"Using Labor Productivity Change Estimates as an Input for X-Factors in Price-Cap Regulation"

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Abstract

In this paper I provide an estimate of labor productivity growth for the electricity distribution sector in Latin America, in the period 1994 to 2001. I report an annual rate of labor productivity change of about 6%. A comparison of the changes in prices and labor productivity reveals that, in most cases, final prices to customers did not fall to reflect the huge labor productivity gains that were achieved during the period under analysis.

JEL Classification: O3.

Keywords: stochastic frontiers, productivity, technical change.

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I. Introduction

For decades rate of return regulation has been the dominant approach to regulating utilities. Though such regulation avoids the welfare losses that result from monopoly pricing, it provides few incentives for regulated firms to minimize costs. In recent years many regulators have developed and adopted stronger incentive schemes (see Crew and Kleindorfer 1986 and 2002; Laffont and Tirole 1993; Armstrong, Cowan, and Vickers 1994; Sappington 1994; and Vogelsang, 2002). Incentive regulation can take various forms, the most common of which involves price-cap regulation.

Price-cap regulation requires the regulator to adjust the utility's prices in line with some general index of prices—such as the consumer price index (CPI)—minus an efficiency factor *X*. This scheme is usually called CPI-*X*. The *X* factor represents the real cost reduction the firm is expected to achieve. If the firm's cost reduction is greater than the expected reduction, it can keep the difference and earn above-normal profits—at least while the price cap applies.

A central issue in CPI-*X* regulation is how *X* factors should be set. This decision is critical to the long-term viability of any price-cap regulation. If too low an *X* factor is imposed, the regulated firm's information rents will be excessive. If the *X* factor is too high, the firm's financial viability can be threatened.[1]

In empirical applications the value of *X* is generally based on the regulator's assessment of the potential productivity growth of the regulated firm, which is based on assessments of the firm's current efficiency and past rates of productivity growth in the industry.

In this paper I provide an estimate of labor productivity growth for the electricity distribution sector in Latin America, in the period 1994 to 2001.

[1] For a theoretical discussion on how to set the *X* factor, see Bernstein and Sappington (1999, 2000, and 2001).

II. Latin American electricity distribution sector

The Latin American electricity market has undergone a major transformation over the past 20 years. Reform in the region started in Chile with the privatization of major electric utilities between 1986 and 1989. Argentina followed Chile's example in 1992; shortly thereafter Bolivia, Colombia, and Peru followed suit. During the second half of the 1990s, Panama, El Salvador, Guatemala, Nicaragua, Honduras, and Brazil also adopted reforms. The main missing players in the process of transforming the electricity sectors have been Costa Rica, Ecuador, Mexico, Paraguay, Uruguay, and Venezuela, although Costa Rica, Ecuador, Mexico, and Venezuela recently initiated actions toward restructuring.

The diversity in the size of countries and power demand in the region—Brazil has a population of 160 million and an installed capacity of 58000 MW, while Honduras has 4.4 million people and 396 MW—but all have followed similar paths for reforms. The reform processes in the region have been based on a central change in the paradigm for the electrical business. The paradigm has evolved from a stated-owned, vertically integrated electricity monopoly, to one in which different economic characteristics are recognized in the generation, transmission, and distribution stages. Competition among private operators is established in generation, with the State regulating transmission and distribution activities.

As shown in Table 1, however, in many Latin American countries the state still controls sizeable amounts of the generation, transmission, and distribution segments.[2] The average percentages of private participation are roughly 41%, 22%, and 51% for generation, transmission, and distribution—with a much lower variance for generation than for the other segments of the business. In most of the countries in the region public and private operators share the distribution

[2] For a description of the reforms in the region, see Dussan (1996); Rudnick (1998); Fischer and Serra (2000); Espinasa (2001); Millan, Lora, and Micco (2001); Rudnick and Zolezzi (2001).

market. From the viewpoint of efficiency concerns, this diversity is useful since it allows some degree of competition by comparison.

