. Nevertheless, the labor productivity of the utilities in the top ten percent improved at an annual growth rate of 10.3 percent in contrast to the 4 percent annual improvement of the utilities in the bottom ten percent; there was a cumulative improvement of 48.1 percent in the lower performing decile.



Residential Connections per Employee

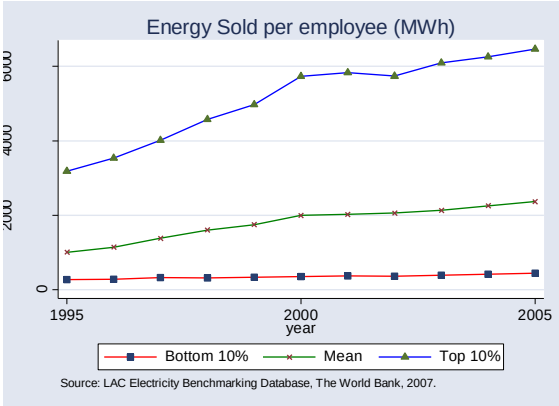
Year	Bottom 10%	Mean	Top 10%	Total
1995	79.1	241.5	435.1	251.9
1996	82.9	267.0	523.5	291.1
1997	89.9	304.1	656.7	350.2
1998	95.1	345.4	729.5	390.0
1999	98.9	380.3	819.5	432.9
2000	99.6	419.8	937.9	485.8
2001	102.6	442.9	1033.5	526.3
2002	106.5	452.6	1049.8	536.3
2003	110.0	472.2	1098.4	560.2
2004	114.5	486.5	1136.3	579.1
2005	117.1	502.0	1167.8	595.6
Total	99.6	392.2	871.6	454.5

Compañia Eléctrica del Rio Maipo in Chile with an average 1,327 connections per employee is the pioneer for the highest labor productivity throughout the last 10 years. *Empresa Eléctrica de Colina S.A.*. follows with 1,111.5 residential connections per employee.

Residential Connections per Employee

Country	Name	Mean 95-05
Argentina	Empresa Distribuidora San Luis S.A.	853.3
Argentina	Empresas Distribuidora de Electricidad de Salta S.A.	998.5
Bolivia	Electricidad De La Paz S.A.	920.1
Brazil	AES SUL Distribuidora Gaúcha de Energia S/A	893.1
Brazil	Companhia de Eletricidade do Rio de Janeiro	864.3
Brazil	Companhia Energética do Rio Grande do Norte	832.5
Brazil	Companhia Energética do Ceará	882.2
Brazil	Companhia Paulista de Força e Luz - Piratininga	971.3
Chile	Compañía General de Electricidad S.A.	863.4
Chile	Compañía Eléctrica Osorno S.A.	909.6
Chile	Empresa Eléctrica de Colina S.A.	1111.5
Chile	Compañía Eléctrica del Litoral S.A.	989.5
Chile	Compañía Eléctrica Puente Alto Ltda.	831.6
Chile	Compañía Eléctrica del Rio Maipo S.A.	1327.4
Guatemala	Distribuidora de Electricidad de Occidente	1041.9
Peru	EdelNor	1054.9
Peru	Luz del Sur	910.2
Peru	EdelNor - Zonal Chancay	973.1
Peru	Empresa de Distribuición Eléctrica Canete S.A.	915.2
El Salvador	Distribuidora Eléctrica de Usulatan, S.A.	1020.6

The average energy sold by the utilities in the top ten percent is 5,127.7 MWh per employee, more than twice as much as the middle 80 percent, which sold an average of 1,790.8 MWh per employee. Similar to the time trend for labor productivity of residential connections per employee, the utilities in the top ten percent have doubled their productivity with an annual growth rate of 7.3 percent. In contrast, the utilities in the bottom ten percent have only slightly increased their productivity from 1995-2005 with an average of 5 percent per year. On average, the utilities in the top ten percent have been 14.6 times more productive than those in the bottom ten percent. It is noteworthy that most of the improvements for this indicator occurred in the first half of the decade.



Energy Sold per Employee (MWh)

Year	Bottom 10%	Mean	Top 10%	Total
1995	271.4	1003.8	3184.2	1486.5
1996	278.2	1142.8	3536.6	1652.5
1997	326.7	1382.1	4013.7	1907.5
1998	319.4	1602.0	4576.5	2166.0
1999	336.9	1746.6	4974.8	2352.8
2000	349.5	1995.8	5730.2	2691.8
2001	366.9	2020.7	5830.6	2739.4
2002	363.5	2057.5	5739.1	2720.0
2003	389.6	2130.1	6092.7	2870.8
2004	411.2	2252.0	6260.6	2974.6
2005	443.6	2365.3	6465.6	3091.5
Total	350.6	1790.8	5127.7	2423.0

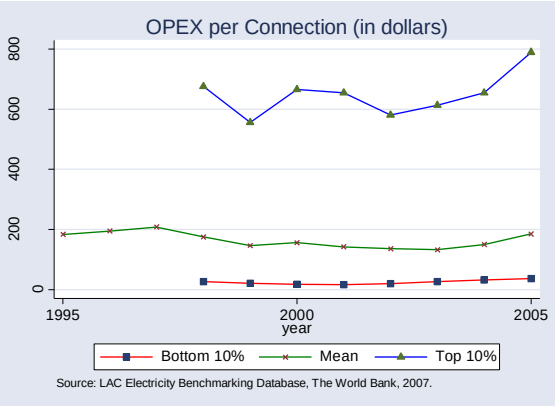
In terms of the average energy sold per employee during the last decade, *Manaus Energia S.A.* of Brazil ranks first with 6,402 MWh sold per employee followed by *Codensa S.A. ESP* from Colombia with 5,648 MWh sold.

Energy Sold per Employee (MWh)

Country	Name	Mean 95-05
Argentina	Empresa Distribuidora y Comercializadora Norte S.A.	4934.5
Argentina	Empresa Distribuidora Sur S.A.	4667.0
Argentina	Empresa Distribuidora San Luis S.A.	4907.7
Argentina	Empresa Distribuidora de Electricidad de la Roja S.A.	4842.3
Brazil	Rio Grande Energia S/A	5158.1
Brazil	Companhia Paulista de Força e Luz	5027.9
Brazil	Eletropaulo Metropolitana – Eletricidade de São Paulo S/A	5094.3
Brazil	Bandeirante Energia S/A.	5457.9
Brazil	Manaus Energia S/A	6402.3
Brazil	Companhia Jaguari de Energia	5273.7
Brazil	Companhia Paulista de Força e Luz - Piratininga	4487.2
Chile	Chilectra S.A.	4739.1
Chile	Cooperativa Eléctrica Osorno	5511.6
Chile	Compañía Eléctrica del Rio Maipo S.A.	5286.4
Colombia	Codensa S.A. ESP	5648.0
Colombia	Empresas Municipales De Cali Eice	4472.5
Peru	EdelNor	5410.0
Peru	Luz del Sur	5293.2
Venezuela	Energía Eléctrica de la Costa Oriental	4795.5

3.4 INPUT INDICATORS

As presented in the previous chapters, OPEX represents the amount of expenditure for operating and maintaining service. The following figure presents the evolution of OPEX (in dollars) per connection. The top ten percent utilities incurred higher operating expenses averaging $648.78 per connection per year, almost four times higher than the utilities in the middle group, and more than 26 times the average of the utilities in the bottom ten percent. The utilities in the bottom ten percent operate at an average $24.75 per connection which is 6 times less than the simple average of the utilities in the mean group, averaging $164.65 per connection. The top ten percent group had an annual increase of 2.2 percent in the last seven years of the sample, half of the 4.8 percent increase of the bottom ten percent.



Opex per Connection

Year	Bottom 10%	Mean	Top 10%	Total
1995	n.a.	183.57	n.a.	183.57
1996	n.a.	194.64	n.a.	194.64
1997	n.a.	208.50	n.a.	208.50
1998	26.82	175.17	675.61	292.53
1999	20.71	146.46	556.02	241.06
2000	17.24	156.12	666.04	279.80
2001	16.57	142.23	654.71	271.17
2002	20.39	135.90	580.27	245.52
2003	27.02	132.98	613.41	257.81
2004	31.94	150.08	654.80	278.94
2005	37.33	185.45	789.39	337.39
Total	24.75	164.65	648.78	266.64

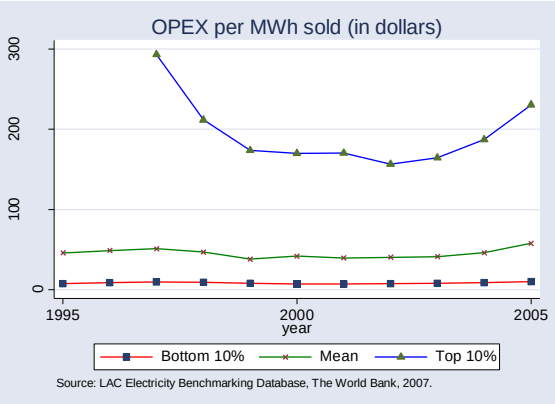
Compañia Nacional de Fuerza y Luz and *Junta Administradora de Servicios Eléctricos de Cartago* of Costa Rica have the lowest OPEX at $12.98 per connection and $14.71 per connection respectively. *Compañia Nacional de Fuerza y Luz* spends a third of what *Empresa Luz e Força Santa Maria S.A.* does on electricity connections. While *Empresa Luz e Força Santa Maria S.A.* of Brazil is amongst the utilities with low OPEX, it has the highest operation expenditures in this group.

OPEX per Connection

Country	Name	Mean 95-05
Brazil	Companhia de Eletricidade do Rio de Janeiro	31.29
Brazil	Companhia Energética de Alagoas	22.82
Brazil	Empresa Luz e Força Santa Maria S/A	47.25
Costa Rica	Compañia Nacional de Fuerza y Luz	12.98
Costa Rica	Junta Administradora de Servicios Eléctricos de Cartago	14.71
Ecuador	Empresa Eléctrica Milagro S.A.	30.36
Ecuador	Empresa Eléctrica Norte S.A.	28.82
Ecuador	Empresa Eléctrica Riobamba S.A.	26.46
Ecuador	Empresa Eléctrica Regional Sur S.A.	28.70
Ecuador	Empresa Eléctrica Ambato S.A.	24.92
Ecuador	Empresa Eléctrica Bolívar S.A.	25.45
Ecuador	Empresa Eléctrica Centro Sur S.A.	31.14
Ecuador	Empresa Eléctrica Cotopaxi S.A.	31.08
Ecuador	Empresa Eléctrica El Oro S.A.	31.47
Honduras	Empresa Nacional de Energía Eléctrica	20.15
Paraguay	Compañia Luz y Fuerza S.A.	15.05

The utilities in the bottom ten percent perform at a sixth of the total regional mean of $164.65 and at four percent of the operational expenditures of utilities found in the top ten percent. The disparity between the top ten percent and the bottom ten percent is notable as in the case of *Compania Luz y Fuerza S.A. (CLYFSA)* of Paraguay incurring 2.5 percent of the expenditures of the utilities in the top ten percent.

However, unlike operation expenditures per connection, the operation expenditures per MWh energy sold of the utilities in the top ten percent witnessed a significant change especially between 1997 and 2000 with a total 123.2 unit reduction. Meanwhile, the utilities in the middle 80 percent reported a 12.11 unit reduction while those in the bottom decile were able to decrease OPEX per MWh by 2.32 MWh in the same three years. Beginning in 1997, the total annual reduction for the top decile was 3 percent per year, in contrast to the minimal annual change for the intermediate and bottom groups.



Opex per Energy Sold (MWh)

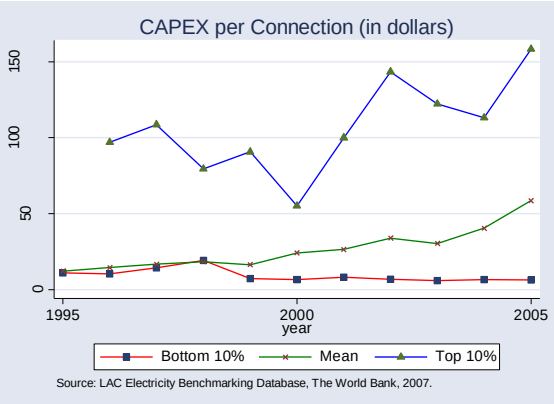
Year	Bottom 10%	Mean	Top 10%	Total
1995	7.63	45.71	n.a.	26.67
1996	8.74	48.80	n.a.	28.77
1997	9.62	51.12	293.16	117.96
1998	9.04	46.94	211.71	89.23
1999	7.75	38.09	173.67	73.17
2000	7.17	41.72	169.94	72.94
2001	7.04	39.55	170.34	72.31
2002	7.44	40.26	156.37	68.02
2003	7.83	41.22	164.58	71.21
2004	8.64	45.98	187.19	80.60
2005	9.95	57.82	230.48	99.42
Total	8.26	45.20	195.27	75.66

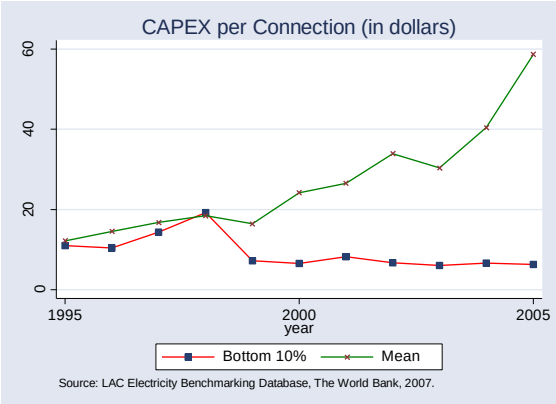
In terms of OPEX per MWh sold, *Compania Luz y Fuerza S.A. (CLYFSA)* of Paraguay leads the utilities in the bottom tenth percentile with $4.27 per energy sold. The next best utility with low operational expenditures is *Empresa Nacional de Energia Electrica (ENEE)* in Honduras with $4.98 per energy sold.

OPEX per MWh Sold

Country	Name	Mean 95-05
Brazil	AES SUL Distribuidora Gaúcha de Energia S/A	11.25
Brazil	Companhia de Eletricidade do Rio de Janeiro	8.64
Brazil	Rio Grande Energia S/A	9.09
Brazil	Bandeirante Energia S/A.	11.31
Brazil	Companhia Energética de Alagoas	7.05
Brazil	Companhia Paulista de Força e Luz - Piratininga	5.30
Brazil	Empresa Luz e Força Santa Maria S/A	9.87
Costa Rica	Empresa de Servicios Públicos de Heredia	5.39
Ecuador	Empresa Eléctrica Quito S.A.	10.49
Ecuador	Corporación para la Administración Temporal de Guayaquil	10.55
Ecuador	Empresa Eléctrica El Oro S.A.	14.03
Ecuador	Empresa Eléctrica Esmeraldas S.A.	11.38
Honduras	Empresa Nacional de Energía Eléctrica	4.98
Mexico	Comisión Federal de Electricidad	9.80
Paraguay	Administración Nacional de Electricidad	6.37
Paraguay	Compañia Luz y Fuerza	4.27

The counterpart of operation expenditures is capital expenditures used by utilities to acquire or upgrade physical assets such as buildings, equipment, and property. Our findings indicate that capital expenditures followed the same trends as operational expenditures. On average, the middle 80 percent spent $26.58 per connection, while the tenth percentile spent 4 times more on CAPEX per connection and the bottom percent spent 2.8 times less. Growing at an annual rate of 17 percent, the middle 80 percent spent $58.67 per connection in 2005. In the meantime, the annual growth for utilities in the tenth percentile was 5.5 percent in contrast to the 5.3 percent annual reduction of the bottom decile.





CAPEX per Connection

Year	Bottom 10%	Mean	Top 10%	Total
1995	10.95	12.19	n.a.	11.57
1996	10.42	14.52	97.00	40.65
1997	14.34	16.75	108.59	46.56
1998	19.22	18.42	79.45	39.03
1999	7.24	16.43	90.69	38.12
2000	6.57	24.19	55.14	28.63
2001	8.23	26.53	99.98	44.91
2002	6.74	33.93	143.40	61.36
2003	6.04	30.34	122.20	52.86
2004	6.64	40.41	113.10	53.38
2005	6.29	58.67	158.35	74.43
Total	9.34	26.58	106.79	45.72

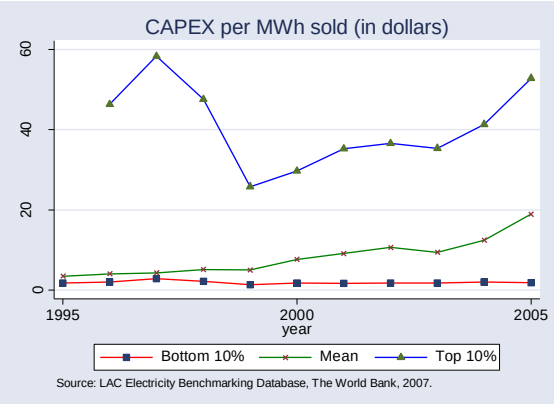
According to the data collected, *Electro Sur S.A.* of Peru spent the least on capital projects averaging $3.01 per connection for the last ten years. In contrast, amongst the bottom ten percent for capital expenditures per connection, *Companhia Energética do Maranhão* in Brazil spent the most on capital assets with $12.82 per connection.

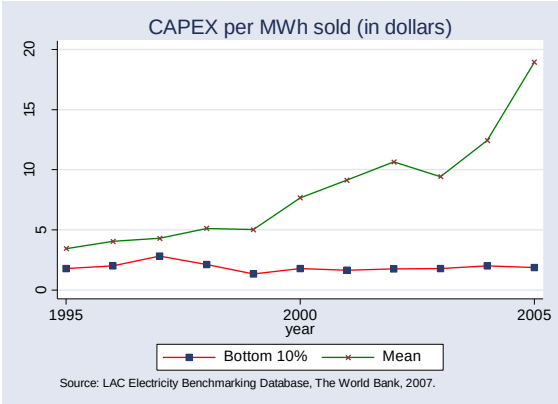
CAPEX per Connection

Country	Name	Mean 95-05
Brazil	Companhia Energética do Maranhão	12.82
Brazil	Companhia Energética do Piauí	7.84
Colombia	Empresas Municipales De Cali Eice	5.96
Costa Rica	Compañía Nacional de Fuerza y Luz	11.55
Costa Rica	Empresa de Servicios Públicos de Heredia	5.81
Costa Rica	Junta Administradora de Servicios Eléctricos de Cartago	9.03
Honduras	Empresa Nacional de Energía Eléctrica	10.65
Peru	Electro Oriente S.A	9.44
Peru	Electro Puno S.A.	3.85
Peru	Electro Sur S.A.	3.01
Peru	Electro Ucayali S.A.	3.58
Venezuela	Compañía Anónima de Administración y Fomento Eléctrico	7.48
Venezuela	CA Compañía Luz Eléctrica del Yaracuy	3.24

The capital expenses per energy sold incurred by the utilities in the top ten percent were on average 21 times more than the utilities in the bottom ten percent. While the expenses of the utilities in the middle group increased 5.5 times, there was little relative change in the utilities in the bottom decile. When assessing the best performer in terms of capital expenditures per energy sold, on average *CA Compañía Luz Eléctrica del Yaracuy* of Venezuela spent the least amount throughout the last 10 years, namely $0.80 per MWh. In contrast, *Comisión Federal de Electricidad* of Mexico spent the most on

capital assets with $2.76 per energy sold (MWh).





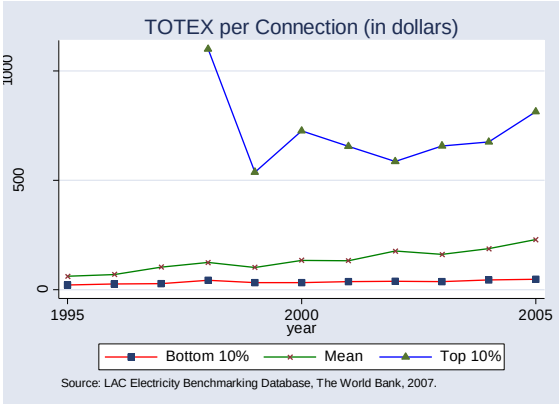
CAPEX per Energy Sold (MWh)

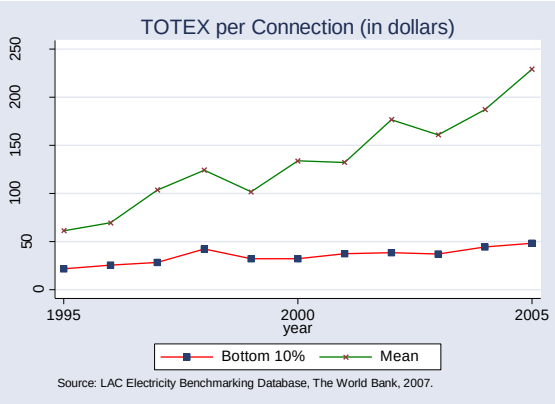
Year	Bottom 10%	Mean	Top 10%	Total
1995	1.78	3.44	n.a.	2.61
1996	2.00	4.05	46.31	17.45
1997	2.82	4.30	58.35	21.82
1998	2.14	5.12	47.57	18.28
1999	1.34	5.02	25.79	10.72
2000	1.79	7.67	29.68	13.05
2001	1.64	9.13	35.26	15.35
2002	1.76	10.65	36.61	16.34
2003	1.79	9.43	35.35	15.52
2004	2.01	12.43	41.31	18.59
2005	1.87	18.94	52.82	24.54
Total	1.90	8.20	40.90	16.26

CAPEX per Energy Sold (MWh)

Country	Name	Mean 95-05
Brazil	Companhia Paulista de Força e Luz - Piratinin	2.06
Brazil	Manaus Energia S/A	2.42
Brazil	Companhia Paulista de Força e Luz - Piratininga	2.52
Brazil	Companhia Força e Luz do Oeste	2.64
Costa Rica	Compañía Nacional de Fuerza y Luz	1.73
Costa Rica	Empresa de Servicios Públicos de Heredia	1.02
Costa Rica	Junta Administradora de Servicios Eléctricos de Cartago	1.52
Honduras	Empresa Nacional de Energía Eléctrica	2.74
Mexico	Comisión Federal de Electricidad	2.76
Peru	Electro Sur S.A.	1.71
Peru	Electro Ucayali S.A.	1.41
Venezuela	Compañía Anónima de Administración y Fomento Eléctrico	0.94
Venezuela	CA Compañía Luz Eléctrica del Yaracuy	0.80

For the last decade, an average of $134.57 was incurred for operational and capital expenditures per connection by the utilities in the middle 80 percent. The utilities in the bottom ten percent spent 5 percent of the amount of the utilities in the top ten percent. Nevertheless, beginning in 1998, the utilities in the top ten percent curtailed their total expenditures by 26 percent, while those in the bottom ten percent more than doubled and the middle 80 percent more than tripled since 1995.