III. Data

Data on firms were collected from several sources. Data for South America in the period 1994-2000 were mostly compiled from CIER (*Comisión de Integración Energética Regional*, a commission that co-ordinates the different participants in the electricity sector in South America) reports: *Datos Estadísticos. Empresas Eléctricas. Año 1994*; *Datos Estadísticos. Empresas Eléctricas. Años 1995-1996-1997*; *Información Económica y Técnica de Empresas Eléctricas. Datos 1998-1999*; and *Información Económica y Técnica de Empresas Eléctricas. Datos 2000*.

The database includes the following variables: sales to final customers, in GWh. Sales to final customers were calculated as total sales minus sales to other electric companies, in order to isolate the distribution activity in the case of integrated firms; number of final customers; service area, in square kilometers; total distribution lines, in kilometers (including high and low voltage power lines); total transformer capacity, in mega-volt-ampere, MVA; number of employees.

Data on number of employees include information on part-time and full-time employees. Part-time employees were counted as half-time employees. In vertically integrated firms there is information on the number of employees employed by each department: generation, transmission, distribution, billing and collection, and administrative. For these firms, the number of employees of firm j was calculated as follows: $l_j = l_{1j} + l_{2j} + \left[\sum_{k=1}^{2} l_{kj} \Big/ \sum_{k=1}^{4} l_{kj} \right] l_{5j}$, where l_{1j} = distribution (proper); l_{2j} = billing and collection; l_{3j} = generation; l_{4j} = transmission; and l_{5j} = administrative and general.

The sample is representative of the electricity distribution sector in the region. It covers the following countries: Argentina (29 firms supplying electricity to approximately 80% of the total number of customers in the country), Bolivia (2, 31%), Brazil (4, 19%), Chile (2, 18%), Colombia (4, 30%), Costa Rica (4, 91%), Ecuador (12, 61%), Mexico (1, 79%), Panama (1, 62%), Paraguay (1, 100%), Peru (11, 97%), Uruguay (1, 100%), and Venezuela (8, 92%).

Summary statistics of the unbalanced panel are presented in Table 2. A total of 352 observations are available for estimation.

The variables

Electricity distributors use their network and transformer capacity, together with labor, to deliver a number of electrical units to a specified set of customers in a given geographical area. Our electricity distribution model reflects this: it includes three outputs (the number of final customers, the total energy supplied to final customers, and the service area), a labor input (the number of employees), and two capital inputs (transformer capacity and kilometers of distribution network).[3]

Latin American electricity distribution firms have the obligation to meet demand; therefore I consider the amount of electricity supplied to final customers (in gigawatt hours, GWh) and the number of final customers served as an output not controlled by the firm.

I include the service area (in square kilometers) as an output, since an increase in the service area either increases the use of resources or reduces the supply of other products (Førsund and Kittelsen, 1998). Although there is an occasional redrawing of boundaries due to merger and

[3] Jamasb and Pollitt (2001) review the different input and output variables used in models of electricity distribution. They find that the most frequently used outputs are units of energy delivered, number of customers, and the size of the service area, whereas the most widely used physical inputs are number of employees, transformer capacity, and network length.

takeover, for practical purposes the firm has little direct control over the size of its service territory, and hence the service area may be considered as a variable not controlled by the firm.

I use two capital inputs, total distribution lines (in kilometers) and transformer capacity (in mega-volt-ampere, MVA). An important decision in a benchmarking exercise is how to treat the capital inputs. The way these inputs are treated affects the model specification. In general, the assumption is that capital is not controlled by the firm. In this context, labor requirement function is preferable input controlled by the firm is labor.

As noted by Neuberg (1977), Kumbakhar and Hjalmarsson (1998), and Hattori (2002), distributors have limited control over the length of distribution lines, since the amount of capital in the form of network reflects geographical dispersion of customers rather than differences in productive efficiency. And this is also the case, although perhaps to a lesser degree, for transformer capacity (in mega-volt-ampere, MVA). Therefore, I treat distribution lines and transformer capacity as variables representing the characteristics of the network (not controlled by the firm).[4] This leaves labor as the main variable input;[5] accordingly, I focus on labor productivity.