TOTEX per Connection

Year	Bottom 10%	Mean	Top 10%	Total
1995	21.80	61.32	n.a.	41.56
1996	25.36	69.51	n.a.	47.44
1997	28.22	103.63	n.a.	65.92
1998	42.34	124.24	1100.18	422.25
1999	31.98	101.69	537.71	223.80
2000	32.21	133.77	725.75	297.24
2001	37.33	132.26	654.91	274.83
2002	38.46	176.70	586.47	267.21
2003	37.00	160.97	657.62	285.20
2004	44.25	187.12	675.37	302.25
2005	48.25	229.07	814.16	363.83
Total	35.20	134.57	719.02	253.99

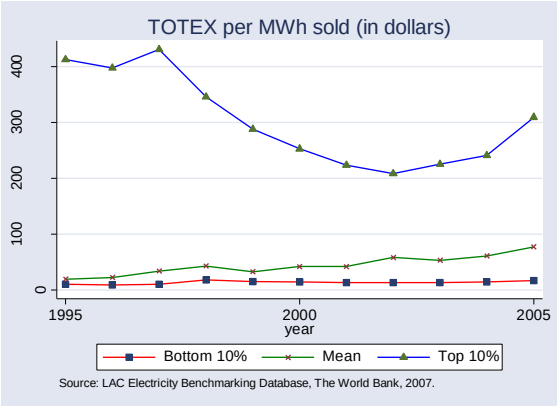
The *Junta Administradora de Servicios Eléctricos de Cartago* and *Compañia Nacional de Fuerza y Luz* of Costa Rica were the operators with the least total expenditures at $23 and $24 per connection per year.

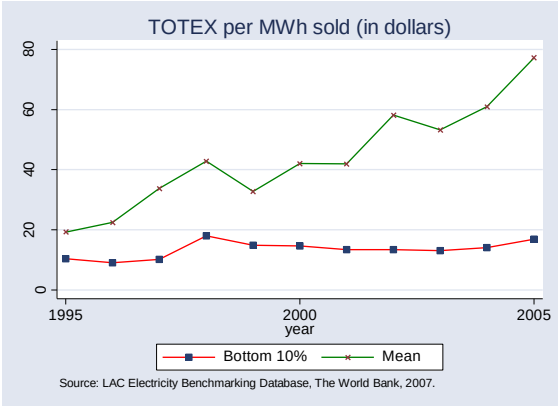
TOTEX per Connection

Country	Name	Mean 95-05
Brazil	Companhia de Eletricidade do Rio de Janeiro	59.15
Brazil	Companhia Energética do Maranhão	39.52
Brazil	Companhia Energética de Alagoas	34.89
Costa Rica	Compañia Nacional de Fuerza y Luz	24.53
Costa Rica	Empresa de Servicios Públicos de Heredia	40.54
Costa Rica	Junta Administradora de Servicios Eléctricos de Cartago	23.09
Ecuador	Empresa Eléctrica Norte S.A.	48.94
Ecuador	Empresa Eléctrica Bolívar S.A.	58.13
Honduras	Empresa Nacional de Energía Eléctrica	28.79
Mexico	Comisión Federal de Electricidad	55.02
Peru	Electro Oriente S.A	38.70
Peru	Proyecto Especial Chavimochic	54.04
Paraguay	Administración Nacional de Electricidad	54.63
Paraguay	Compañía Luz y Fuerza S.A.	53.12

With respect to the total expenditures per energy sold, the simple average for the middle group was $44.05 per MWh with an annual growth rate of 14.8 percent. The greatest change when addressing the total expenditures per energy sold is apparent in the performance of the utilities in the middle group that have increased total expenditures by 300 percent implying a 14.8 percent increase per year. From 1995 to 2005, the utilities in the top ten percent have experienced a cumulative 25 percent decrease in total expenditures with the exception of the sudden reversion starting in 2003. Although the utilities in the

bottom ten percent exhibit an increase in the period studied, it is significantly smaller than the average increase for the middle 80 percent.





TOTEX per Energy Sold (MWh)

Year	Bottom 10%	Mean	Top 10%	Total
1995	10.44	19.27	412.55	147.42
1996	9.07	22.45	397.46	142.99
1997	10.16	33.75	430.78	158.23
1998	18.01	42.81	345.69	135.50
1999	14.83	32.73	287.90	111.82
2000	14.65	42.06	252.81	103.17
2001	13.38	41.91	223.67	92.99
2002	13.36	58.17	208.38	93.30
2003	13.07	53.22	225.19	97.16
2004	14.12	60.95	241.13	105.40
2005	16.89	77.25	309.26	134.47
Total	13.45	44.05	303.17	120.22

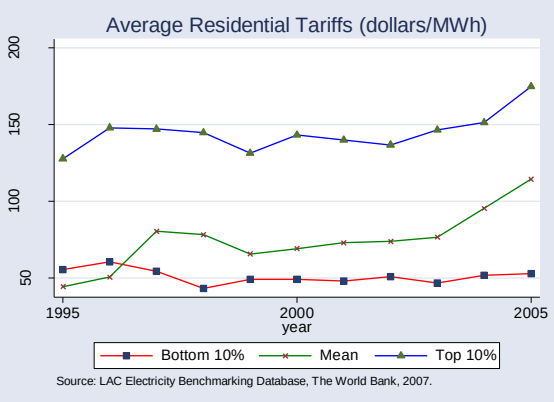
While Brazilian utilities make up 61 percent of the bottom ten percentile, *Comisión Federal de Electricidad* of Mexico spends the least on total expenditures with $11.26 per MWh followed by *Companhia Paulista de Força e Luz – Piratininga* in Brazil with $11.70 per energy sold.

TOTEX per Energy Sold (MWh)

Country	Name	Mean 95-05
Brazil	AES SUL Distribuidora Gaúcha de Energia S/A	14.00
Brazil	Rio Grande Energia S/A	11.83
Brazil	Eletropaulo Metropolitana	16.52
Brazil	Elektro Eletricidade e Servicios S/A	18.44
Brazil	Bandeirante Energia S/A	17.35
Brazil	Companhia Energética de Alagoas	11.84
Brazil	Companhia Paulista de Força e Luz - Piratininga	11.70
Brazil	Empresa Luz e Força Santa Maria S/A	14.60
Ecuador	Empresa Eléctrica Quito S.A.	16.45
Honduras	Empresa Nacional de Energía Eléctrica	12.97
Mexico	Comisión Federal de Electricidad	11.26
Paraguay	Administración Nacional de Electricidad	15.77
Paraguay	Compañia Luz y Fuerza S.A.	15.32

3.5 PRICE: AVERAGE RESIDENTIAL AND INDUSTRIAL TARIFFS

Utilities in the top ten percent reported average residential tariffs of $144.69, double the $74.79 simple average of the middle 80 percent, and triple the simple average of the utilities in the bottom ten percent. Despite the slight decrease in the average of the bottom ten percent, the middle 80 percent increased the average tariff more than two-fold, at an annual rate of 9.9 percent. Finally, utilities in the top ten percent increased their residential tariffs by 36.7 percent throughout the last ten years.



Average Residential Tariffs (dollars/MWh)

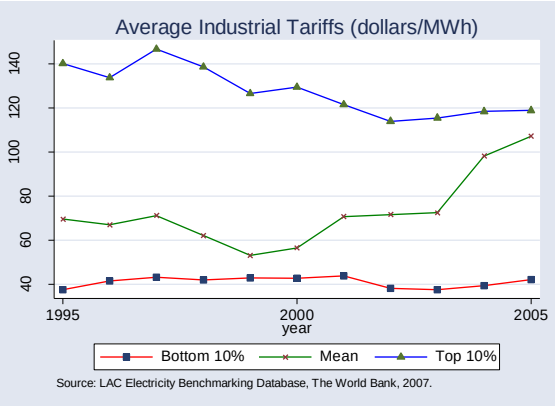
Year	Bottom 10%	Mean	Top 10%	Total
1995	55.56	44.46	127.79	75.94
1996	60.63	50.68	147.92	86.41
1997	54.51	80.51	147.11	94.04
1998	43.34	78.35	144.80	88.83
1999	49.20	65.77	131.44	82.14
2000	49.23	69.26	143.31	87.27
2001	48.11	73.04	139.92	87.02
2002	51.07	73.95	136.74	87.25
2003	46.90	76.68	146.58	90.05
2004	51.92	95.48	151.30	99.57
2005	52.97	114.49	174.75	114.07
Total	51.22	74.79	144.69	90.24

C.A. Electricidad de Valencia, C.A. Electricidad de Venezuela, and *C.A. Energía Eléctrica de Barquisimeto* provide their residential customers with the lowest tariffs amongst the utilities found in the bottom ten percent.

Residential Tariffs in Dollars

Country	Name	Mean 95-05
Bolivia	Compañia Eléctrica de Sucre S.A.	55.96
Colombia	Empresas Públicas De Medellín E.S.P.	52.29
Costa Rica	Cooperativa de Electrificación Rural de San Carlos	52.44
Costa Rica	Empresa de Servicios Públicos de Heredia	49.55
Costa Rica	Junta Administradora de Servicios Eléctricos de Cartago	47.22
Peru	EdelNor	54.03
Peru	Luz del Sur	54.27
Peru	Electro Sur Medio S.A.	54.35
Peru	Electro Centro S.A.	54.93
Peru	Electro Nor Oeste S.A.	55.93
Peru	Electronorte Medio S.A.-Hidradina S.A.	54.35
Paraguay	Administración Nacional de Electricidad	55.07
Venezuela	Compañia Anónima de Administración y Fomento Eléctrico	48.71
Venezuela	C.A. Electricidad de Valencia	33.99
Venezuela	C.A. Energía Eléctrica de Venezuela	37.63
Venezuela	C.A. Energía Eléctrica de Barquisimeto	41.62

Assessing the change in the industrial tariff per MWh is partly accounting for the 54 percent increase of the utilities in the middle 80 percent at an annual growth rate of 4.4 percent from 1995 to 2005. Concurrently, the utilities in the bottom ten percent increased tariffs by 12 percent at an annual growth rate of 1.1 percent. In contrast, the utilities forming the top decile report a 15 percent deduction in tariffs ending in $118.92 in 2005. This amount however remains on average $54.91 more than that of the middle group and $ 86.6 more that the utilities in the bottom ten percent.



Average Industrial Tariffs (dollars/MWh)

Year	Bottom 10%	Mean	Top 10%	Total
1995	37.62	69.59	140.21	82.47
1996	41.57	66.99	133.80	80.79
1997	43.26	71.20	146.77	87.08
1998	41.99	62.16	138.71	80.95
1999	42.99	53.11	126.62	74.24
2000	42.78	56.54	129.50	76.27
2001	43.85	70.78	121.55	78.73
2002	38.21	71.68	114.02	74.63
2003	37.61	72.50	115.52	75.21
2004	39.44	98.26	118.46	85.39
2005	42.16	107.25	118.92	89.44
Total	41.04	72.73	127.64	80.47

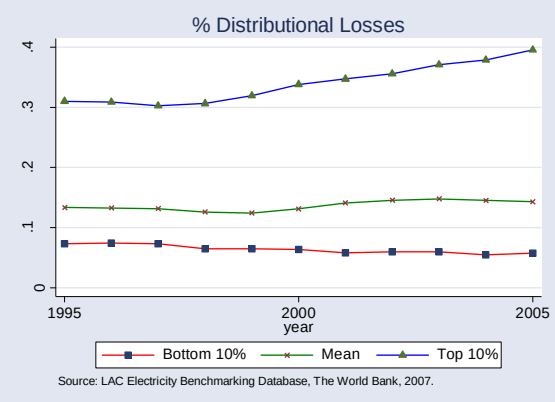
Venezuelan utilities once again lead the region with the lowest industrial tariffs followed by *Administración Nacional de Electricidad (ANDE*) and *Compania Luz y Fuerza S.A. (CLYFSA)* of Paraguay.

Industrial Tariffs

Country	Name	Mean 95-05
Argentina	Dirección Provincial de Energía de Corrientes	47.09
Argentina	Ente Provincial de Neuquén	41.22
Paraguay	Administración Nacional de Electricidad	36.25
Paraguay	Compañia Luz y Fuerza S.A.	36.54
Uruguay	Administración Nacional de Usinas y Transmisiones Eléctricas	43.77
Venezuela	La Electricidad de Caracas S.A.	42.03
Venezuela	C.A. Electricidad de Valencia	47.11
Venezuela	C.A. Luz y Fuerza de Puerto Cabello	24.31
Venezuela	C.A. Energía Eléctrica de Barquisimeto	28.40
Venezuela	C.V.G. Electrificación del Caroni C.A. Caracas	17.36

3.6 OPERATING PERFORMANCE

In regards to distributional losses, the situation for the middle 80 percent exhibits a cumulative increase of 7.1 percent in ten years. The utilities in the top ten percent have experienced an upturn in losses with a 27 percent increase, a 3.7 percent annual increase in loss since 1998. In contrast, utilities in the bottom ten percent reduced their distributional losses by 21.7 percent since 1995, a 1.6 percentage point decrease from their initial 7.3 percent in 1995.



Distributional Losses

Year		Mean	Top 10%	Total
1995	0.073	0.133	0.310	0.172
1996	0.074	0.133	0.309	0.172
1997	0.073	0.132	0.303	0.169
1998	0.065	0.126	0.306	0.166
1999	0.065	0.124	0.319	0.169
2000	0.064	0.131	0.338	0.178
2001	0.058	0.141	0.347	0.182
2002	0.060	0.146	0.356	0.187
2003	0.060	0.148	0.371	0.193
2004	0.055	0.145	0.379	0.193
2005	0.057	0.143	0.395	0.199
Total	0.064	0.136	0.339	0.180

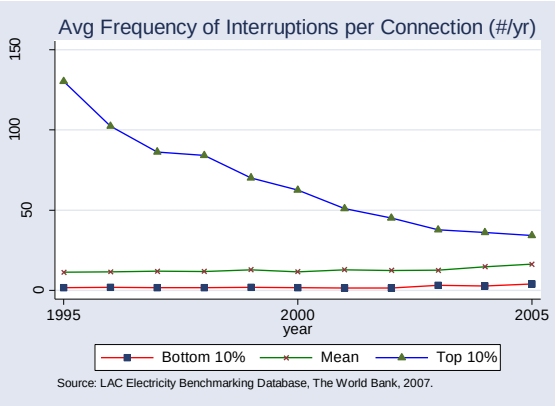
Companhia Força e Luz do Oeste and *Empresa Força e Luz de Urussanga Ltda* of Brazil performed with an impressively low level of distributional losses of 1.6 percent and 3.1 percent respectively.

Distribution Losses

Country	Name	Mean 95-05
Argentina	Ente Provincial de Neuquén	6.8%
Argentina	Empresa Distribuidora de Electricidad del Este S.A.	7.4%
Argentina	Cooperativa Limitada de Consumo de Electricidad del Salto	7.3%
Argentina	Cooperativa Electrica de Azul Ltda.	5.9%
Brazil	Companhia Paulista de Força e Luz	6.2%
Brazil	Elektro Eletricidade e Serviços S/A.	6.8%
Brazil	Empresa Elétrica Bragantina S.A.	4.2%
Brazil	Companhia Jaguari de Energia	3.8%
Brazil	Companhia Paulista de Força e Luz - Piratininga	6.6%
Brazil	Companhia Força e Luz do Oeste	1.6%
Brazil	Força e Luz Coronel Vivida Ltda	3.2%
Brazil	Hidroelétrica Panambi S/A	3.5%
Brazil	Empresa Força e Luz de Urussanga Ltda	3.1%
Chile	Chilectra S.A.	6.3%
Chile	EnerQuinta	6.7%
Chile	Compañia Nacional de Fuerza Eléctrica S.A.	6.0%
Chile	Empresa Eléctrica de Iquique S.A.	7.2%
Chile	Empresa Eléctrica de Atacama S.A.	6.8%
Chile	Compañía Eléctrica del Rio Maipo S.A.	6.2%
Venezuela	C.A. Luz Eléctrica de Venezuela	4.9%
Venezuela	C.V.G. Electrificación del Caroni C.A. Caracas	3.9%

3.7 QUALITY OF SERVICE

The best performing utilities with respect to the quality of service averaged a frequency of 2.09 interruptions per connection. Although there were no significant changes until 2002, the results suggest that there has been an increase in the average frequency of interruptions. The utilities in the middle 80 percent reveal a total increase of 44.4 percent in power interruptions with a frequency of 16.2 interruptions per connection in 2005. In addition, it is worth noting the considerable decrease in interruptions by the utilities in the top ten percent. On average, the utilities in the top ten percent experienced frequencies of interruptions that were five times greater than the number of interruptions in the middle 80 percent. While in 1995, the average consumer of the top ten percent experienced 130.34 interruptions, by 2005 the average consumer experienced 34.15 interruptions.



Frequency of Interruptions per Connection

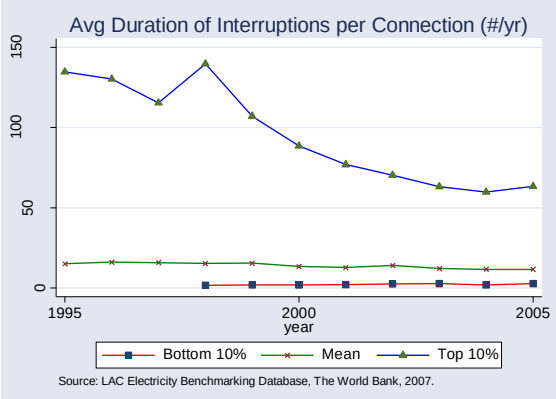
Year	Bottom 10%	Mean	Top 10%	Total
1995	1.67	11.24	130.34	47.75
1996	1.82	11.52	102.41	38.58
1997	1.60	11.85	86.31	33.25
1998	1.72	11.78	84.06	32.52
1999	1.81	12.84	70.13	28.26
2000	1.67	11.54	62.55	25.25
2001	1.45	12.79	50.89	21.71
2002	1.51	12.41	45.02	19.64
2003	3.14	12.50	37.72	17.79
2004	2.61	14.68	35.99	17.76
2005	4.02	16.24	34.15	18.14
Total	2.09	12.67	67.23	27.33

Empresa Eléctrica Esmeraldas S.A. of Ecuador provides the best quality of service in the region with an average of 0.96 interruptions per connection. *Luz Linares S.A.* of Chile is the second best performer with 1 interruption per connection.

Frequency of Interruptions

Country	Name	Mean 95-05
Argentina	Empresa Distribuidora Sur S.A.	2.76
Bolivia	Electricidad De La Paz S.A.	3.13
Chile	Luz Linares S.A.	1.00
Ecuador	Empresa Eléctrica Manabí S.A.	3.52
Ecuador	Empresa Eléctrica Quito S.A.	2.89
Ecuador	Empresa Eléctrica Santo Domingo S.A.	3.79
Ecuador	Empresa Eléctrica Regional Sur S.A.	2.42
Ecuador	Empresa Eléctrica Bolivar S.A.	2.95
Ecuador	Empresa Eléctrica Regional Centro Sur S.A.	2.37
Ecuador	Empresa Eléctrica Esmeraldas S.A.	0.96
Mexico	Comisión Federal de Electricidad	2.99
Venezuela	La Electricidad de Caracas S.A.	3.47

The average duration of interruptions for the utilities in the middle 80 percent was 13.9 hours per connection. This group had 3.6 fewer hours of interruptions than in 1995, a drop of 23.5 percent. The utilities in the bottom ten percent reported an average of 2.2 hours of interruption, one-sixth of the simple average for the middle 80 percent. The simple average for utilities in the top ten percent was 95.4 hours, 6.8 times more than the power outages experienced by the customers represented in the middle 80 percent utilities. Despite the long duration times in comparison to the simple average, utilities in the top decile made significant progress throughout the decade and reduced duration time by 71.3 hours.



Duration of Interruptions per Connection

Year	Bottom 10%	Mean	Top 10%	Total
1995	n.a.	15.1	134.6	74.8
1996	n.a.	16.1	130.2	73.2
1997	n.a.	15.8	115.4	65.6
1998	1.6	15.3	139.7	52.2
1999	1.8	15.5	107.1	41.4
2000	1.9	13.3	88.5	34.6
2001	2.0	12.8	76.9	30.6
2002	2.6	13.9	70.3	28.9
2003	2.6	12.1	63.1	25.9
2004	2.0	11.6	59.8	24.5
2005	2.8	11.5	63.3	25.9
Total	2.2	13.9	95.4	40.6

The best utility performer when measuring the duration time of interruptions was *Empresas Públicas De Medellín E.S.P.* in Colombia with 0.54 hours of interruptions per consumer. *Empresa Antioqueña de Energía S.A. E.S.P* in Colombia exhibits the second lowest duration time of .94 hours per connection.

Average Duration of Interruptions per Connection

Country	Name	Mean 95-05
Bolivia	Electricidad De La Paz S.A.	3.17
Bolivia	Empresa de Luz y Fuerza Eléctrica Oruro S.A.	3.58
Chile	Luz Linares S.A.	2.67
Colombia	Empresa Antioqueña de Energía S.A. E.S.P	0.94
Colombia	Electrificadora de Santander (Bucaramanga)	3.58
Colombia	Empresas Municipales De Cali Eice	1.55
Colombia	Empresas Públicas De Medellín E.S.P.	0.54
Colombia	Electrificadora del Huila S.A. ESP	1.45
Costa Rica	Empresa de Servicios Públicos de Heredia	2.38
Ecuador	Empresa Eléctrica Manabí S.A.	2.76
Ecuador	Empresa Eléctrica Quito S.A.	2.21
Ecuador	Empresa Eléctrica Regional Sur S.A.	1.76
Ecuador	Empresa Eléctrica Regional Centro Sur S.A.	2.53
Mexico	Luz y Fuerza del Centro	2.49
Mexico	Comision Federal de Electricidad	3.46
Peru	Electro Puno S.A.A.	1.43
Peru	Electro Sur Este SA	3.41
Peru	Sociedad Eléctrica del Sur Oeste S.A.	2.16

3.8 CONCLUSION

While assessing the performance of the distribution utilities presented in this study, we have encountered significant discrepancies amongst utilities. For instance, in 2005, utilities in the top ten percentile were ten times more productive and sold six times the amount of energy (per connection) of utilities in the bottom ten percent. The best performing utilities had less than four interruptions per year and less than 4 hours of duration of the utilities represented in the bottom ten percent. In the same vein, the bottom decile utilities had one fifth of the distributional losses that characterized the underperforming utilities.

A second but equally important message is the overall improvement of the underperforming utilities during the last ten years. As attested by the time trends, the utilities in the bottom ten percent improved significantly in coverage from an initial 40 percent electrification in 1995 to 61 percent electrification in 2005. Similar improvements were observed in the frequency and duration of interruptions especially by the underperforming utilities. The evolution of the level of labor productivity illustrates the progress of the poorer performers with a three-fold improvement in the last ten years.

Third, there were cases with significant deterioration in performance reflected in indicators such as the average tariffs and distributional losses. While the residential tariff increased from $44.4 in 1995 to $114.4 in 2005 for the middle 80 percent, the top ten percent increased their residential tariffs by 36.7 percent compared to the initial $127 per MWh sold in 1995. With respect to distributional losses, while the middle 80 percent did not exhibit a significant change during the decade, the underperforming ten percent showed a 27 percent increase in distribution losses.

Chronicling the story of the best performing distribution utilities during the last decade is a story of universal electrification and significant improvements of the utilities represented in the middle 80 percent. Electrification increased by almost 15 percentage points for the middle 80 percent and 20 percentage points for the bottom ten percent attaining 88 percent and 61 percent coverage in 2005 respectively.

Finally, the chapter also identifies the utilities that set the standard of good performance for each indicator. Although there are some variations within and between countries, in general, several companies in Brazil lead with best performance in terms of labor productivity, distributional losses, OPEX, and coverage. In addition, Costa Rica benchmarks good performance in coverage, OPEX, and tariffs. Finally, several utilities in Chile produced leaders for indicators measuring labor productivity and technical efficiency.

4. AN ASSESSMENT OF THE DISTRIBUTION OF PRIVATE AND PUBLIC UTILITIES [8]

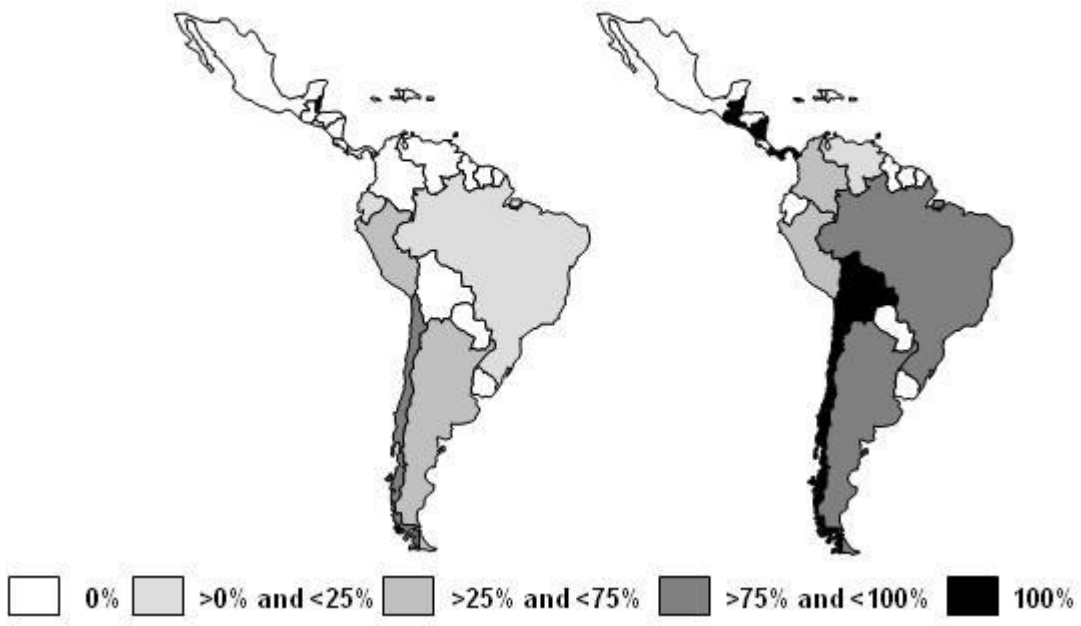
Private sector participation has been a major component in shaping electricity trends in the region over the last ten years. Private participation has grown substantially since 1990, and especially between 1995-1998. While in 1990 there was little significant participation of the private sector in electricity distribution, by 1995, 11.1 percent of electricity connections in the region were served by the private sector. By the end of our period of analysis, 60 percent of electricity connections in our database were supplied by private utilities. According to the Private Participation in Infrastructure (PPI) Project Database, during the last 15 years, US$ 102.6 billion was the total investment[9] made in 384 private electricity projects in LCR of which one third corresponded to distribution. Most Latin American countries have introduced private participation in electricity as part of broader reforms attempting to establish a more competitive market structure. Considering the major impact of private participation on electricity development, we have dedicated this chapter to provide a comparative analysis of private and public distribution utilities.

Private sector participation in Electricity Distribution in LAC (as a % of the total number of connections):

A) 1995: 11 % **B) 2005: 60 %**

[8] In our sample (250 cases), there are a few utilities in Peru (4) and the Dominican Republic (2) in which privatized electricity distribution utilities have recently reverted to public sector ownership. It worth noting that the change in ownership in these cases has not impacted the overall results we have drawn from our benchmarking analysis. While we are accounting for this change, it has not shown to have a significant immediate affect on our Private and Public Comparison results. Considering the small size of this sub-sample, we have included them in our privatized after 1995 utilities group since they do not establish a trend by themselves nor alter our results.

[9] This includes investments in facilities as resources the project company commits to invest in expanding and modernizing facilities, and investment in government assets.



This chapter benchmarks electricity distribution in Latin America and the Caribbean region and depicts the progress made by both public and private utilities. The objective is to present the results describing electricity activity in the last ten years. At this stage, the report does not attempt to explain the existing facts nor draw any conclusions. While the previous chapters of this report indicate major improvements in coverage and quality at the regional, country, and utility-levels, this chapter provides insight on utility performance based on the means of ownership. The following results are based on the **simple average across the 250 utilities** measured according to the 26 indicators used in the methodology implemented for this benchmarking study. The utilities presented in this chapter fall into the following three categories: **public utilities** throughout the period of 1995-2005, **utilities that privatized before 1995** and remained private throughout 2005, and **utilities that privatized after 1995** and remained private throughout 2005. In order to most accurately assess and compare the performance of public and private distribution utilities, we considered the initial conditions in 1995 as well as the overall trend of the last ten years. Finally, we present the variance of change and improvement of the studied indicators. For this comparison, we report the average top ten, bottom ten, and middle eighty percent public and private utilities.

4.1 MAIN FINDINGS

The main findings of this chapter attest to the considerable improvement in the performance of the electricity sector. The following results show the public and/or private utilities that benchmark good performance for each respective indicator.

- When comparing the performance of private and public utilities, the main differences in performance are marked by: labor productivity, distribution losses, quality of service, and tariffs.

In contrast, other indicators such as coverage and operation expenditures exhibit similar trends and/or do not present significant changes between the groups.

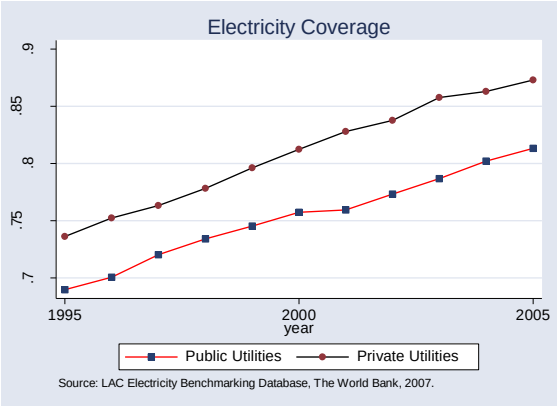
- ***On average, private utilities performed better than public utilities with clear differences after the change in ownership.*** Significant improvements in labor productivity are a distinguishing factor when assessing the performance of the sector. When measuring the number of connections per employee in 1995, the labor productivity of post-1995 privatized utilities was only 10.7 percent greater that that of public utilities. Yet by the end of the decade, the labor productivity of post 1995 privatizations increased three-fold and doubled the amount of public utilities. Another indicator exhibiting significant improvement after the change in ownership is that of distribution losses. In 1995, public and post-1995 utilities experienced on average 17.9 and 15.3 distributional losses. However whereas private utilities by 2005 reduced distribution losses by 12.6 percent, public utilities resulted with a 4.9 percent increase.

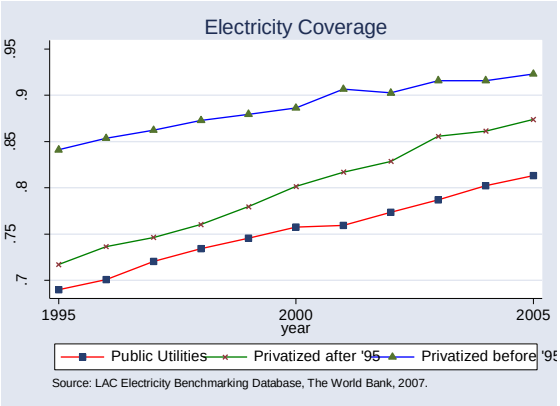
- ***More remarkable are the cases in which public utilities and post 1995 utilities experienced similar initial conditions in 1995, yet after the change in ownership diverged in their performance.*** One such instance is noted when assessing the quality of service. In 1995, public utilities experienced on average a frequency of 22 interruptions per connection, 5 interruptions less than that of private utilities. However by the end of the decade, public utilities reduced the average frequency of interruptions by 4 (interruptions), a modest improvement considering that private utilities cut their average frequency of interruptions by half. Moreover, this contradistinction is more evident when comparing the average duration time of private and public utilities. Whereas public and private utilities were separated by one hour duration in 1995, by the end of 2005, public utilities exhibit a 48.8 percent increase in the average duration per connection, while private utilities improved the quality of service by reducing the average duration per connection by 28.2 percent.

- ***There are good public and private utilities and underperforming private and public utilities.*** For several indicators the top 10 percent public utilities performed better than the average private utilities and in other cases the bottom 10 percent of the private utilities performed worse than the average public utilities. In the case of distribution losses, it is noteworthy that the public utilities in the bottom 10 percent perform better than the average private utilities. Likewise the private utilities forming the top decile experience more distribution losses than the average public utilities.

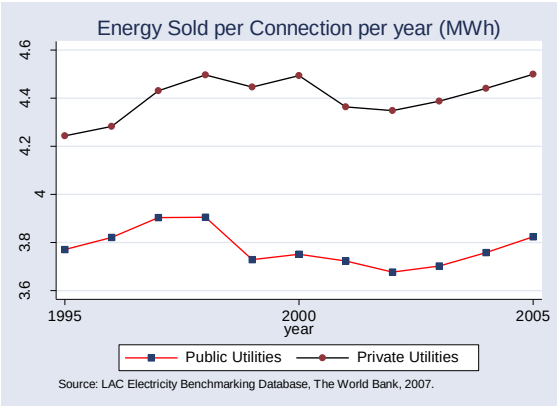
4.2 COVERAGE AND OUTPUT

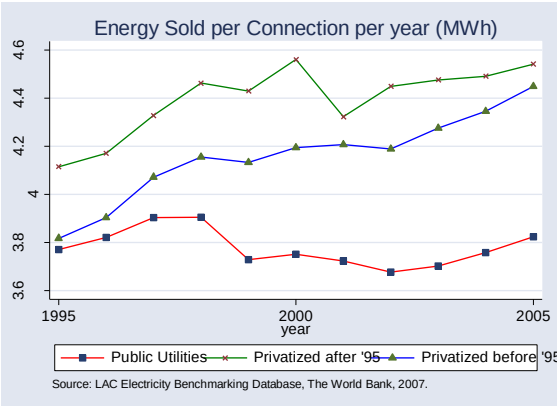
There has been significant progress made in the last ten years by both public and private utilities to expand electricity coverage. Starting with 69 percent coverage in 1995, ***public utilities*** increased at an annual rate of 1.7 percent to reach 81 percent coverage by 2005. Similarly, ***utilities that privatized after 1995*** started around the same range with 71 percent coverage in 1995 and increased at an annul rate of two percent to reach 87 percent coverage by the end of 2005. While ***utilities that privatized before 1995*** experienced a smaller annual growth rate of 0.9 percent, these utilities experienced an 8.2 percentage point increase during the last ten years covering 92.3 of electricity connections by 2005. Despite the fact that public utilities and post 1995 privatized utilities started in the same range, with only a 2.7 percentage point difference, post 1995 privatized utilities ended with 6.1 percentage points higher in coverage than public utilities by the end of 2005 and 4.9 percentage points lower than utilities privatized prior to 1995.





Assessing output in terms of the amount of energy sold per connection per year is a multifaceted measurement dependent on demand. On average, consumption per connection for public utilities was at 3.7 MWh per year while for private utilities it was 4.4 MWh, 14.1 percent higher. Pre 95 privatized utilities depict a 16.5 percent increase in consumption and an annual growth rate of 1.5 percent. When assessing this increase according to the utilities privatized after 1995, the post-1995 privatized utilities experienced a 10.3 percent increase from 4.1 MWhs sold per connection in 1995 to 4.5 in 2005. Concurrently, those utilities that privatized before 1995 exceeded the annual growth rate of the post 1995 privatized utilities. Perhaps the most striking improvement is the increase in consumption of privatized utilities when compared to that of public utilities. In 1995, both public and pre 1995 privatized utilities experienced similar amounts of energy sold, respectively 3.7 MWhs per connection for public utilities and 3.8 MWhs for privatized utilities. However, throughout the decade, pre 1995 privatizations contributed to this gap with a total of 0.63 MWh more per connection than that of public utilities by the end of 2005.

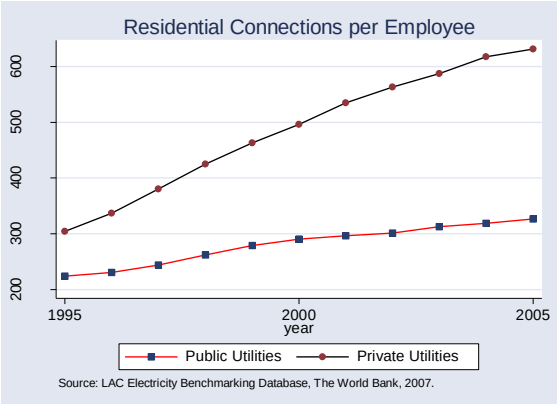


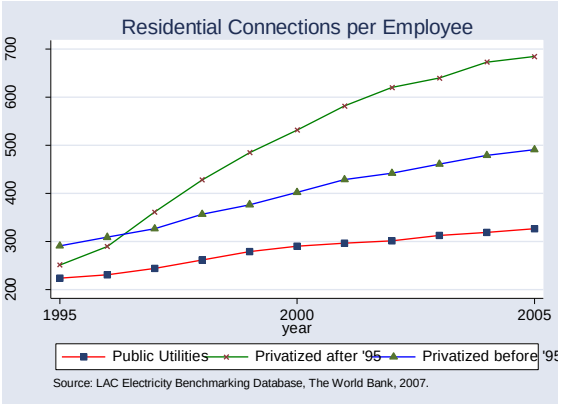


4.3 LABOR PRODUCTIVITY

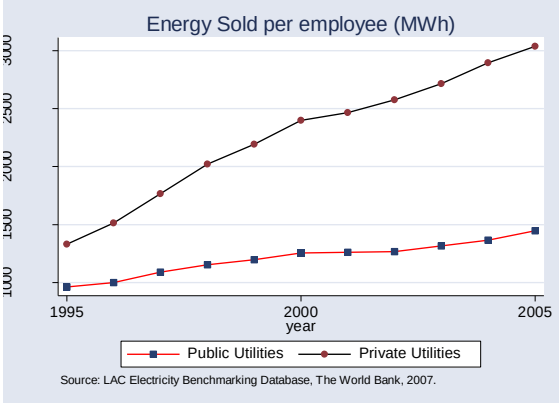
When measuring the number of residential connections per employee, there is once again a major increase in the labor productivity of private utilities creating a stark contrast with the productivity levels of public utilities. In 1995, the labor productivity of public utilities was measured at 223 residential connections per employee, while that of post 1995 privatizations was only 27 connections higher. However, by the end of the decade, the labor productivity of post 1995 privatizations increased three-fold and doubled that of public utilities. In 2005, not only did post 1995 privatizations exceed public utilities by

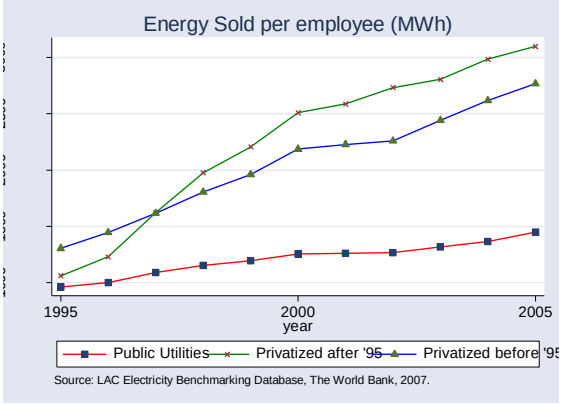
357 connections per employee, but post 1995 privatizations overtook pre 1995 privatizations by 193 connections, growing steadily until 684 residential connections per employee. Post 1995 privatizations grew at an impressive annual rate of 10.6 percent and almost tripled during the last decade.





Labor productivity measured as the energy (MWh) sold per employee exhibits a significant increase for private utilities in contrast to the slight change in public utilities. A closer look at the evolution of labor productivity shows a 112 percent increase in pre 1995 privatizations at an annual growth rate of 7.8 percent, and a 192 percent increase in post 1995 privatizations. Unlike the increasing trend of private utilities, public utilities grew at a lower annual rate of 4.2 percent resulting with 1447 MWhs of energy sold per employee. A noteworthy observation is that both public utilities and post 1995 privatizations displayed approximately the same level of labor productivity in 1995, respectively 961 MWhs by public utilities and 1061 MWhs by post 1995 privatizations. Post 1995 privatized utilities tripled their labor productivity to 3099 MWhs of energy sold per employee, and public utilities increased by only 50.5 percent to result in 1447 MWhs in 2005. The labor productivity of post 1995 privatizations more than doubled that of public during the last ten years.

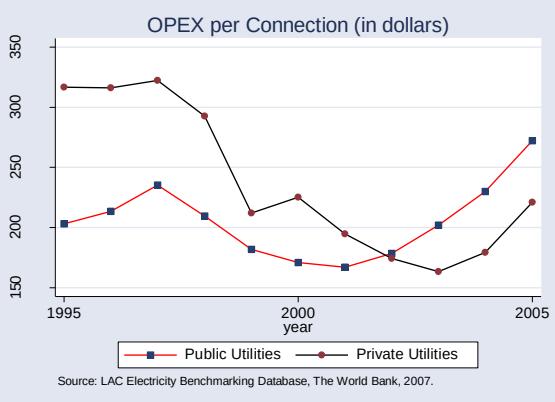


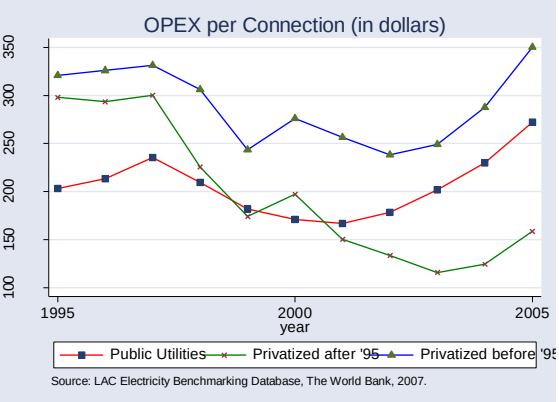


4.4 INPUT INDICATORS

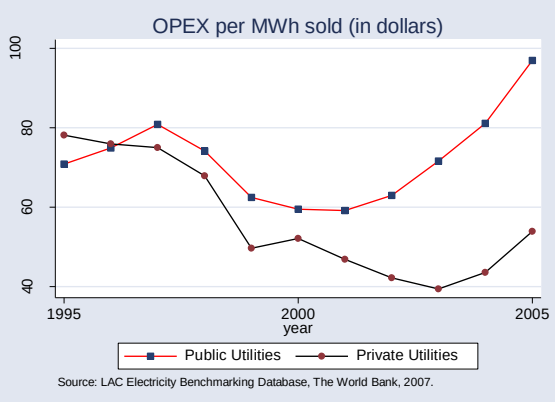
When measuring the operation expenditures per connection (in dollars), private utilities decreased expenditures by 30.1 percent spending on average $237 per connection in 2005. On the other hand, public utilities experienced a 34 percent increase resulting with $272 per connection in 2005, surpassing the amount it spend on OPEX per connection in 1995. When assessing OPEX per connection as disaggregated

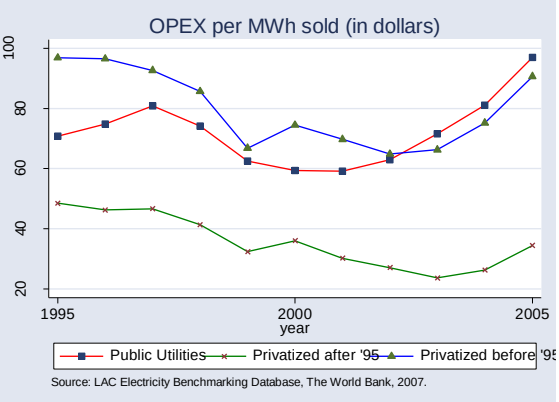
values of private utilities, the pre 1995 utilities spent 1.5 times more than post 1995 privatized utilities during the last 10 years. Post 1995 privatized utilities started with operation expenditures of $298 per connection in 1995, but decreased this amount by 46.7 percent and charged $158 per connection by the end of 2005. When attempting to assess these values and the discrepancies within and between private and public utilities, it is important to note that higher or lower operation expenditures are not necessarily better. These values are dependent upon the results of other indicators such as efficiency.





With respect to operation expenditures per MWh sold (in dollars), public utilities do not depict a trend in OPEX values throughout the last decade. Operation expenditures dropped by $11.6 per MWh sold between 1997 and 2001, only to gradually increase by $38 per energy sold by 2005. While operation expenses for private companies exhibit a more gradual decrease throughout the decade, by 2005 public utilities experience a significant increase. By the end of 2005, pre 1995 privatizations and public utilities spent approximately the same amount on operations, $90 and $97 respectively. On the contrary, post 1995 privatizations spent on average $36 less per MWh than public utilities and $44 less than pre-1995 privatized utilities during the last decade.