Following the above considerations, I represent electricity distribution technology by means of a labor requirement function. The concept of efficiency used throughout the paper is labor use efficiency: a firm is inefficient if, given the capital inputs, it uses more labor to produce a given bundle of outputs than an otherwise efficient firm would.

IV. Econometric model

In order to estimate the parametric labor requirement function, I use a translog functional form because it provides a good second-order approximation to a broad class of functions, and

[4] The Dutch regulator also specifies network length and transformer capacity as exogenous to the firm (DTe, 2000). The DTe argues that network length and transformer capacity can be seen as variables for customer dispersion.

[5] Indeed, while productivity in electricity generation is mainly determined by the technology, productivity in distribution is, to a large extent, driven by management and efficient labor use. Typically, the labor cost share in generation amounts to less than 10% while in distribution the figure is around 50%.

admits the Cobb-Douglas as a special case. A translog labor requirement model with three outputs and two exogenous capital inputs, for a panel of $i = 1,...,N$ firms producing in $c = 1,...,C$ countries and observed over $t = 1,...,\mathrm{T}$ periods, may be specified as

$$\begin{aligned} l^{it} &= \alpha + \alpha_c + \sum_{m=1}^{3} \varpi_m y_m^{it} + \frac{1}{2}\sum_{m=1}^{3}\sum_{n=1}^{3} \varpi_{mn} y_m^{it} y_n^{it} + \sum_{k=1}^{2} \beta_k x_k^{it} + \frac{1}{2}\sum_{k=1}^{2}\sum_{j=1}^{2} \beta_{kj} x_k^{it} x_j^{it} + \sum_{k=1}^{2}\sum_{m=1}^{3} \kappa_{km} x_k^{it} y_m^{it} \\ &\quad + \theta_t t + \frac{1}{2}\theta_{tt} t^2 + \sum_{k=1}^{2} \varsigma_{kt} x_k^{it} t + \sum_{m=1}^{3} \zeta_{mt} y_m^{it} t + \lambda Ln\left(GNP\ per\ capita^{ct}\right) + v^{it}, \end{aligned} \qquad (1)$$

where l, y_1, y_2, y_3, x_1, and x_2 are the natural logarithms of labor, sales, customers, area, lines, and transformer capacity, and v is the random error term. GNP per capita varies over time and across countries and should control for productivity shocks at the national level. The country fixed-effects (α_c) control for potential biases caused by any omitted variables that are country specific and time invariant.

The time-trend variable appears in a second order polynomial in t and interacting with the outputs and the capital inputs. These terms introduce second order flexibility in the translog labor requirement function and will be used to identify technical change over time, which can vary from firm to firm and from one period to the next. In the model in equation (1), technical change is neutral with respect to the outputs and the capital input, and the environmental variables if, and only if, $H_0 : \varsigma_{kt} = \zeta_{mt} = 0\ \forall k, m$, and it is absent if, and only if, $H_0 : \theta_t = \theta_{tt} = \varsigma_{kt} = \zeta_{mt} = 0\ \forall k, m.$

In our model specification, the rate of technical change (ΔT) is obtained as the logarithmic derivative of the labor requirement function with respect to time:

$$\Delta T = \frac{\partial l}{\partial t} = \theta_t + \theta_{tt} t + \varsigma_{1t} x_1 + \varsigma_{2t} x_2 + \zeta_{3t} y_1 + \zeta_{2t} y_2 + \zeta_{3t} y_3 .$$

According to its effect on the relative input utilization, the overall rate of technical change can further be decomposed into effects due to pure technical change $\left(\theta_t + 2\theta_{tt}t\right)$ and effects due to non-neutral technical change $\left(\varsigma_{1t}x_1 + \varsigma_{2t}x_2 + \zeta_{3t}y_1 + \zeta_{2t}y_2 + \zeta_{3t}y_3\right)$.