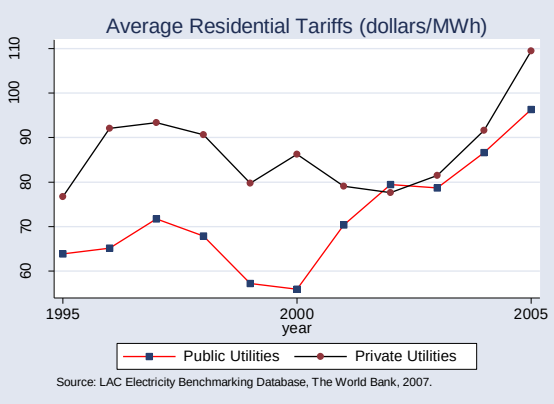


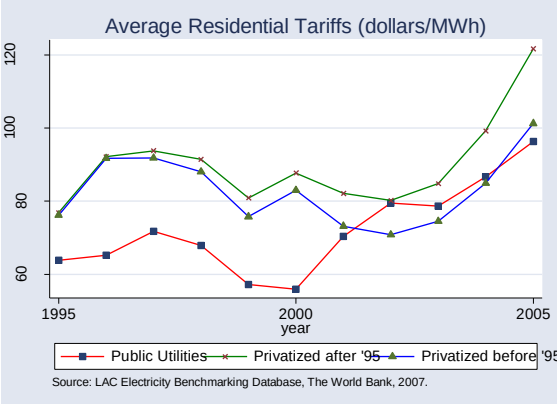
4.5 PRICES: RESIDENTIAL AND INDUSTRIAL TARIFFS

Depicting the average tariffs of public and private utilities in Latin America and the Caribbean is telling a story about initial conditions and overall trends during the last ten years. Average residential tariffs increased by 50.8 percent in public utilities, 58.3 percent in the post 1995 privatizations, and 32.9 percent in pre 1995 privatizations. It is noteworthy that despite the fact that public utilities in 1995 charged

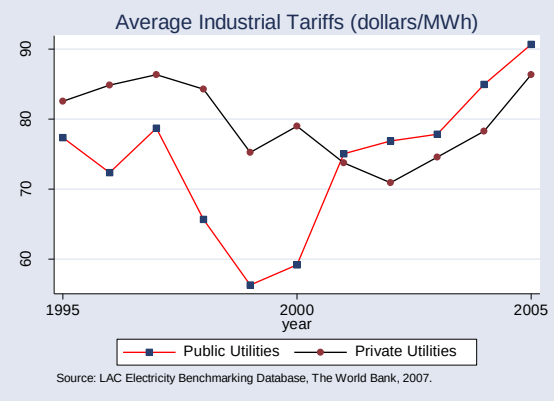
on average $12.9 less per MWh than private utilities, throughout the decade, public utilities increased tariffs by 50.8 percent while private utilities increased tariffs by 42.6 percent, resulting in a $13.14 difference in 2005.

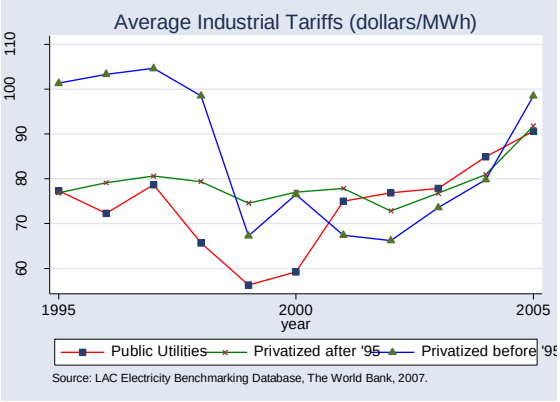
Post 1995 privatized utilities exhibit the greatest increase in residential tariffs and the highest annual growth rate of 4.7 percent. Utilities that privatized after 1995 charged the highest residential tariffs in 2005 averaging at $122 per MWh. This amount is $44.8 greater than the initial charge, $25 more than public utilities and $20 more than pre 1995 privatized utilities.





The average industrial tariffs per MWh charged by public utilities in 1995 was $77.3, $5.1 less than the price charged by private utilities. However, by 2005, the average public industrial tariffs reached $90.6, a 17.2 percent increase compared to the modest 4.5 percent increase exhibited by private utilities. A closer look at the disaggregation of the charges by utilities privatized pre and post 1995 recounts a story of gradual increases and decreases throughout the last 10 years. When considering the industrial charges administered by pre 1995 utilities, there was a significant drop for the first part of the decade driven by the Brazilian utilities that underwent devaluation, followed by a gradual increase in the last 5 years. Utilities that privatized after 1995 increased tariffs by 19.4 percent at an annual growth rate of 1.8 percent. Albeit this increment, by the end of 2005, post 1995 utilities charged only $1.1 more than public utilities.

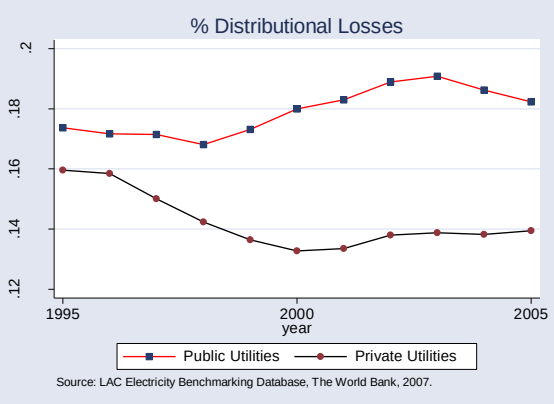


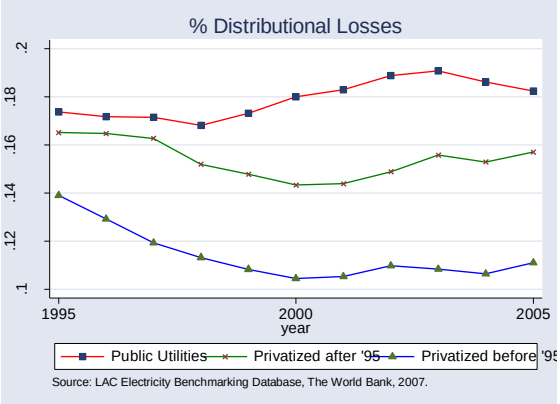


4.6 OPERATING PERFORMANCE

When measuring distribution losses, there have been visible improvements for private and

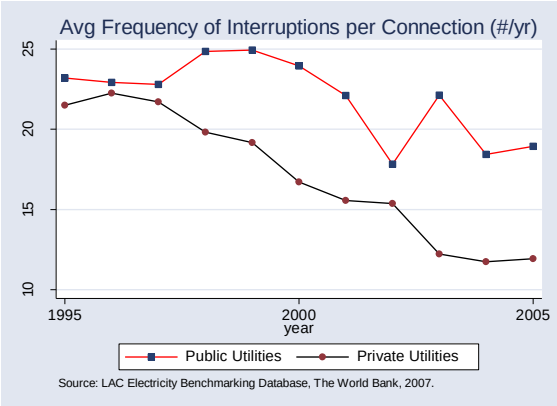
privatized utilities. In 1995, private utilities experienced 16 percent distribution losses which decreased to 14 percent by 2005. Post 1995 privatized utilities followed a similar pattern reducing distribution losses by 0.8 percentage points, from 16.5 percent in 1995 to 15.7 percent in 2005. Pre 1995 privatized utilities experienced a 2.7 percentage point drop from 13.8 percent in 1995 to 11.1 percent in 2005. On the contrary, public utilities increased their distributional losses by 4.9 percentage points from 17.3 in 1995 to 18.2 in 2005. It is worth noting that despite the fact that public and post 1995 privatized utilities started in the same range of 17.3 percent and 16.5 percent (a 0.8 percentage point difference) respectively in 1995, there was a 2.5 percentage point difference between the two utility types by the end of 2005. Finally, the utilities privatized before 1995 experienced a greater improvement in operating performance than the other two groups during the last decade. Post 1995 utilities decreased distribution losses by 4.9 percent during the last ten years. Based on these results, private utilities have significantly exceeded public utilities in decreasing and maintaining low levels of distribution losses.

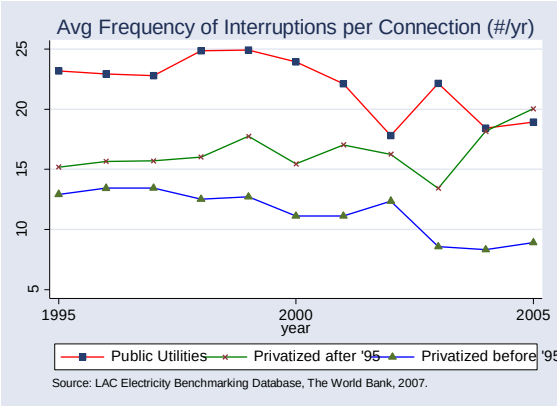




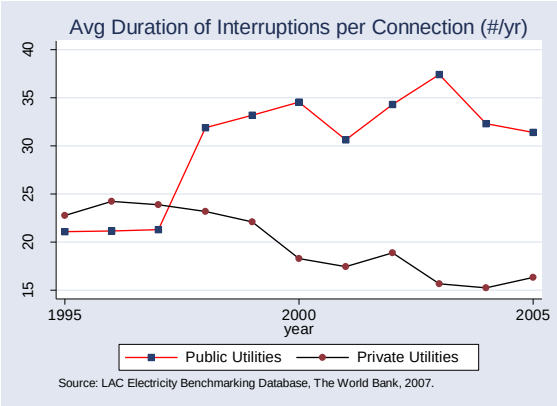
4.7 QUALITY OF SERVICE

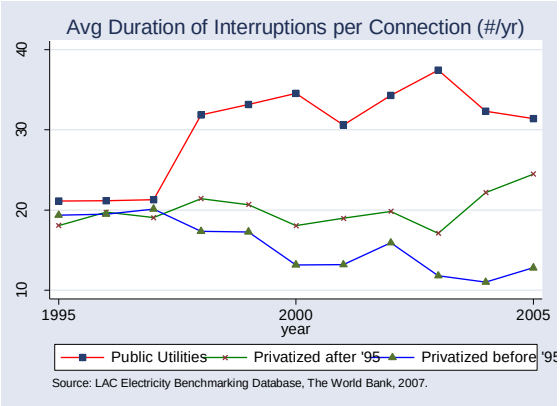
When benchmarking the quality of service for public and private electricity distribution utilities, it is worth noting that most public and private utilities have only recently started to collect and disclose data indicating the frequency and duration of interruptions. In light of this, it is important to understand the following results as indicators not only of the quality of service but also of the quality of measurement. Based on the data collected in our sample, the average frequency of interruptions per connection per year dropped from 12.9 times per connection in 1995 to 8.9 times in 2005 for pre 1995 privatized utilities whereas interruptions increased from 15.2 to 20 in post 1995 privatized utilities. Public utilities, which in 1995 exhibited 23.2 interruptions per connection, reduced the frequency of interruptions to 18.9 interruptions at an annual rate of 2.0 percent. Both pre 1995 privatized utilities and public utilities managed to reduce the average frequency of interruptions by 4 interruptions per connection, while post-1995 private utilities lag behind in improving the quality of service.





With regards to the average duration of interruptions per connection the results exhibit a slight decrease in the average duration of interruptions per connection for private utilities yet a significant increase in duration time of public utilities. In 1995, the average duration time for public utilities was 21 hours per connection compared to the 31 hour duration per connection in 2005. Unlike the increase in duration time for public utilities, the aggregated result for private utilities demonstrate a gradual decrease throughout most of the decade with the exception of the last year. Utilities that privatized after 1995, show a 35 percent total increase in duration time resulting with 24 hour durations. The best performers when measuring the quality of service are the utilities privatized before 1995 with a 34 percent reduction in the last decade and low 12 hour durations by 2005.



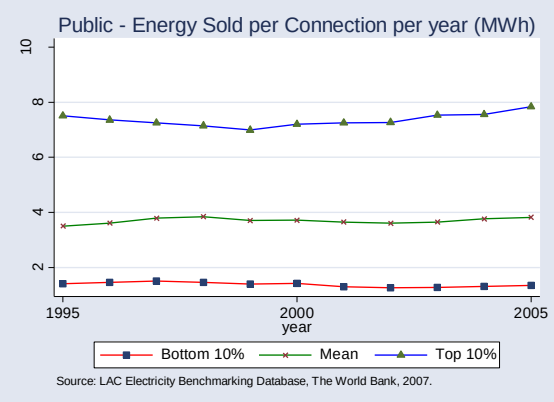


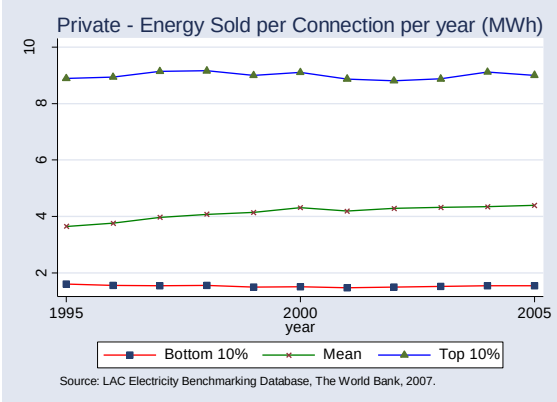
4.8 TOP TEN AND BOTTOM TEN PERCENT PERFORMERS

The following section serves as a supplementary comparative analysis of the top ten and bottom ten percent public and private distribution utilities. The main message is that, although private utilities performed better than public utilities with clear differences after the change in ownership, there are cases in which the top 10 percent public utilities outperformed the average private utilities and the bottom 10 percent private utilities performed poorer than the average public utilities. The following indicators were selected because they exhibit significant change and improvement that may be less perceptible in the previous comparisons. For the results of the remaining indicators, please see Annex 5.

Output

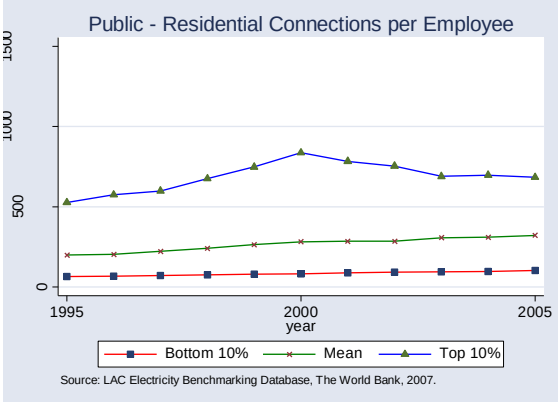
An in-depth perspective on the energy sold per connection is gained when comparing the top and bottom ten percent public and private performers. In the case of output, it is important to note that by 2005, the top ten percent public utilities sold twice as much energy as the average private utilities. The same proportion is applicable when comparing the average public utilities to the bottom ten percent private utilities. By 2005, the bottom ten percent of the private utilities sold less than half of the energy (MWh) sold by the average public utilities.

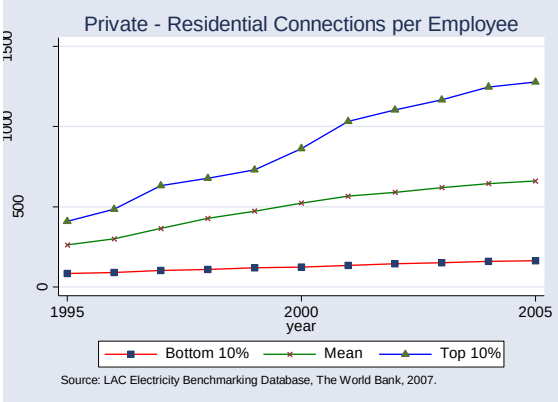




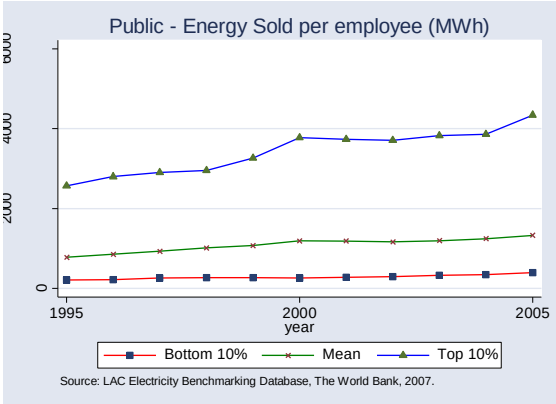
Labor Productivity

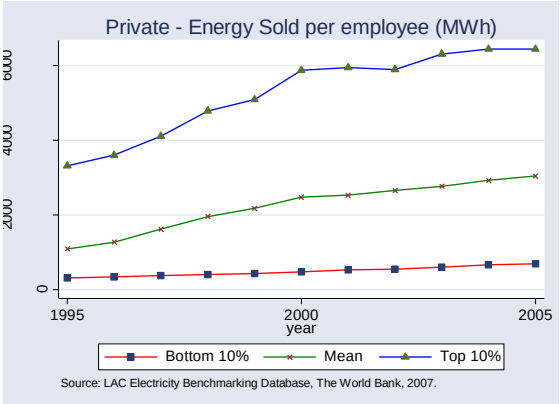
When considering the exceptional improvement in the labor productivity of private utilities, we witness that despite initial conditions in 1995, the private utilities in the mean and top ten percent experienced double the improvement of the public utilities forming the same categories. Nevertheless, it is worth considering that the top ten percent public utilities outperformed the private utilities found in the mean. In addition the public utilities in the mean resulted with double the labor productivity of private utilities in the bottom decile.





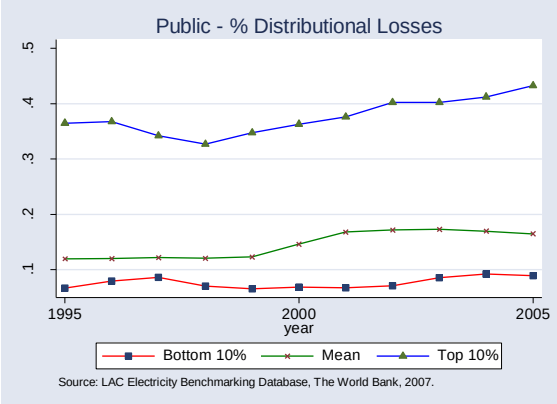
The following figures provide an additional perspective when comparing the labor productivity of public and private utilities. Whereas private utilities are on average more efficient than public utilities, it is worth considering that the public utilities in the top ten percentile surpass the efficiency of the private utilities in the mean. It is also worth noting that the top ten percent of both public and private utilities exhibit a significant increasing trend. On the contrary, the bottom ten percentile of both public and private utilities fall in the same range and maintained their initial level of performance.

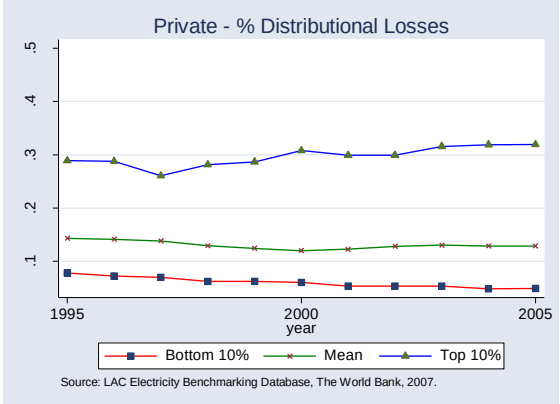




Operating Performance

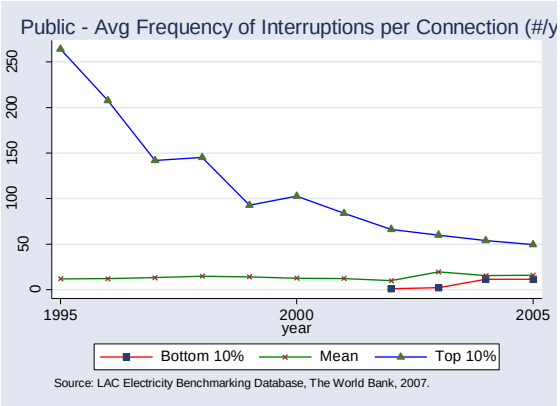
Another dimension to consider when assessing the operating performance of distribution utilities is the performance of the utilities in the decile that benchmarks good performance. In the case of distribution losses, it is noteworthy that the public utilities in the bottom 10 percent perform better than the average private utilities. Likewise the private utilities forming the top decile experience more distribution losses than the average public utilities.

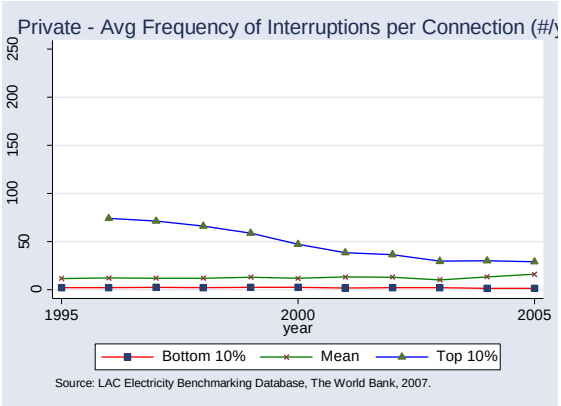




Quality of Service

Despite similar initial conditions, by 2005 there is a significant gap between the average frequency of interruptions characterizing private and public utilities. However, when comparing the top ten percent public and private performers, both utility types result in close proximity. Moreso, the extraordinary reduction in the average frequency of interruptions per connection attest to the improved quality of service for the top ten percent public utilities. A similar trend is noticeable when measuring the average duration of interruptions per connection. Please see Annex 5 for a detailed representation.





4.9 CONCLUSIONS

The results presented in this chapter indicate that on average, private utilities performed better than public utilities with clear differences after the change in ownership. While there have been modest improvements by public utilities, on average, private utilities surpassed the performance (improvement) of public utilities as is evident by indicators measuring labor productivity, distribution losses, quality of service and tariffs.

A key message is that despite the fact that private and public utilities experienced similar initial conditions in 1995, by the end of the decade, the two groups diverged in performance. For instance, when measuring distributional losses, private and public utilities were separated by a 1.4 percentage point gap in 1995, yet by the end of 2005, there was a 4.2 percentage point difference between the two utility types. With respect to labor productivity, in 1995, public utilities resulted with 10.7 percent less residential connections per employee than that of post 1995 privatized utilities, yet by the end of 2005, the labor productivity of post-1995 privatized utilities almost tripled its initial amount, and doubled the amount of the labor productivity of public utilities, which totaled 326 connections per employee in 2005, a 4.5 percent increase over the last decade.

A final notable message is that for the indicators measuring output, labor productivity and operating performance, the top 10 percent public utilities outperformed the average private utilities and the bottom 10 percent private utilities performed poorer than the average public utilities.

CONCLUSIONS

Latin American and Caribbean countries have made significant efforts in improving infrastructure, the backbone of economic activity, and the channel of social integration. Significant progress has been noted in the electricity sector during the last 10 years and describing this process is one of the objectives of this report. A key initiative for both public and private owned distribution utilities has been to upgrade their efficiency as well as to increase the coverage and quality of service. In order to accomplish this goal, this report serves as a clearing house for information regarding the regional, country, and utility level performance of the electricity distribution sector. By providing multiple perspectives of the performance of distribution utilities, this initiative allows countries and utilities to benchmark their performance in relation to other comparator utilities and countries in light of the regional average. In doing so, this benchmarking study contributes to the improvement of the electricity sector by filling in knowledge gaps for the identification of the best performers of the region.