V. Empirical results

Ordinary least squares (OLS) estimates of the labor requirement function model are reported in Table 3. As usual for translog function approximations, the variables are expressed in deviations with respect to average values; therefore, the first-order output and capital input coefficients are elasticities evaluated at the sample mean.

Estimates regarding technological parameters are in line with the specialized literature on electricity distribution, yielding further confidence to the validity of our estimation strategy. The first-order output coefficients have the expected signs regarding economic behavior—an increase in outputs is associated with an increase in the use of labor. I test the null hypothesis of a Cobb-Douglas specification against the more general translog using the likelihood ratio (LR) statistic[6] and I am able to reject the null at the 1% level.

In Column (1) I present the model without technical change. In Column (2) I add a linear time trend to the model in (1). The coefficient on time is negative and significant at the 1% level, and its value indicates an annual average increase in labor productivity at a rate about 6%. In Column (3) I introduce the squared of the time trend to the model in (2). The coefficient on the squared time trend is not significant at the usual confidence levels. In Column (4) I present the general non-neutral specification corresponding to the equation (1). In this specification, I reject the null hypothesis that there is no technical change, $H_0 : \theta_t = \theta_{tt} = \varsigma_{kt} = \zeta_{mt} = 0 \ \forall k, m$, at the 1%

[6] The likelihood ratio (LR) statistic is defined by LR = 2[$L_U - L_R$], where L_R is the log likelihood of the restricted model and L_U is the log likelihood of the unrestricted model. Under the null hypothesis, LR is asymptotically distributed as a chi-square with degrees of freedom equal to the number of restrictions involved.

level, according to a LR test. The null hypothesis of neutral technical change, $H_0 : \varsigma_{kt} = \zeta_{mt} = 0 \ \forall k, m$, is also rejected at the 1% level. Productivity change, evaluated at the sample mean values, remains about 6% per year.[7]

To check the robustness of the results, I estimate an alternative specification including time-fixed effects $(\psi_t;\ t = 1995, ..., 2001)$, instead of the polynomial on the time trend. Following Caves, Christensen and Swanson (1981), neutral technical change can be calculated as the difference between the parameters of two time dummy variables. Thus, the rate of technical change from t to $t+1$ is $\psi_{t+1} - \psi_t$, and the cumulated technical change at the end of the period is the coefficient of the dummy variable corresponding to the last period. The growth rate of technical change in the first period (from December 1994 to December 1995, since the data corresponds to December of each year) is equal to the coefficient of the first dummy variable (ψ_{1995}) because the model includes a constant. As shown in Column (5), the cumulative productivity change at the end of the sample period is about 41%, implying an annual rate of about 6%, which is similar to the ones found in previous specifications.

I also address some concerns related to the type of data I am using. First, surveys answered by firms may have selection bias—i.e. only the most efficient firms could be willing to answer the survey. To see how sensitive the results are to this potential bias I constructed a source dummy variable that takes the value of one when the observation comes from survey data and zero otherwise. The source dummy is not significant, indicating that there are no systematic differences in efficiency between the firms that answered the survey and the other firms in our sample.

[7] In this specification, which is the preferred one according to LR tests, the coefficient on GNP per capita is significant at the 10% level, and it has the expected sign, in the sense that firms operating in countries with higher income use less labor, *ceteris paribus*.

Second, some firms in our sample are vertically integrated—i.e., they produce and transport electricity, as well as distributing it. To explore the possibility that labor productivity might be correlated with different degrees of vertical integration, I added a dummy variable for vertically integrated firms. The vertically integrated firm dummy has a positive and significant coefficient, suggesting that vertically integrated firms are using more labor, *ceteris paribus*, than the other firms in our sample. The inclusion of the vertically integrated dummy, however, does not have any impact on the value or significance of other coefficients.[8] In particular, the rate of productivity change remains about 5.5% per year.