In producing a benchmarking analysis, the report collected detailed information of 26 countries and 250 utilities in the region. An analytical framework was designed to produce a comprehensive description of the sector as well as a mechanism for ranking countries and utilities for best performance. The data collected for this benchmarking project is representative of 88 percent of the electrification in the region. By serving as a mirror of good performance, the report allows for a comparative analysis and the ranking of utilities and countries according to the indicators used to measure performance. Through in-house and field data collection, consultants compiled data to tell various stories about the distribution sector based on accomplishments in output, coverage, labor productivity, input, operating performance, the quality of service, and prices. Based on the results of these performance indicators, the report benchmarks the performance of electricity distribution at the regional, country, and utility-level.

The assessment of distribution performance at the regional level is based on the weighted averages of the distribution utilities representing the regional status of the electricity sector. **The main findings of this report indicate overall improvement across the region during the last decade with significant changes in the following areas:** a ten percentage point increase in coverage reaching 94.6 percent in 2005, a rise in private sector participation from 11 percent of electricity connections in 1995 to 60 percent in 2005, labor productivity that more than doubled and an improvement in the quality of service by more than 40 percent. While there were no clear trends in operational expenditures, overall OPEX grew between 40.8 and 44 percent during the last decade. Concurrently, residential and industrial tariffs (in real terms) doubled since 1995. In contrast, there appeared to be no significant changes in distributional losses.

The second chapter presents the status of electricity distribution at the country-level by using the simple average across countries based on the weighted averages of the utilities. It provides a cross-country comparison that identifies the best performer according to the indicators measured. The utilities are ranked according to their output, coverage, labor productivity, input, operating performance, quality, and prices. **According to the analyses, most countries demonstrate a significant overall improvement in the coverage and labor efficiency of electricity services during the last 10 years.** Chile is amongst the strongest regional leader with 97 percent electricity coverage, labor productivity that is double the regional average, and the lowest distributional losses. In regards to the average residential tariff, Argentina and Peru serve their customers at the lowest rate of $38 and $43 per MWh per year respectively while Paraguay provides industrial consumers the lowest regional tariff of $34. When assessing the overall quality of service by measuring the frequency and duration of interruptions, Mexico takes the lead with a low of 2.19 interruptions per consumer while Ecuador has the lowest duration time, averaging 2 hours.

Another regional forerunner is Peru with one of the most notable improvement trends in labor productivity and distributional losses. Finally, Honduras is noted for the lowest operational expenditures followed closely by Paraguay.

The third chapter assesses the performance of electricity distribution by evaluating the results of the simple average of the 250 utilities included in this study. The method used to benchmark the performance of all the utilities for this initiative was to rank them according to the top ten percent, middle 80 percent, or bottom ten percent of distribution performance. In this chapter, the best performing utilities are listed in the top or bottom ten percent depending on the indicator being measured. **Amongst the characteristics of the top performing utilities are utilities with 100 percent electrification, an average of 897.1 residential connections or 6,402 MWh of energy sold per employee, 6.5 percent distributional losses, and residential prices in the range of $591 per MWh consumed.** The story of the last decade is one of universal electrification and significant improvements of the utilities represented in the middle 80 percent. Electrification increased by almost 15 percentage points for the middle 80 percent resulting in 88 percent coverage while the bottom ten percent increased by 20 percentages points resulting in 61 percent coverage by 2005. The chapter provides three main messages: First, there are significant discrepancies amongst utility performance. Second, there has been an overall improvement of the underperforming utilities during the last ten years. Third, there are cases with significant deterioration in distribution performance as reflected by indicators such as the average tariffs and distributional losses.

Notwithstanding the overall improvements of electricity distributors over the last 10 years, several utilities stand out as a reference point for good performance. *Compania Eléctrica del Rio Maipo* of Chile and *Manaus Energía S.A.* of Brazil lead with more than 3 times the labor productivity of the average utility in the middle eighty percent. With regards to operation expenditures per connection, *Compañía Nacional de Fuerza y Luz* and *Junta Administradora de Servicios Eléctricos de Cartago* of Costa Rica incur the least amount of expenses and operate at 2 percent of the costs of the utilities in the top ten percent. When assessing the best utility performer for the lowest capital expenditures per connection, *Electro Sur S.A.* of Peru has averaged $3.01 per connection for the last 10 years. Furthermore, *C.A. Electricidad de Valencia* provides its residential customers with the lowest tariffs, 4 times less than the utilities in the top ten percent. Finally, *Compañía Força e Luz do Oeste and Empresa Força e Luz de Urussanga Ltda* of Brazil stand out for the least distributional losses. *Empresa Eléctrica Esmeraldas S.A.* of Ecuador provides its customers the best quality of service in the region with 0.96 when measuring the frequency of interruptions while *Empresas Públicas de Medellín E.S.P.* lead with the lowest average duration of 0.54 hours per connection.

In addition, the third chapter reports improvements of the underperforming countries as manifested by the time trends. **In summary, for the time period of 1995-2005, the lower performing countries have doubled their electricity coverage and labor productivity, curtailed the frequency of interruptions per connection by 73 percent and the duration of interruptions by 55.9 percent, and decreased their total expenditures per connection by 26 percent.** As attested by the aforementioned results, significant progress has been made by the majority of the utilities in all categories throughout the last decade.

The last chapter compares the performance of private and public utilities. The main differences in performance are marked by: labor productivity, distribution losses, quality of service, and tariffs. In contrast, other indicators such as coverage and operation expenditures exhibit similar trends and/or do not present significant changes between the groups.

On average, private utilities performed better than public utilities with clear differences after the change in ownership. Significant improvements in labor productivity are a distinguishing factor when assessing the performance of the sector. When measuring the number of connections per employee

in 1995, the labor productivity of post-1995 privatized utilities was only 10.7 percent greater that that of public utilities. Yet by the end of the decade, the labor productivity of post 1995 privatizations increased three-fold and doubled the amount of public utilities. Another indicator exhibiting significant improvement after the change in ownership is that of distribution losses. In 1995, public and post-1995 utilities experienced on average 17.9 and 15.3 distributional losses. However whereas private utilities by 2005 reduced distribution losses by 12.6 percent, public utilities resulted with a 4.9 percent increase.

More remarkable are the cases in which public utilities and post 1995 utilities experienced similar initial conditions in 1995, yet after the change in ownership diverged in their performance. One such instance is noted when assessing the quality of service. In 1995, public utilities experienced on average a frequency of 22 interruptions per connection, 5 interruptions less than that of private utilities. However by the end of the decade, public utilities reduced the average frequency of interruptions by 4 (interruptions), a modest improvement considering that private utilities cut their average frequency on interruptions by half. Moreover, this contradistinction is more evident when comparing the average duration time of private and public utilities. Whereas public and private utilities were separated by one hour duration in 1995, by the end of 2005, public utilities exhibit a 48.8 percent increase in the average duration per connection, while private utilities improved the quality of service by reducing the average duration per connection by 28.2 percent.

There are good public and private utilities and underperforming private and public utilities. For several indicators the top 10 percent public utilities performed better than the average private utilities and in other cases the bottom 10 percent of the private utilities performed worse than the average public utilities. In the case of distribution losses, it is noteworthy that the public utilities in the bottom 10 percent perform better than the average private utilities. Likewise the private utilities forming the top decile experience more distribution losses than the average public utilities.

The benchmarking of the electricity sector reveals the status of distribution services at the regional, country and utility level. In turn, this knowledge is intended to serve as the foundation for setting and achieving higher standards in coverage and services delivery. Furthermore, the comparative analyses provide country and utility-specific direction to the actors that form part of the electricity market. Finally, the all-encompassing purpose of this benchmarking report is to foster knowledge and incentive for the improvement of electricity distribution.

LOOKING AHEAD

While this benchmarking initiative serves as a transparent baseline of electricity distribution utilities in LAC, it calls upon further analytical work to explain the best practices that characterize the region's good or poor performers. An in-depth analysis of the facts presented in this report, would all us to draw conclusions regarding the changes and trends that characterize the region. Future analytical work would focus on questions such as: Why have distribution losses increased by 1.1 percent? How was Peru able to reduce distribution losses by 11 percent? What are the reasons for a 40 – 44 percent increase in OPEX and TOTEX, a 70 to 90 percent increase in tariffs, yet little improvement in distributional losses? What are the reasons for a 2.9 percent decrease in sales despite an increase in the power generated and a 45 percent increase in the number of electricity connections? What is the correlation between prices and performance? And why is there such a wide variance between tariffs in the region?

Understanding *how* and *why* regional, country, and utility performance has improved or worsened would allow Latin American and Caribbean countries to share experiences and learn from each other by appraising what has worked and what has not worked, in order to establish the

strongest possible basis for an efficient and reliable electricity sector in the future. In addition, future analytical work is valuable because it may be used to target potential users such as the private sector, utility managers, political decision makers, policy makers, and regulators, among others. Providing potential users with knowledge about the status and best practices of the electricity sector is providing them the tools for moving forward and additional impetus for reform.

It is equally important to sustain, update and improve the quality of the data used in this benchmarking report, so that it remains an on-going resource for the Bank and the world at large. Efforts to continue data collection and analysis are crucial in order for the World Bank to provide a resource that is continuously valid not only for LAC but also for the other regions.

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ANNEX 1 - METHODOLOGY

The results of this paper serve as a guide to the performance of electricity distribution utilities in 26 countries in the Latin American and Caribbean Region. Sector performance is assessed according to the benchmarking of electricity distribution at regional, country, and utility levels. Broadly defined, benchmarking is the comparison of some measure of actual accomplishment against a reference or benchmark performance (Jamasb and Pollitt [2000]). In this study, the benchmarking model consists of a database containing annual information of 250 private and state-owned utilities using 26 variables indicating coverage, output, input, labor productivity, operating performance, quality and customer services, and prices. The time frame covers data as early as 1990 but the main focus is the period of 1995-2005. It is important to acknowledge that data availability and data sources vary from each respective country, often times depending on their ownership and means of regulation. While the benchmarking study uses a homogenous set of variables for collecting data and measuring performance, each country represents a special case and therefore efforts were made to assure consistency of the data across time and utility. The following sections define the indicators used, describe the process of data collection, and explain the efforts and challenges encountered in the completion of the database.

The Process of Data Collection:

Data for each performance indicator was registered in a database with a detailed description of sources and collected variables, including comments clarifying the methodology used in the cases where variables were constructed or proxies used. For each identified indicator in the database, information was collected at country and utility level in order to have a product that could be compared across the region. In order to obtain such a cross-country product, data sources and categories were standardized and keen attention was given to the consistency of units. Necessary conversions were performed in electrical units or monetary currency in order to have an equivalent comparison. Furthermore, the data was collected with sensitivity to the variance in size of each respective country and utility, as well as other factors such as the time and process of privatization, geography, and subsidies.

The primary means of conducting research was field data collection and in house data collection. A standard template and set of variables was used by both field and in house consultants. Field consultants collected data to complement the information in some of the countries (see Annex 2 – Source of the data). Due to limited information available on the web for these countries, local consultants were the most resourceful. For these selected countries and utilities a preliminary feasibility screening was conducted in order to determine which countries would be likely to provide information. While field workers had direct access to the respective utility and government, the process of data collection was often hindered by unexpected factors such as: political affairs, bureaucracy, un-systematized data, and confidentiality issues, among other elements.

The main sources for the in house data collection were the World Wide Web, information collected by staff bank for other projects, and the internal World Bank Databases (SIMA, IRIS, etc.). The main source of information on the internet was the utility's website. For some countries, the following proved to be useful sources: regulators, ministries, partnerships, central banks, online financial journals, papers, loan reports, financial reports, annual reports, monthly bulletins, statistics offices, and contacts with the companies and regulators. In addition, the following associations and organizations provided valuable statistics for the region: ARIAE (*Asociación Iberoamericana de Entidades Reguladores de Energía*), ECLAC (*Economic Commission for Latin America and the Caribbean*), IEA (*International Energy Agency*), and CIER (*Comisión de Integración Energética Regional*). However, since regulators and international organizations or and commissions cover the electricity distribution of the entire region, most of the information provided was aggregated at country level and not disaggregated by utility. One of the challenges of data collection was the inconsistency between the data provided by utilities or regulators in

annual and financial reports. Considering this, appropriate calculations and approximations were made to construct missing data points. For example, through the method of interpolation, data was constructed for the earlier years of certain variables such as number of connections, number of employees, etc. However, it is essential to note that interpolation and other means of constructing data was the exception based on already concrete data and time trends. Specific methodologies were designed according to the variables at hand in order to ensure their comparability and consistency across time and utilities.

For the results presented at country and regional level, the values were averaged weighting the observations by the size of the utility (measured as the number of total connections). In order to avoid misleading tendencies due to the change in the composition of the sample, we computed the annual growth rate for each indicator and for each utility after which we aggregated these values for each year in order to calculate the weighted annual change. In order to define the average level, we computed the weighted average for 2002 and then imputed the annual change calculated before in order to build the time series. Finally, we filtered the annual growth rates out of the 3-standard deviation range from the mean in order to exclude outlier values.

Performance Indicators:

In order to best describe the efficiency of the distribution sector of LAC, indicators were selected to determine utility-level performance. The utility-level indicators reflect relevant and feasible measurements in depicting the distribution segment of the electricity sector. The utility-level indicators were computed in order to measure factors such as technical efficiency, operating efficiency, cost efficiency, quality of service, etc. Technical efficiency is defined as the capacity of the utility to achieve maximum output from a given set of inputs. In order to compute the technical efficiency of a utility, output and input indicators reflecting operating and cost efficiency were aggregated.

The following table lists the output variables used in this benchmarking study. The data collected for the output variables are the prime indicators of a utility's efficiency. In the cases that data were not found according to the selected or designed variables, the second best option was selected. For example, when the Total number of connections was not available, the Total number of clients was used instead. Similarly, the Total electricity sold per year was also calculated and defined by several utilities as the Total electricity produced and thus used as a proxy once corrected for distributional losses.

OUTPUT VARIABLES		
1	Total Number of Connections (Residential and Non-residential) in the utility area.	number
2	Total number of residential connections in the utility area	number
3	Total electricity sold per year	MWh
4	Length of distribution network	km
5	Energy sold per connection per year	MWh

With respect to measuring the total cost efficiency, the following input indicators were calculated:

INPUT VARIABLES		
6	Total number of employees	number
7	OPEX (operation expenditures) of the distribution services per connection.	in dollars
8	CAPEX (capital expenditures) of the distribution	in dollars

	services per connection.	
9	TOTEX (total expenditures) of the distribution services per connection.	in dollars
10	OPEX of the distribution services per MWh sold.	in dollars
11	CAPEX of the distribution services per MWh sold.	in dollars
12	TOTEX of the distribution services per MWh sold.	in dollars

OPEX consists of operating and maintenance costs, customer service and accounts expenses, sales expenses, administrative, and general expenses. Usually, the biggest items of OPEX were labor, materials, and third party service contract expenses. While OPEX reflects the operations of the distribution segment, it does not include purchases of electricity, taxes, transmission payments, and at times depreciation. CAPEX consists of the expenditures to acquire, expand, repair, or renovate fixed assets, implying the purchase of goods and services whose benefits extend beyond the year and add to the company's assets. CAPEX represents the annual gross capital outlays of a company.

However when calculating CAPEX and OPEX, there were several cases in which CAPEX and OPEX had overlapping or disaggregated amounts, making it difficult to calculate them or establish TOTEX. In addition, each country calculated and presented CAPEX and OPEX amounts differently according to their distinct accounting styles. When operating and capital expenditures were provided by the utility or regulator, that amount was registered. In the cases that OPEX and CAPEX were not provided, the amounts were aggregated according to the criteria mentioned above. Furthermore, collecting data for the average wholesale price, average transmission charges, and number of employees posed a challenge when the respective utility was vertically integrated, managing generation, transmission, and distribution. In such cases, the utility often times did not provide the internal price of transference but rather only accounted for the end user price.

With respect to labor productivity, two variables were used: residential connections per employee and energy sold per employee.

LABOR PRODUCTIVITY		
13	Number of Residential Connections per Employee	#
14	Energy Sold per Employee	MWh

When assessing labor productivity, it is worth noting that this value is affected by factors such as increased private participation and population growth in the case of residential connections per employee, and distributional losses when calculating energy sold per employee. With increased private participation and the unbundling of the sector, electricity utilities significantly reduced the number of employees. After the separation of electricity generation, transmission, and distribution, we gathered the total employment information for each of the segments in order to compute the average change before and after the reforms. For consistency purposes, we imputed the total percent reduction in each of the segments in order to have a proportionally similar drop in the number of employees.

The indicators used to measure operating performance consist of the energy losses (percent) in distribution, disaggregated, when possible, as technical and non-technical losses. While technical losses represent the energy lost in the network for physical reasons, non-technical losses represents the amount of energy stole from the system. While the selected variable set reflects the operating performance of electricity distribution, the study also accounts for external factors that may impact efficiency such as the environment and customer density per network.

OPERATING PERFORMANCE

15	Energy losses in distribution per year (due to technical losses and illegal connections)	percentage
16	Energy losses in distribution per year due to technical losses	Percentage
17	Energy losses in distribution per year due to non-technical losses (illegal connections)	Percentage

In addition, the benchmarking study included the following variables to indicate quality and customer services.

QUALITY AND CUSTOMER SERVICES		
18	Average duration of interruptions per subscriber	hours / year
19	Average frequency of interruptions per subscriber	# interruptions / year
20	Number of residential subscribers per 100 households in the concession area (Residential coverage)	# / 100 households

When calculating the average duration and frequency of interruptions per subscriber, the majority of the information found expressed this information according to the standard international measures: ***SAIDI,*** System Average Interruption Duration Index (calculated by dividing the sum of all customer interruption durations, in minutes, by the total number of customers served) and ***SAIFI,*** System Average Interruption Frequency Index (calculated by dividing the total number of sustained customer interruptions by the total number of customers served). However, some countries such as Guatemala reported the quality of service in terms of TTIK (Total interruption time per kVA) and FMIK (Mean frequency of Interruption per kVA). In such cases, TTIK was used as a proxy after accounting for the difference in units.

When considering the variables for measuring quality and customer services, the recent trend reflects a greater emphasis on quality indicators as countries recognize the importance of measuring quality and customer service. Considering that most countries have only recently started to measure and report the quality of their services, the data collected for these variables is fragmented and, in some cases, inadequate. For example the average duration of interruptions was sometimes presented in hours, days, or minutes, depending on the country, year, and report. In light of this, the study accorded careful attention to measures of consistency and trends over time.

Finally, in order to determine the relationship between prices and cost, the study measured the allocative efficiency of each utility. The following indicators were used to measure allocative efficiency.

PRICES		
21	Average residential tariff	dollars / MWh
22	Average industrial tariff	dollars / MWh

Appendix: Definition of the variables

A. Output Variables:

1. ***Total Number of Connections (Residential and Non-residential) in the utility area***. This is the total number of connections (subscribers) in the utility area (i.e. Number of residential and non-residential connections)

2. ***Total number of residential connections in the utility area.*** This is the total number of residential connections (subscribers) in the utility area.
3. ***Total electricity sold per year.*** This is the total electricity supplied in MWh or the amount of electricity that was put on the network.
4. ***Length of distribution network.*** The length (km) of the network was reported by voltage. Only networks whose voltages are classified by the country's regulator as distribution were added in the distribution network length measure.
5. ***Energy sold per connection.*** This is the ratio between the Total energy sold per year and the Total number of connections.

B. Input Variables:

6. ***Total number of employees.*** This is the total number of employees related to electricity distribution activities. When the end of the year number was not available, then the Full Time Employment number (FTE) was used. Outsourced labor was added as an Extra variable at the end of the excel sheet.
7. ***OPEX (operation expenditures) of the distribution services per connection (in dollars).*** OPEX consists of operating and maintenance costs, customer service and accounts expenses, sales expenses, administrative and general expenses. Usually, the biggest items of OPEX were labor, materials and third party service contract expenses. OPEX reflects the operations of the distribution segment and therefore do not include depreciation. Nominal values were converted to nominal dollars. Finally, for each year observation, we divided OPEX by the number of total connections.
8. ***CAPEX (capital expenditures) of the distribution service per connection (in dollars).*** CAPEX consists of the expenditures to acquire, expand, repair, or renovate fixed assets, implying the purchase of goods and services whose benefits extend beyond the year and add to the company's assets. CAPEX represents the annual gross capital outlays of a company. Nominal values were converted to nominal dollars. Finally, for each year observation, we divided OPEX by the number of total connections.
9. ***TOTEX (total expenditures) of the distribution service per connection (in dollars).*** TOTEX is the sum of OPEX and CAPEX (TOTEX = OPEX + CAPEX). Nominal values were converted to nominal dollars. Finally, for each year observation, we divided by the number of total connections.
10. ***OPEX of the distribution services per MWh sold (in dollars).*** Same OPEX definition provided above but divided by the total energy sold.
11. ***CAPEX of the distribution service per MWh sold (in dollars).*** Same CAPEX definition provided above but divided by the total energy sold (in MWhs).
12. ***TOTEX of the distribution service per MWh sold (in dollars).*** Same TOTEX definition provided above but divided by the total energy sold (in MWhs).

C. Labor Productivity:

13. ***Residential Connections per Employee***: This is the division of the number of residential connections by the number of employees.
14. ***Energy Sold per Employee***: This is the division of the energy sold in MWh by the number of employees.

D. Operating Performance:

15. ***Total Energy losses in distribution per year (due to technical losses and illegal connections)*** Total Energy losses. Total distribution losses is the sum of technical and non-technical (commercial losses).

16. ***Energy losses in distribution per year due to technical losses.*** Energy losses due to technical reasons (i.e. Dissipation of power in electrical system components).
17. ***Energy losses in distribution per year due to non-technical losses.*** Energy losses due to non-technical or commercial losses (i.e. Theft of service (illegal connections) and losses due to failure in the billing system).

E. Quality and Customer Services:

18. ***Average duration of interruptions per subscriber.*** This is the number of hours-subscriber the system was without power in a year, divided by the total number of subscribers. The equivalent is ***SAIDI,*** System Average Interruption Duration Index calculated by dividing the sum of all customer interruption durations, in minutes, by the total number of customers served.
19. ***Average frequency of interruptions per subscriber.*** The average number of interruptions experienced by a consumer unit during one year. The equivalent is ***SAIFI,*** System Average Interruption Frequency Index calculated by dividing the total number of sustained customer interruptions by the total number of customers served.
20. ***Number of residential subscribers per 100 households in the concession area (Residential coverage).*** Ration of residential connections per 100 households (within the area of operation). In other words, the percentage of households connected in each concession area (residential service coverage = residential connection / number of households).

F. *Prices:*

21. ***Average residential tariff.*** The average price per MWh of electricity sold to residential consumers, including both fixed and variable components, in local nominal currency.
22. ***Average industrial tariff.*** The average price per MWh of electricity sold to industrial consumers, including both fixed and variable components, in local nominal currency.

ANNEX 2 - SOURCES OF INFORMATION BY COUNTRY

Three main sources of information were used to compile data for the benchmarking analysis of the electricity distribution sector for Latin American and Caribbean countries: the study "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"* [10], the study "*An Empirical Assessment of Private Sector Participation in Electricity and Water Distribution in Developing Countries*"[11], a benchmarking database compiled by Martin Rossi, and the study "*The Feasibility of Regional Cooperation in Regulation of the Electricity Sector of the Eastern Caribbean States*."[12]

In addition, regional sources were consulted. These sources comprise of the *Asociación Iberoamericana de Entidades Reguladoras de Energía* (ARIAE), the *Comisión de Integración Eléctrica Regional* (CIER), the Internacional Association for Energy Economics (IAEE), the Internacional Energy Agency (IEA), and in some cases the *Alianza en Energía y Ambiente con Centroamérica* (AEA), and the Energy Information Administration of the US government (EIA).

1. Argentina

Data for Argentina was obtained using different sources. In total there is data for 38 companies. Most of the data was integrated using the three main sources: the study *"Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"* which supplied data for about 18 companies, the study "*An Empirical Assessment of Private Sector Participation in Electricity and Water Distribution in Developing Countries"* which provided data for 7 companies, and the database provided by Martin Rossi which contributed with 13 companies and complemented some missing observations from the previous two sources. In-house collection was done by reviewing sources such as the *Ente Nacional Regulador de la Energía Eléctrica* (ENRE) and the *Asociación de Distribuidores de Energía Eléctrica de la República Argentina* (ADEERA).

2. Belize

Data gathering for the only electricity distribution company in the country was accomplished in-house. The main source of information was the company's website and the annual reports published there.

3. Bolivia

The main sources of data are the study *"Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"* and in-house collection. Through these channels, it was possible to gather data for 7 companies. The sources used for the in-house collection are: *Superintendencia de Electricidad* (SIE), *Comisión Nacional de Despacho de Carga* (CNDC), the *Sistema de Regulación Sectorial* (SIRESE), and the *Instituto Nacional de Estadística* (INE). In addition, the companies' websites, if any, were also consulted.

4. Brazil

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[10] Andres, L. V. Foster, and J.L. Guasch. "Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries," World Bank, forthcoming 2007.

[11] Gassner, K. A. Popov, and N. Pushak. "An Empirical Assessment of Private Sector Participation in Electricity and Water Distribution in Developing Countries," World Bank, forthcoming 2007.

[12] Schwartz, J. "The Feasibility of Regional Cooperation in Regulation of the Electricity Sector of the Eastern Caribbean States," World Bank, January 2007.

This country represented a challenge as the number of electricity distribution companies is very large. Therefore, different approaches for data gathering were followed here. Some of the data was obtained from the study *"Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"*, totaling 45 companies. Some more companies were obtained from the study "*An Empirical Assessment of Private Sector Participation in Electricity and Water Distribution in Developing Countries"*, which accounted for 5 more companies. Data shared by Martin Rossi advanced the completion of some indicators in the database. In addition, a local consultant gathered data for 10 more companies. Several sources of data were used in the in–field data gathering process. The most effective was direct contact with the companies and the departments which are in charge of documenting such information. In-house collection was accomplished by consulting sources such as the *Agência Nacional de Energía Elétrica* (ANEEL), the *Associação Brasileira de Distribuidores de Energia Eléctrica* (ABRADEE), and the *Câmara de Comercializacão de Energia Elétrica* (CCEE)

5. Chile

Chile also posed a challenge in the data collection process as it has several electricity distribution companies. Since the regulatory system works efficiently and companies are accountable, information is available. Identifying the 36 companies was done by using the information from the study *"Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"*. However, some of the information was fragmentary, and in some cases very limited. Therefore, a local consultant was hired in order to fill in the missing information for the 36 companies in Chile. In addition, information was obtained from the *Comisión Nacional de Energía* (CNE), the *Superintendencia de Electricidad y Combustibles* (SEC), and the individual distribution firms.

6. Colombia

When gathering data for this country, we grouped the data already collected for 3 companies according to the study "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries*" and by the study *"An Empirical Assessment of Private Sector Participation in Electricity and Water Distribution in Developing Countries"*, which accounted for 7 more companies. In house work was performed to complete some variables missing in the previous studies, while a local consultant was hired to collect data for 12 more companies, for a total of 22 electricity distribution firms. The main sources of data for Colombia were the *Comisión de Regulación de Energía y Gas* (CREG), the *Superintendencia de Servicios Públicos Domiciliarios*, and the *Sistema Único de Información de Servicios Públicos* (SUI), in addition to individual distribution firms.

7. Costa Rica

A local consultant was in charge of the data collection of four companies in Costa Rica: ICE, CNFL, ESPH, and JASEC. The data was obtained from direct consultation with the firms. The rest of the companies (four cooperatives) included in this analysis were obtained from the study "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries*". Information provided by Martin Rossi contributed to the completion of some of the missing variables, particularly for years previous to 2000. In addition to the electricity distribution firms, the *Autoridad Reguladora de los Servicios Públicos* (ARESEP) and the *Ministerio de Energía y Ambiente* (MINAE) were also consulted.

8. Dominican Republic

In-house data collection was carried out to obtain data for 3 electricity distribution companies in

the Dominican Republic. Data was obtained from the publication "Memorias 2000-2004 EDENORTE" and "Memorias 2000-2004 EDESUR" published by the *Corporación Dominicana de Empresas Electricas Estatales*. Additional data was obtained from the websites of the companies.

9. Ecuador

The *Consejo Nacional de Electricidad* (CONELEC), through its different divisions, was the main provider of data for this country. CONELEC's Rates Division, Supervision Division, and Planning Division were useful in the data gathering. In addition, data was obtained from the Central Bank of Ecuador. The rest of the data was obtained directly for each one of the companies listed in the study. An in-field consultant was in charge of coordinating the data collection in Ecuador.

10. El Salvador

The main source of data for El Salvador's five electricity distribution companies was the study "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries".* In addition, in-house collection of data was accomplished using the following sources: *Superintendencia General de Electricidad y Telecomunicaciones* (SIGET), the *Ministerio de Economía* (MINEC), the *Asociación Salvadoreña de Industriales* (ASI), the *Ente Operador del Mercado Eléctrico Regional* (EOR), the *Administradora del Mercado Mayorista de Energía Eléctrica de El Salvador* (also known as Unidad de Transacciones, UT), and the websites of the companies.

11. Guatemala

For this country, the study "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"* was used as well as in-house work that focused on the main 4 companies in the country. The four companies cover the majority of the electricity market in Guatemala. The main sources included the *Comisión Nacional de Energía* (CNEE) and the *Administrador del Mercado Mayorista* (AMM).

12. Honduras

Data for Honduras' *Empresa Nacional de Energía Eléctrica* (ENEE) was collected in-house. Data sources included the *Comisión Nacional de Energía* (CNE) and the website for the *Empresa Nacional de Energía Eléctrica*.

13. Mexico

In this case, data was obtained by direct request through the Ministry of Energy in Mexico. The office of the Vice ministry of Electricity contacted the two electricity companies in Mexico (CFE and LyFC) and requested the data which was compiled for this study.

14. Nicaragua

Data for the two Nicaraguan electricity distribution companies was obtained from the study "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"*, and by means of in-house collection. The sources for the in-house collection were: *the Instituto Nicaragüense de Energía* (INE), the *Comisión Nacional de Energía* (CNE), the *Centro Nacional de Despacho de Carga* (CNDC), the Public Services International Research Unit (PSIRU), the *Unidad de Reestructuración de ENEL* (URE), the *Instituto Nacional de Estadísticas y Censos* (INEC), in addition to companies' websites.

15. Panama

Data for the three Panamanian companies was obtained from the study "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"*, and through in-house collection. The sources for the in-house collection were: *Autoridad Nacional de Servicios Públicos* (also known as *Ente Regulador de Servicios Públicos*, ERSP) and the *Bolsa de Valores de Panamá* (PANABOLSA), in addition to the websites of the companies.

16. Paraguay

Because of the structure of the electricity sector in Paraguay, a local consultant with extensive knowledge of the electricity sector was hired. (ANDE) a large company in Paraguay accounts for almost all the market. In addition, an effort was made to gather some data of a smaller company CLYFSA. In-house work was done and a request for information was sent to ANDE. The local consultant followed up with the request and dealt with the questions and comments regarding the quality of data and technical details. The main sources are the distribution companies (ANDE and CLYFSA).

17. Peru

Peru also used the three main sources of data: the studies "*Impact of Privatization on Firms in the Infrastructure Sector in the Latin American Countries"*, which contributed data for 10 companies, and "*An Empirical Assessment of Private Sector Participation in Electricity and Water Distribution in Developing Countries"*, which contributed data for 7 companies. Rossi's data base was used to complete the information gaps for the 17 companies. In addition, in-house work was performed to obtain financial indicators through the *Organismo Supervisor de Inversión en Energía* (OSINERG).

18. Uruguay

The data for this country was obtained by direct request to the utility and after in-house review of external sources of information and of the *Unidad Reguladora de los Servicios de Agua y Energía* (URSEA). The bulk of data was granted by different departments within UTE, after direct approval from the president of the company.

19. Venezuela

Partial information for 13 companies has been gathered for this country. Data for Venezuela came from two sources: electricity distribution companies, by means of in-house collection, and data provided by Martin Rossi. In-house collection relied on the following sources: the Fundación para el *Desarrollo del Servicio Eléctrico* (FUNDELEC), the *Cámara Venezolana de la Industria Eléctrica* (CAVEINEL), the *Oficina de Operación de Sistemas Interconectados* (OPSIS), and the *Superintendencia para la Promoción y Protección de la Libre Competencia* (Procompetencia). In those cases where it was possible, the websites of the different companies were consulted.

20. Caribbean

The following countries are part of the Caribbean and are significantly smaller than the rest of the region. In most of these countries the energy sector is significantly small and every country has one or two electricity distribution companies. In addition, countries have done little recording of past statistics, marking it difficult to gather consistent data.

For these countries, in-house collection was the primary mean of data collection extracting

information from different projects that the World Bank has implemented in the Caribbean. The main reference for these countries was data gathered by Jordan Schwartz who has been working with these countries. He shared data from **Antigua and Barbuda, Dominica**, **Grenada**, **St. Kitts and Nevis**, **St. Lucia**, and **St. Vincent and the Grenadines.**

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ANNEX 3 - LIST OF UTILITIES COVERED IN THIS REPORT

Country	Acronyms	Name
Antigua and Barbuda	APUA	Antigua Public Utilities Authority
Argentina	APELP	Administración Provincial de Energía de la Pampa
Argentina	Coop TANDIL	Coop. Agropecuaria de Tandil Limitada
Argentina	Coop AZUL	Coop. Eléctrica de Azul Ltda.
Argentina	Coop CHACABUCO	Coop. Eléctrica de Chacabuco Ltda.
Argentina	Coop PERGAMINO	Coop. Eléctrica de Serv. Anexos de Vivienda y Crédito de Pergamino Ltda.
Argentina	Coop LUJAN	Coop. Eléctrica y Servicios Públicos Lujanense Ltda.
Argentina	Coop MORENO	Coop. Eléctrica y de Servicios Mariano Moreno Ltda. 9 de Julio
Argentina	Coop SALTO	Coop. Limitada de Consumo de Electricidad del Salto
Argentina	Coop OLAVARRIA	Coop. Ltda. de Consumo de Electricidad y Serv. Anexos de Olavaria
Argentina	Coop GUALEGUACU	Coop. de Consumo de Electricidad y Afines de Gualeguaychú LTDA
Argentina	Coop ZARATE	Cooperativa de Electricidad y Servicios Anexos Ltda. De Zarate
Argentina	Coop SAN PEDRO	Coop. de Provisión de Serv. Eléctricos Públicos y Sociales de San Pedro Ltda.
Argentina	Coop COLON	Coop. de Provisión de Serv. Eléctricos y Sociales, Vivienda y Crédito Colón Ltd
Argentina	DPEC	Dirección Provincial de Energía de Corrientes
Argentina	EMSA	Electricidad de Misiones S.A.
Argentina	EDESAL	Empresa Distribuidora San Luis S.A.
Argentina	EDESUR	Empresa Distribuidora Sur S.A.
Argentina	EDEMSA	Empresa Distribuidora de Electricidad de Mendoza S.A.
Argentina	EDESE	Empresa Distribuidora de Electricidad de Santiago del Estero S.A.
Argentina	EDELAR	Empresa Distribuidora de Electricidad de la Roja S.A.
Argentina	EDESTESA	Empresa Distribuidora de Electricidad del Este S.A.
Argentina	EDEA	Empresa Distribuidora de Energía Atlántica
Argentina	EDELAP	Empresa Distribuidora de Energía La Plata S.A.
Argentina	EDEN	Empresa Distribuidora de Energía Norte S.A.
Argentina	EDES	Empresa Distribuidora de Energía Sur S.A.
Argentina	EDECAT	Empresa Distribuidora de Energía de Catamarca S.A.
Argentina	EDEFOR	Empresa Distribuidora de Energía de Formosa S.A.
Argentina	EDENOR	Empresa Distribuidora y Comercializadora Norte S.A.
Argentina	EJE	Empresa Jujeña de Energía S.A.
Argentina	EPEC	Empresa Provincial de Energía de Córdoba
Argentina	EPESF	Empresa Provincial de la Energía de Santa Fe
Argentina	EDET	Empresa de Distribución Eléctrica de Tucumán S.A.
Argentina	EDERSA	Empresa de Energía Rió Negro
Argentina	EDESA	Empresas Distribuidora de Electricidad de Salta S.A.
Argentina	ESJ	Energía San Juan S.A.
Argentina	EDEERSA	Energía de Entre Ríos S.A.
Argentina	EPEN	Ente Provincial de Neuquén
Argentina	SECHEEP	Servicios Energéticos del Chaco Empresa del Estado Provincial
Belize	BEL	Belize Electricity Limited
Bolivia	CESSA	Compañía Eléctrica de Sucre S.A.
Bolivia	CRE	Cooperativa Rural de Electrificación - ÁREA INTERGRADA
Bolivia	ELECTROPAZ	Electricidad De La Paz S.A.
Bolivia	ELFEC	Empresa de Luz y Fuerza Eléctrica Cochabamba S.A.

Bolivia	ELFEO	Empresa de Luz y Fuerza Eléctrica Oruro S.A.
Bolivia	SEPSA	Servicios Eléctricos Potosí
Bolivia	SETAR - CENTRAL	Servicios Eléctricos Tarija S.A.
Brazil	AES Sul	AES SUL Distribuidora Gaúcha de Energia S/A
Brazil	BANDEIRANTE	Bandeirante Energia S/A.
Brazil	BOVESA	Boa Vista Energia S.A.
Brazil	CNEE	CNEE - Companhia Nacional de Energia Elétrica (Southeast region)
Brazil	CAIUA	Caiuá Serviços de Eletricidade S/A.
Brazil	CEMAT	Centrais Elétricas Matogrossenses S/A.
Brazil	CELESC	Centrais Elétricas Santa Catarina S/A
Brazil	ELETROCAR	Centrais Elétricas de Carazinho S/A.
Brazil	CERON	Centrais Elétricas de Rondônia S/A
Brazil	CELPA	Centrais Elétricas do Pará S/A
Brazil	COCEL	Companhia Campolarguense de Energia
Brazil	CEAM	Companhia Energetica do Amazonas
Brazil	CELB	Companhia Energética da Borborema
Brazil	CEAL	Companhia Energética de Alagoas
Brazil	CEB	Companhia Energética de Brasília
Brazil	CELG	Companhia Energética de Goiás
Brazil	CEMIG	Companhia Energética de Minas Gerais
Brazil	CELPE	Companhia Energética de Pernambuco
Brazil	COELCE	Companhia Energética do Ceará
Brazil	CEMAR	Companhia Energética do Maranhão
Brazil	CEPISA	Companhia Energética do Piauí
Brazil	COSERN	Companhia Energética do Rio Grande do Norte
Brazil	CEEE	Companhia Estadual de Energia Elétrica
Brazil	CFLCL	Companhia Força e Luz Cataguazes - Leopoldina
Brazil	CFLO	Companhia Força e Luz do Oeste
Brazil	CHESF	Companhia Hidro Elétrica do São Francisco
Brazil	CJE	Companhia Jaguari de Energia
Brazil	CLFSC	Companhia Luz e Força Santa Cruz
Brazil	COPEL	Companhia Paranaense de Energia
Brazil	CPEE	Companhia Paulista de Energia Elétrica
Brazil	CPFL	Companhia Paulista de Força e Luz
Brazil	CPFL	Companhia Paulista de Força e Luz - Piratininga
Brazil	SULGIPE	Companhia Sul Sergipana de Eletricidade
Brazil	CENF	Companhia de Eletricidade Nova Friburgo
Brazil	ELETROACRE	Companhia de Eletricidade do Acre
Brazil	CEA	Companhia de Eletricidade do Amapã
Brazil	COELBA	Companhia de Eletricidade do Estado da Bahia
Brazil	CERJ	Companhia de Eletricidade do Rio de Janeiro
Brazil	CELTINS	Companhia de Energia Elétrica do Estado do Tocantins
Brazil	CLFM	Companhia de Luz e Força Mococa
Brazil	DEMEI	Departamento Municipal de Energia de Ijuí
Brazil	ELEKTRO	Elektro Eletricidade e Serviços S/A.
Brazil	ELETROPAULO	Eletropaulo Metropolitana – Eletricidade de São Paulo S/A
Brazil	EEB	Empresa Elétrica Bragantina S.A.
Brazil	ENERSUL	Empresa Energética de Mato Grosso do Sul S/A.
Brazil	ENERGIPE	Empresa Energética de Sergipe
Brazil	EFLUL	Empresa Força e Luz de Urussanga Ltda
Brazil	ELFSM	Empresa Luz e Força Santa Maria S/A

Brazil	EEVP	Empresa de Eletricidade do Vale do Paranapanema
Brazil	ESCELSA	Espírito Santo Centrais Elétricas S/A.
Brazil	FORCEL	Força e Luz Coronel Vivida Ltda
Brazil	PANAMBI	Hidroelétrica Panambi S/A (HIDROPAN)
Brazil	LIGHT	Light Serviços de Eletricidade S/A
Brazil	MANAUS	Manaus Energia S/A
Brazil	MUXFELDT	Muxfeldt Marin & Cia. Ltda
Brazil	RGE	Rio Grande Energia S/A
Brazil	SAELPA	Saelpa S/A de Eletrificação da Paraíba
Brazil	NOVAPALMA	Usina Hidroelétrica de Nova Palma
Chile	CHILECTRA	Chilectra S.A.
Chile	CODINER	Compañía Distribuidora de Energía S.A.
Chile	LUZ OSORNO	Compañía Eléctrica Osorno S.A.
Chile	CONAFE	Compañía Nacional de Fuerza Eléctrica S.A.
Chile	LITORAL	Compañía Eléctrica del Litoral S.A.
Chile	RIO MAIPO	Compañía Eléctrica del Rió Maipo S.A.
Chile	CGE	Compañía General de Electricidad S.A.
Chile	COELCHA	Cooperativa Eléctrica de Charrúa
Chile	COOP. CURICO	Cooperativa Eléctrica de Curicó S.A.
Chile	COOPELAN	Cooperativa Eléctrica de Los Angeles S.A.
Chile	SOCOEPA	Cooperativa Eléctrica de Paillaco S.A.
Chile	ELECOOP	Cooperativa Eléctrica del Limarí
Chile	COOPREL	Cooperativa Rural Eléctrica de Rió Bueno Ltda
Chile	COPELEC	Cooperativa de Consumo de Energía Eléctrica de Chillán
Chile	LUZPARRAL	Distribuidora Parral S.A. (LUZPAR LTDA.)
Chile	CHILQUINTA	Enerquinta (Chilquinta Energies S.A.)
Chile	EMEC	Empresa Eléctrica EMEC S.A.
Chile	TIL TIL	Empresa Eléctrica Municipal de Til-Til
Chile	EEPA	Empresa Eléctrica Puente Alto Ltda.
Chile	ELECDA	Empresa Eléctrica de Antofagasta S.A.
Chile	EMELARI	Empresa Eléctrica de Arica S.A.
Chile	EMELAT	Empresa Eléctrica de Atacama S.A.
Chile	EDELAYSEN	Empresa Eléctrica de Aysen S.A.
Chile	EMELCA	Empresa Eléctrica de Casablanca S.A.
Chile	EEC (Colina)	Empresa Eléctrica de Colina S.A.
Chile	ELIQSA	Empresa Eléctrica de Iquique S.A.
Chile	EDELMAG	Empresa Eléctrica de Magallanes S.A.
Chile	EMELECTRIC	Empresa Eléctrica de Melipilla, Colchagua y Maule S.A.
Chile	EMETAL	Empresa Eléctrica de Talca S.A.
Chile	FRONTEL	Empresa Eléctrica de la Frontera S.A.
Chile	EDECSA	Energía de Casablanca S.A.
Chile	GEDELSA	GEDELSA
Chile	LUZANDES	Luz Andes S.A. (Lo Barnechea)
Chile	LUZLINARES	Luz Linares S.A. (LuzAgro LTDA.)
Chile	SAESA	Sociedad Austral de Electricidad S.A.
Chile	SEP	Sociedad Eléctrica de Pirque S.A.
Colombia	CODENSA	CODENSA S.A. ESP
Colombia	CHEC	Central Hidroeléctrica de Caldas S.A. ESP
Colombia	CENS	Centrales Eléctricas del Norte de Santander
Colombia	CEDENAR	Centrales Eléctricas de Nariño S.A. ESP
Colombia	CEDELCA	Centrales Eléctricas del Cauca S.A. ESP

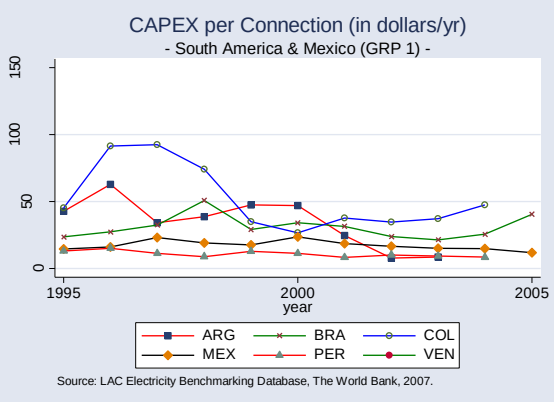
Colombia	TULUA	Compañía de Electricidad del Tulúa S.A. ESP
Colombia	ElectroCosta	Electrificadora de La Costa Atlántica S.A.
Colombia	ElectriCaribe	Electrificadora del Caribe S.A. E.S.P.
Colombia	ESSA	Electrificadora de Santander (Bucaramanga)
Colombia	ELECTROHUILA	Electrificadora del Huila S.A. ESP
Colombia	EMSA	Electrificadora del Meta S.A. ESP
Colombia	ELECTOLIMA	Electrificadora del Tolima S.A ESP
Colombia	EADE	Empresa Antioqueña de Energía S.A. E.S.P
Colombia	EDEQ	Empresa de Energía Eléctrica del Quindio S.A. E.S.P.
Colombia	EPSA	Empresa de Energía del Pacifico
Colombia	EBSA	Empresa de Energía de Boyaca ESP
Colombia	EEC	Empresa de Energía de Cundinamarca S.A. E.S.P.
Colombia	EEP	Empresa de Energía de Pereira S.A. ESP
Colombia	PUTUMAYO	Empresa de Energía de Putumayo S.A. ESP
Colombia	EEAMAZONAS	Empresa de Energía del Amazonas S.A. ESP
Colombia	EMCALI	Empresas Municipales de Cali Eice
Colombia	EEPPMM	Empresas Públicas de Medellín E.S.P.
Costa Rica	CNFL	Compañía Nacional de Fuerza y Luz
Costa Rica	Coopealfaro	Cooperativa de Electrificación Rural de Alfaro Ruiz
Costa Rica	Coopeguana	Cooperativa de Electrificación Rural de Guanacaste
Costa Rica	Coopesantos	Cooperativa de Electrificación Rural de Los Santos
Costa Rica	Coopelesca	Cooperativa de Electrificación Rural de San Carlos
Costa Rica	ESPH	Empresa de Servicios Públicos de Heredia
Costa Rica	ICE	Instituto Costarricense de Electricidad
Costa Rica	JASEC	Junta Administradora de Servicios Eléctricos de Cartago
Dominica	DOMLEC	Dominica Electricity Services Limited
Ecuador	CATEG-D / EMELEC	Corporación para la Administración Temporal Eléctrica de Guayaquil
Ecuador	STA. ELENA	Empresa Eléctrica Santa Elena S.A.
Ecuador	COTOPAXI	Empresa Eléctrica Cotopaxi S.A.
Ecuador	LOS RIOS	Empresa Eléctrica Los Ríos S.A.
Ecuador	MANABÍ	Empresa Eléctrica Manabí S.A.
Ecuador	NORTE	Empresa Eléctrica Norte S.A.
Ecuador	SUR	Empresa Eléctrica Regional Sur S.A.
Ecuador	STO. DOMINGO	Empresa Eléctrica Santo Domingo S.A.
Ecuador	SUCUMBÍOS	Empresa Eléctrica Sucumbios S.A.
Ecuador	AMBATO	Empresa Eléctrica Ambato S.A.
Ecuador	AZOGUES	Empresa Eléctrica Azogues S.A.
Ecuador	BOLIVAR	Empresa Eléctrica Bolívar S.A.
Ecuador	EL ORO	Empresa Eléctrica El Oro S.A.
Ecuador	ESMERALDAS	Empresa Eléctrica Esmeraldas S.A.
Ecuador	GALAPAGOS	Empresa Eléctrica Galápagos S.A.
Ecuador	GUAYAS-LOS RÍOS	Empresa Eléctrica Guayas Los Ríos S.A.
Ecuador	MILAGRO	Empresa Eléctrica Milagro S.A.
Ecuador	QUITO	Empresa Eléctrica Quito S.A.
Ecuador	CENTRO SUR	Empresa Eléctrica Regional Centro Sur S.A.
Ecuador	RIOBAMBA	Empresa Eléctrica Riobamba S.A.
El Salvador	AES CLESA	AES CLESA y Compañía, S. en C. de C.V.
El Salvador	CAESS	Compañía de Alumbrado Eléctrico de San Salvador, S.A.
El Salvador	DEUSEM	Distribuidora Eléctrica de Usulatan, S.A.
El Salvador	DEL SUR	Distribuidora de Electricidad del Sur
El Salvador	EEO	Empresa Eléctrica de Oriente, S.A.

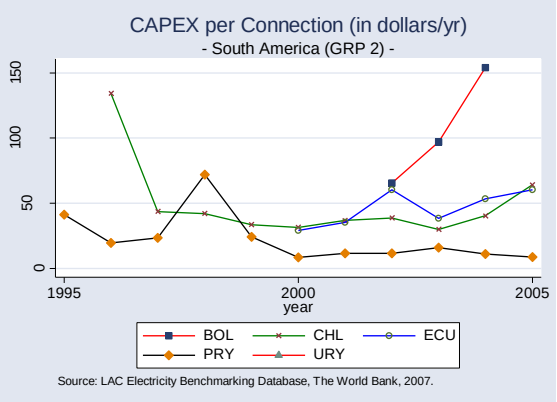
Grenada	GRENLEC	Grenada Electricity Services Limited
Guatemala	DEOCSA	Distribuidora de Electricidad de Occidente
Guatemala	DEORSA	Distribuidora de Electricidad de Oriente
Guatemala	EGEE	Empresa Generadora de Energía Eléctrica
Guatemala	EEGSA	Empresas Eléctricas de Guatemala S.A.
Honduras	ENEE	Empresa Nacional de Energía Eléctrica
Mexico	CFE	Comisión Federal de Electricidad
Mexico	LyFC	Luz y Fuerza del Centro
Nicaragua	DISNORTE	Distribuidora de Electricidad del Norte
Nicaragua	DISSUR	Distribuidora de Electricidad del Sur
Panama	EDECHI	Empresa de Distribución Eléctrica Chiriquí, S.A
Panama	EDEMET	Empresa de Distribución Eléctrica Metro Oeste, S.A.
Panama	ELEKTRA NORESTE	Empresa de Distribución Eléctrica Noreste
Paraguay	ANDE	Administración Nacional de Electricidad
Paraguay	CLYFSA	Compañía Luz y Fuerza S.A.
Peru	EDELNOR	Edelnor
Peru	ELDENOR-CHANGAY	Edelnor - Zonal Chancay
Peru	ELC	Electro Centro S.A.
Peru	ENOSA	Electro Nor Oeste S.A.
Peru	ENSA	Electro Norte S.A.
Peru	ELSM	Electro Sur Medio S.A.
Peru	ELOR	Electro Oriente S.A
Peru	ELPUNO	Electro Puno S.A.A.
Peru	ELSE	Electro Sur Este SA
Peru	ELS	Electro Sur S.A.
Peru	ELU	Electro Ucayali S.A.
Peru	ELECTRO NORTE MEDIO	Electronorte Medio S.A.-Hidradina S.A.
Peru	EDECAÑETE	Empresa de Distribución Eléctrica Canete S.A.
Peru	LUZ del Sur	Luz del Sur
Peru	INADE	Proyecto Especial Chavimochic
Peru	SEAL	Sociedad Eléctrica del Sur Oeste S.A.
Rep. Dominicana	EDEESTE	Empresa Distribuidora de Electricidad del Este
Rep. Dominicana	EDESUR	Empresa Distribuidora de Electricidad del Sur
Rep. Dominicana	EDENORTE	Empresa Distribuidora de Electricidad del Norte
St Kitts and Nevis	Electricity Department	Electricity Department
St Kitts and Nevis	NEVLEC	Nevis Electricity Company
St Lucia	LUCELEC	St. Lucia Electricity Services Limited
St Vincent and the Grenadines	VINLEC	St. Vincent Electricity Services Limited
Uruguay	UTE	Administración Nacional de Usinas y Transmisiones Eléctricas
Venezuela	ELEGGUA	C.A. Electricidad de Guarenas y Guatire
Venezuela	ELEVAL	C.A. Electricidad de Valencia
Venezuela	ENELBAR	C.A. Energía Eléctrica de Barquisimeto
Venezuela	ENELVEN	C.A. Energía Eléctrica de Venezuela
Venezuela	ELEBOL	C.A. La Electricidad de Ciudad Bolívar
Venezuela	CALEV	C.A. Luz Eléctrica de Venezuela
Venezuela	EDELCA	C.V.G. Electrificación del Caroni C.A. Caracas
Venezuela	CALEY	CA Compañía Luz Eléctrica del Yaracuy
Venezuela	CALIFE	CA Luz y Fuerza de Puerto Cabello

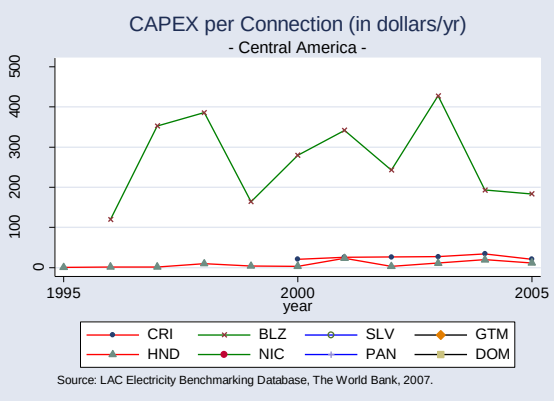
Venezuela	CADAFE	Compañía Anónima de Administración y Fomento Eléctrico
Venezuela	ENELCO	Energía Eléctrica de la Costa Oriental
Venezuela	EDC- AES	La Electricidad de Caracas S.A.
Venezuela	SENECA	Sistema Eléctrico del Estado Nueva Esparta

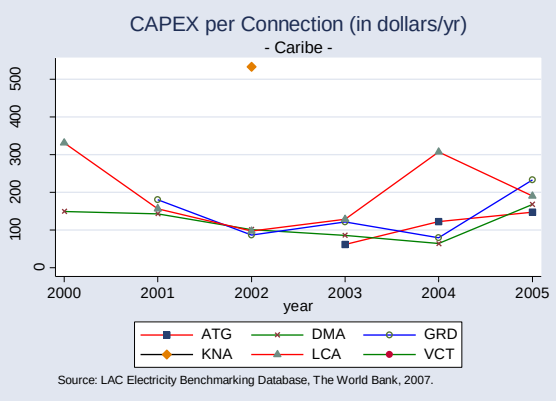
ANNEX 4 – CAPITAL AND TOTAL EXPENDITURES PER CONNECTION

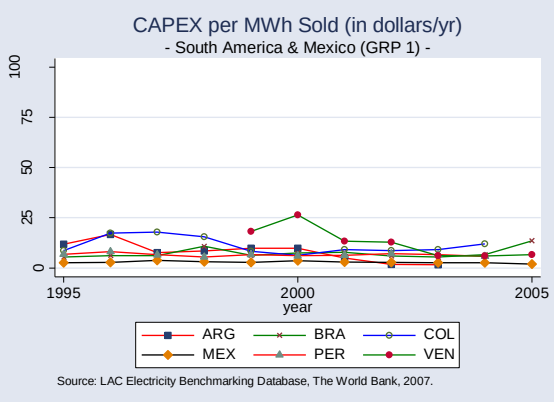
The following results reflect the capital and total expenditures of the distribution utilities in LCR. There are no consistent trends throughout the decade and there are wide discrepancies between comparable countries. Furthermore, this report does not attempt, at this stage, to explain whether and why the following values represent good or poor performance but rather to provide the region with a benchmark of the average total expenditures.

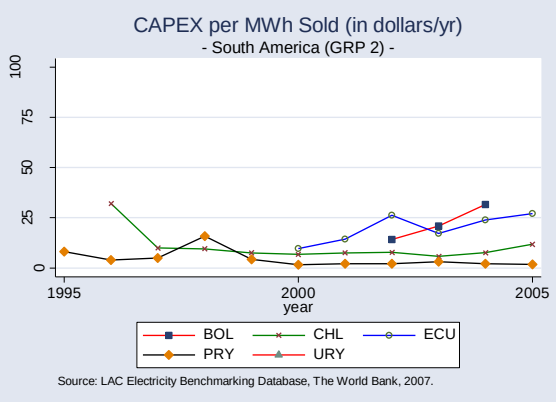


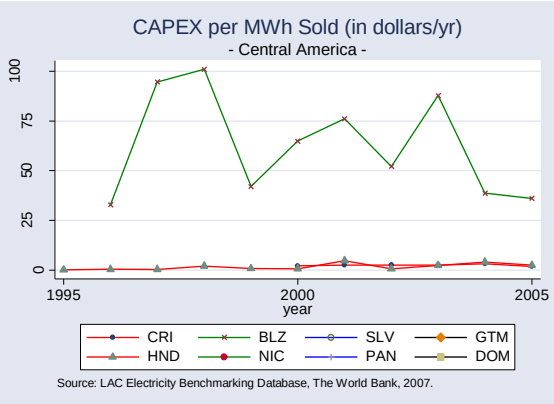


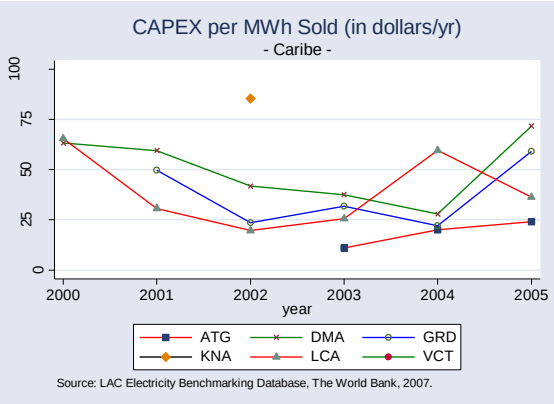


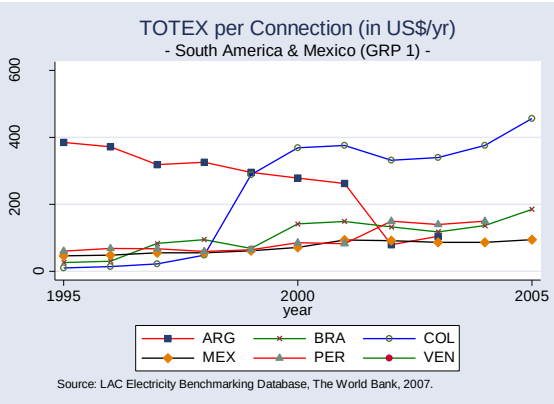


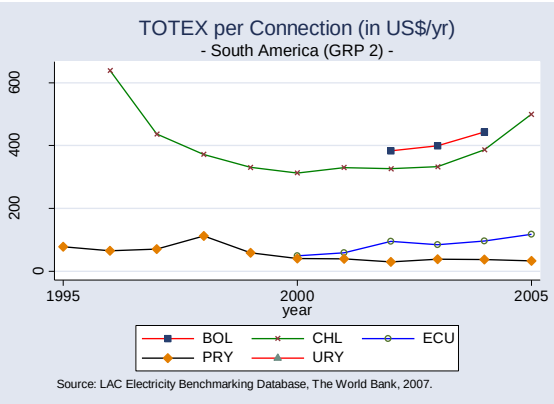


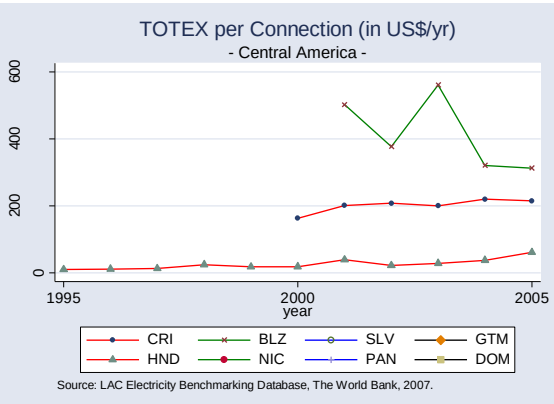


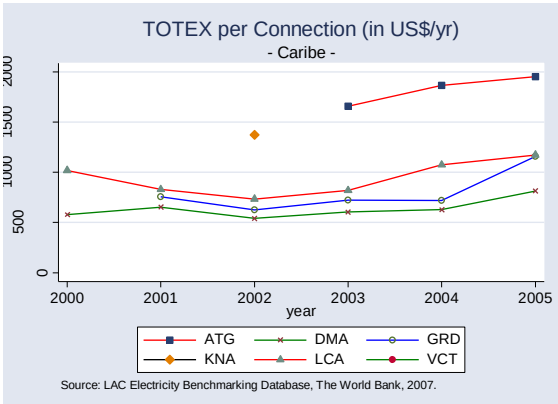

CAPEX per MWh Sold (in dollars/yr)
- Central America -
0
25
50
75
100
1995
2000
2005
year
CRI
BLZ
SLV
GTM
HND
NIC
PAN
DOM
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

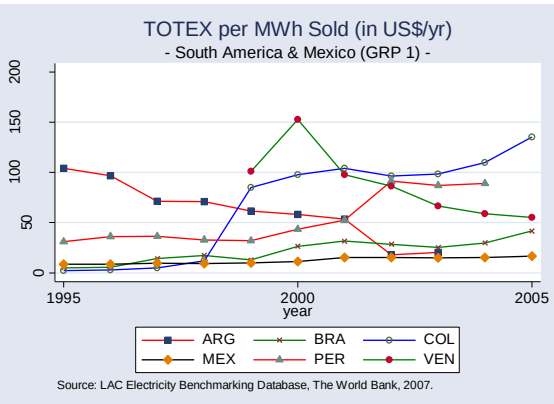

CAPEX per MWh Sold (in dollars/yr)
- Caribe -
0
25
50
75
100
2000
2001
2002
2003
2004
2005
year
ATG
DMA
GRD
KNA
LCA
VCT
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

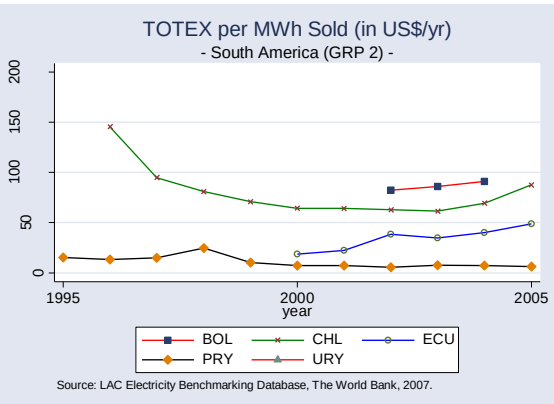

TOTEX per Connection (in US$/yr)
- South America & Mexico (GRP 1) -
0
200
400
600
1995
2000
2005
year
ARG
BRA
COL
MEX
PER
VEN
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

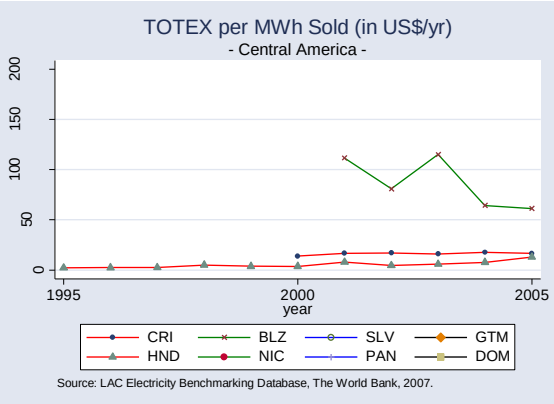

TOTEX per Connection (in US$/yr)
- South America (GRP 2) -
0
200
400
600
1995
2000
2005
year
BOL
CHL
ECU
PRY
URY
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

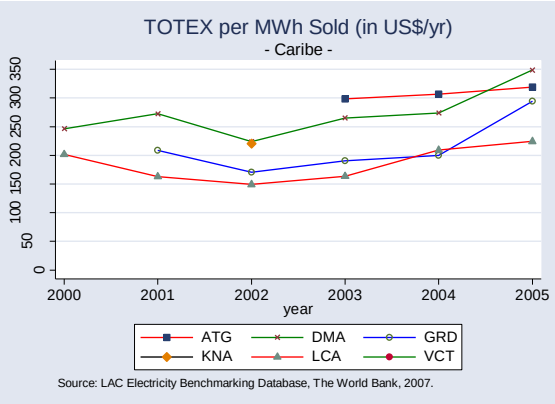

TOTEX per Connection (in US$/yr)
- Central America -
0
200
400
600
1995
2000
2005
year
CRI
BLZ
SLV
GTM
HND
NIC
PAN
DOM
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.


TOTEX per Connection (in US$/yr)
- Caribe -
0
500
1000
1500
2000
2000
2001
2002
2003
2004
2005
year
ATG
DMA
GRD
KNA
LCA
VCT
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.


TOTEX per MWh Sold (in US$/yr)
- South America & Mexico (GRP 1) -
0
50
100
150
200
1995
2000
2005
year
ARG
BRA
COL
MEX
PER
VEN
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

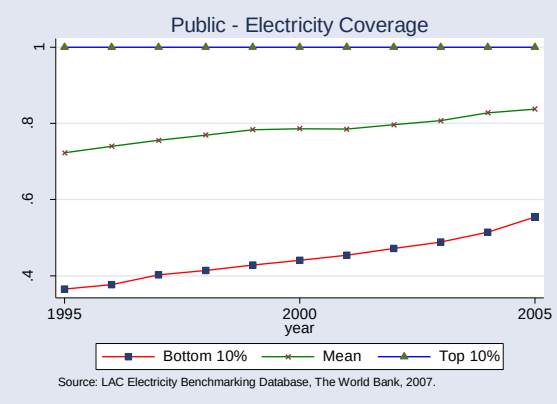

TOTEX per MWh Sold (in US$/yr)
- South America (GRP 2) -
0
50
100
150
200
1995
2000
2005
year
BOL
CHL
ECU
PRY
URY
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

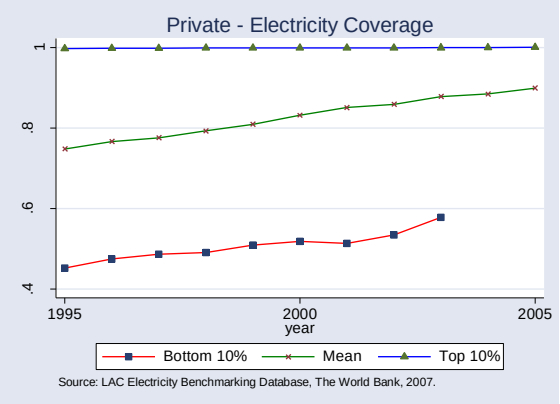

TOTEX per MWh Sold (in US$/yr)
- Central America -
0
50
100
150
200
1995
2000
2005
year
CRI
BLZ
SLV
GTM
HND
NIC
PAN
DOM
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

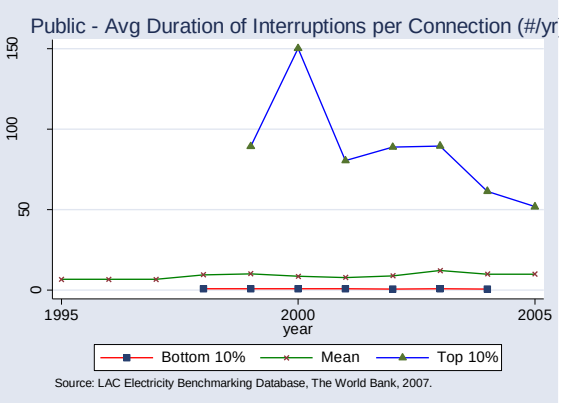

TOTEX per MWh Sold (in US$/yr)
- Caribe -
0
50
100
150
200
250
300
350
2000
2001
2002
2003
2004
2005
year
ATG
DMA
GRD
KNA
LCA
VCT
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

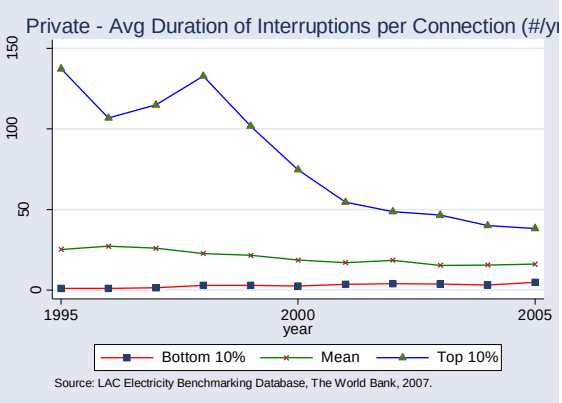
ANNEX 5 –TOP TEN AND BOTTOM TEN PERCENT PUBLIC AND PRIVATE DISTRIBUTION UTILITIES

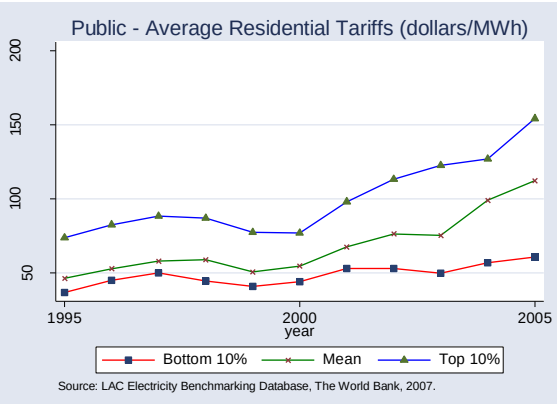
The following graphs provide further comparison of the top ten and bottom ten percent public and private utilities when measuring coverage, quality of service, tariffs, OPEX, CAPEX, and TOTEX. When assessing coverage and the quality of service, the top ten percent private utilities performed better than the top ten percent public utilities. However, in the case of the average duration per connection, the average public utilities out-performed the average private utilities. With regards to tariffs, private utilities charged more than public utilities yet public utilities exhibited a higher rate of growth throughout the last ten years. Finally, while there are no clear trends that delineate OPEX and CAPEX, on average, OPEX and CAPEX are higher for public utilities and are mostly accompanied by increasing trends.

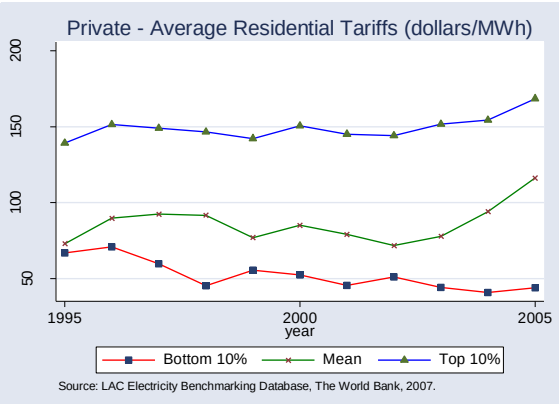


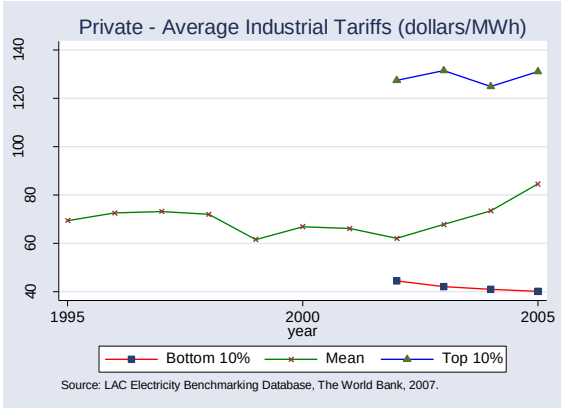


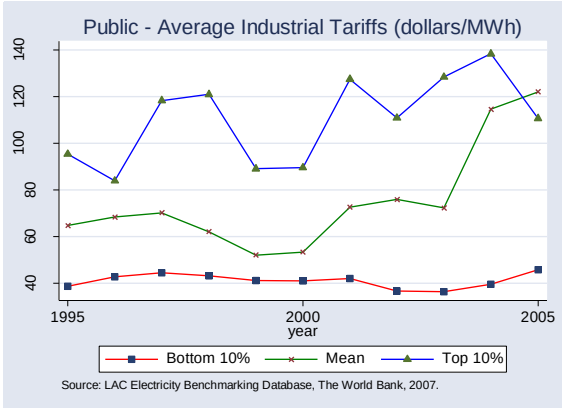


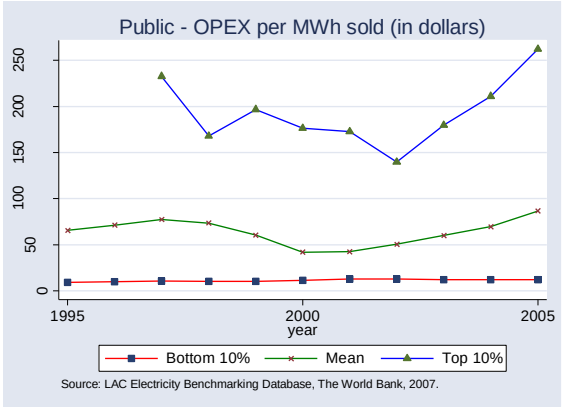


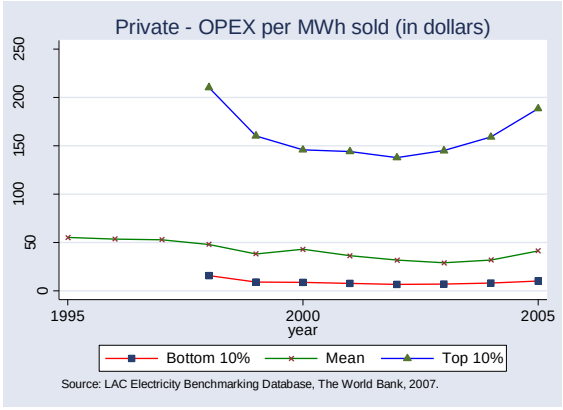


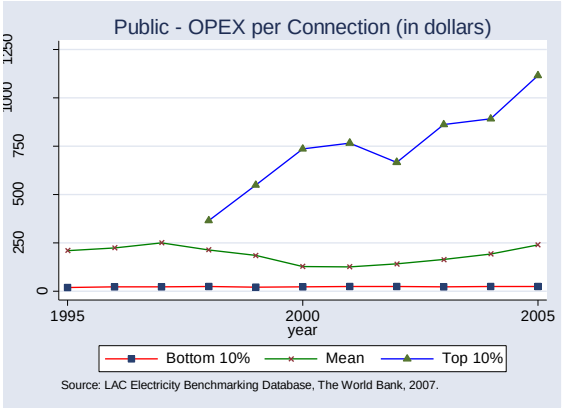


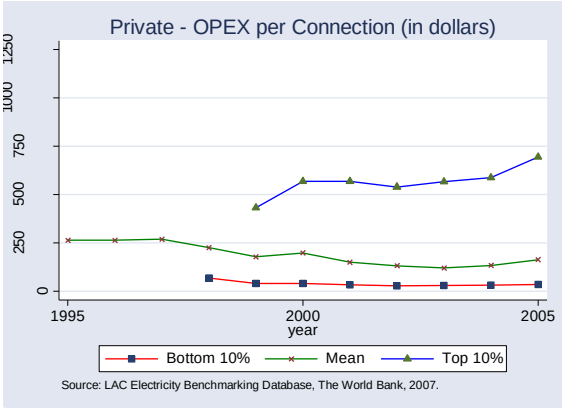

Private - Average Industrial Tariffs (dollars/MWh)
40
60
80
100
120
140
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

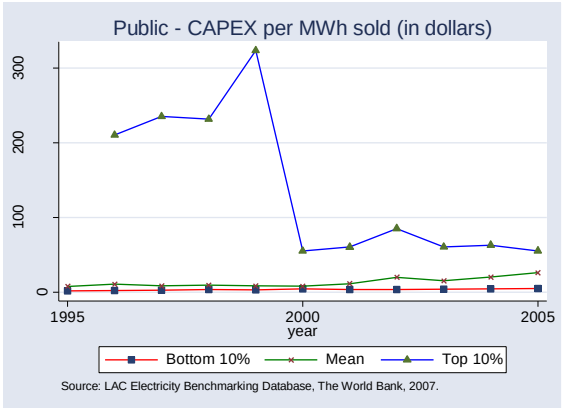

Public - Average Industrial Tariffs (dollars/MWh)
40
60
80
100
120
140
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

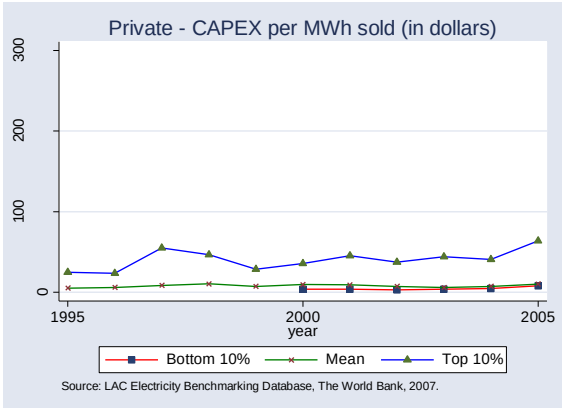

Public - OPEX per MWh sold (in dollars)
0
50
100
150
200
250
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

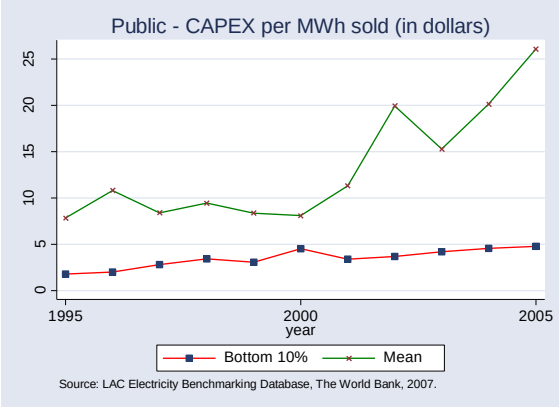

Private - OPEX per MWh sold (in dollars)
0
50
100
150
200
250
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

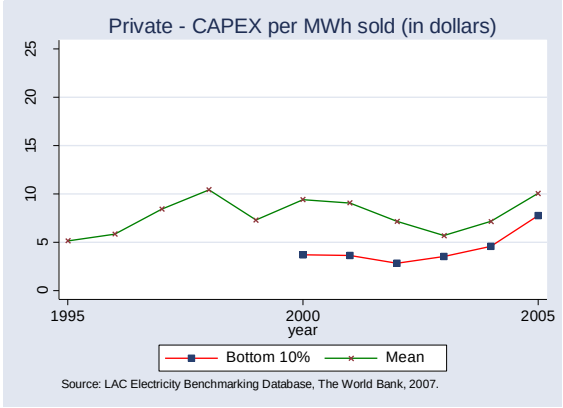

Public - OPEX per Connection (in dollars)
0
250
500
750
1000
1250
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

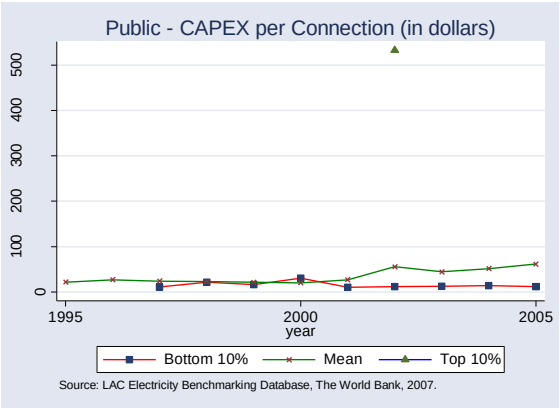

Private - OPEX per Connection (in dollars)
0
250
500
750
1000
1250
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

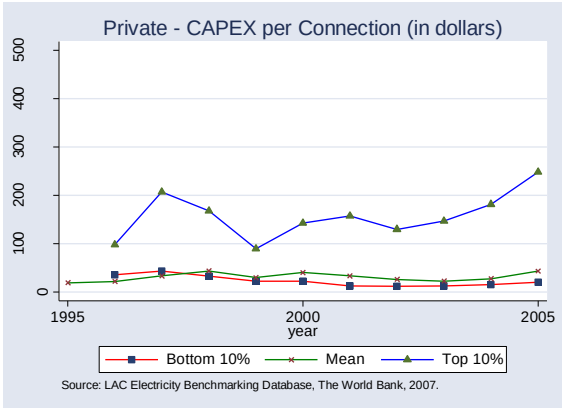

Public - CAPEX per MWh sold (in dollars)
0
100
200
300
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

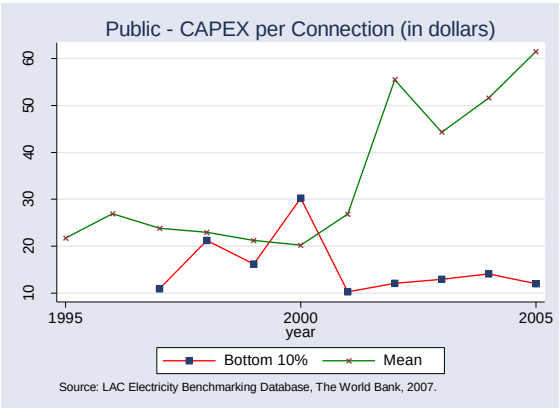

Private - CAPEX per MWh sold (in dollars)
0
100
200
300
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

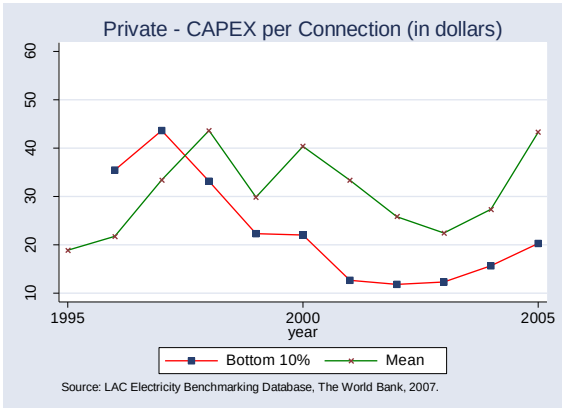

Public - CAPEX per MWh sold (in dollars)
0
5
10
15
20
25
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

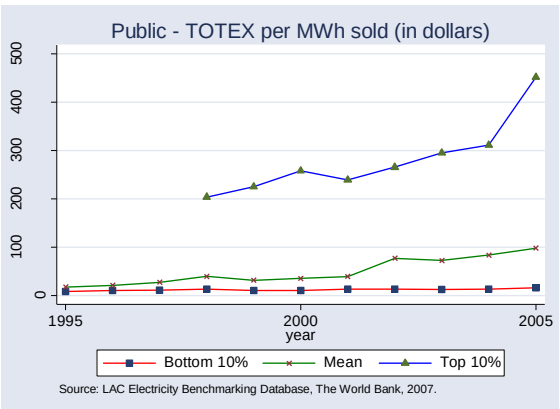

Private - CAPEX per MWh sold (in dollars)
0
5
10
15
20
25
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

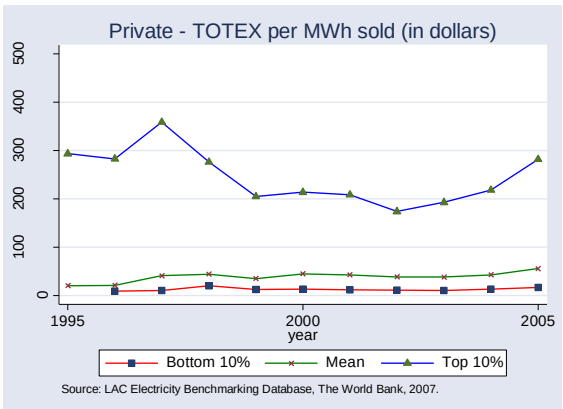

Public - CAPEX per Connection (in dollars)
0
100
200
300
400
500
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

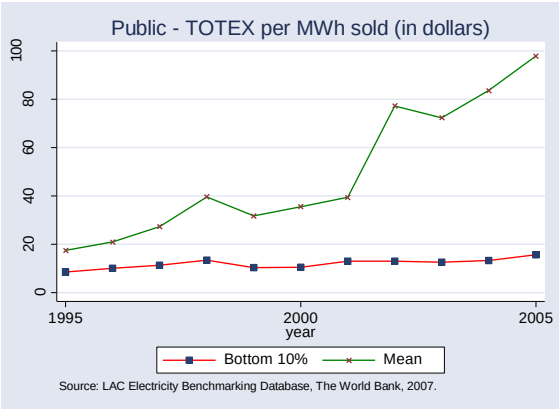

Private - CAPEX per Connection (in dollars)
0
100
200
300
400
500
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

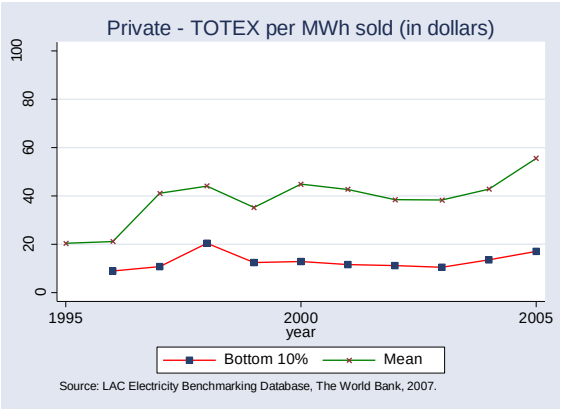

Public - CAPEX per Connection (in dollars)
10
20
30
40
50
60
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

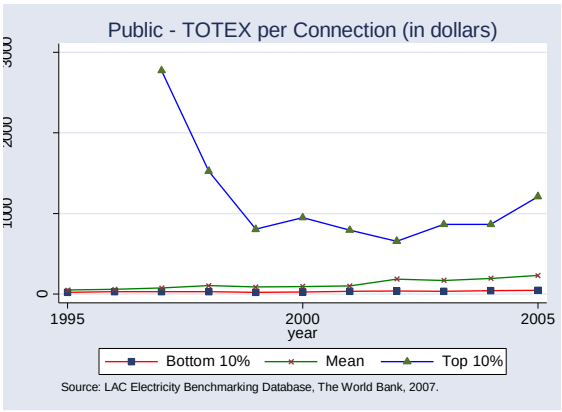

Private - CAPEX per Connection (in dollars)
10
20
30
40
50
60
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

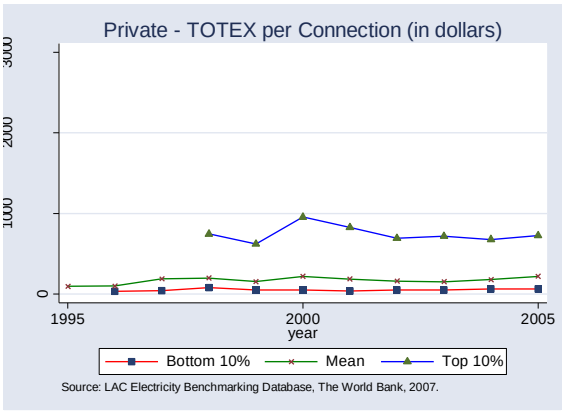

Public - TOTEX per MWh sold (in dollars)
0
100
200
300
400
500
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

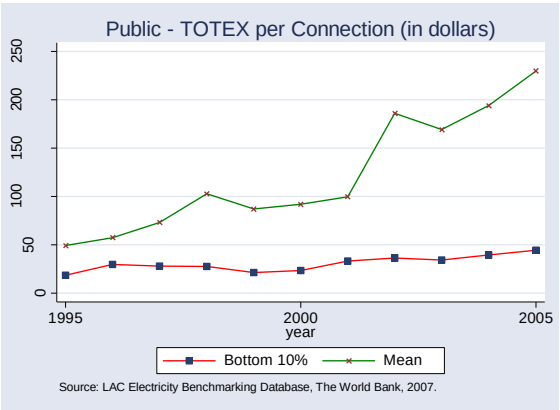

Private - TOTEX per MWh sold (in dollars)
0
100
200
300
400
500
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.

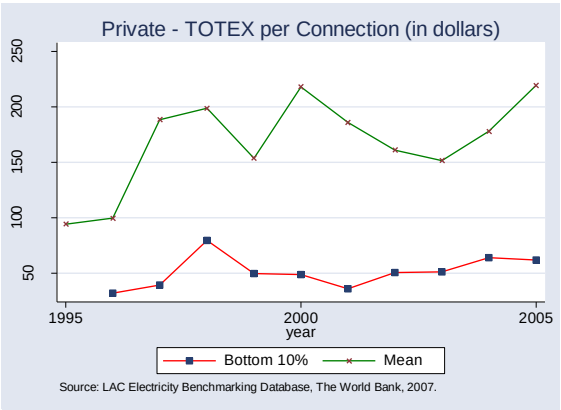

Public - TOTEX per MWh sold (in dollars)
0
20
40
60
80
100
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.


Private - TOTEX per MWh sold (in dollars)
0
20
40
60
80
100
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.


Public - TOTEX per Connection (in dollars)
0
1000
2000
3000
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.


Private - TOTEX per Connection (in dollars)
0
1000
2000
3000
1995
2000
2005
year
Bottom 10%
Mean
Top 10%
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.


Public - TOTEX per Connection (in dollars)
0
50
100
150
200
250
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.


Private - TOTEX per Connection (in dollars)
50
100
150
200
250
1995
2000
2005
year
Bottom 10%
Mean
Source: LAC Electricity Benchmarking Database, The World Bank, 2007.