VI. Discussion

Apart from labor productivity or technical change in the sector as a whole, regulators might be interested in the impact of type of ownership and type of regulatory regime on labor productivity and labor productivity change. Estache and Rossi (2004a), using a similar database as the one used here, studied the impact of the reforms to the electricity sector in the region, documenting an increase in labor productivity in all the countries where restructuring and privatization has taken place. According to their study, privatized firms have higher labor productivity than their public counterparts (though not higher labor productivity change), results that are significant in economic terms—private firms use at least 20% less labor to produce a given bundle of outputs than public firms, and that are relatively robust to controlling for the potential endogeneity of ownership that could arise if governments privatized those utilities with the highest labor productivity first (see also Rudnick, 1998; Fischer and Serra, 2000; and Rudnick and Zolezzi, 2001).

Privatization, however, always involves changes in both ownership and regulation, since the alternative to state ownership is rarely purely private, unregulated firms. Estache and Rossi

[8] All results reported but not presented are available from the author upon request.

(2004b) separate ownership effects from type of regulation effects, finding (i) that there is no significant difference in efficiency between public firms and private firms operating under a rate-of-return regime, (ii) that firms operating under a price-cap regime are the most efficient—they use about 60% fewer workers to produce a given bundle of outputs, and (iii) that firms operating under hybrid regimes lie somewhere in the middle—using about 20% fewer workers, *ceteris paribus*.

In this paper I estimated the labor productivity change in the electricity distribution sector in Latin America for the period 1994-2001, and I found an annual rate of labor productivity change of about 6%. The current debate in the Region is whether final consumers have benefited from this increase in labor productivity. As a first approach to address this issue, here I explore whether the increases in labor productivity have had an effect on lower prices for final consumers.

In Table 4 I list the average annual rate of change (over the period 1994-2001) in household and industrial electricity prices by country,[9] along with the average annual rate of labor productivity change. The countries' average rate of labor productivity change was obtained from Table 2 in Estache and Rossi (2004a). Table 4 shows that the coefficients on the countries' time trends are negative—i.e. an increase in labor productivity over time—for all countries but Venezuela.[10] A comparison of the changes in prices and labor productivity reveals that, in most cases, final prices to customers did not fall to reflect the huge labor productivity gains that were achieved during the period under analysis.

Table 5 lists average household and industrial KWh electricity prices by country, both with taxes and without taxes, along with the share of private sector participation in the distribution activity and the type of regulatory regime under which firms' operate.

[9] Electricity prices were provided by OLADE (*Organización Latinoamericana de Energía*).
[10] Venezuela is the only country where private firms operate under a rate-of-return scheme.

The simple correlations between the share of private sector participation in the distribution activity and household prices with taxes, industrial prices with taxes, household prices without taxes, and industrial prices without taxes (all corresponding to the year 2001) are 0.07, 0.04, -0.23, and 0.36, respectively. This indicates that electricity prices at the household or industrial level, with taxes or without taxes, are not highly correlated with ownership.

It is premature to conclude, however, that the results presented above provide conclusive evidence that consumers have not benefited from the reform process in the region. As pointed out by Kridel, Sappington, and Weisman (1996), low service rates is just one of many possible benefits from incentive regulation schemes. There is evidence, for instance, that quality of service has improved more in those countries where reform and privatization have taken place (see Estache and Rossi, 2004a). Besides that, in most of the countries were privatization has taken place, by 2001 no price reviews have taken place. This is important given that price cap regulation—the main regulatory scheme adopted by reformist countries—is known to have an impact on prices only after at least one price review. Finally, the final price faced by households and industrial customers is influenced not only by the efficiency in the distribution activity, but also by the generation and transmission stages. That is, both further research and a longer time period after the reforms are needed before general conclusions can be drawn on whether final customers have benefited from the privatization process in the electricity sector.

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Table 1: Share of private sector participation in selected countries (in percent)

	Generation	Transmission	Distribution
Argentina	60	100	70
Bolivia	90	90	90
Brazil	30	10	60
Chile	90	90	90
Colombia	70	10	50
Costa Rica	10	0	10
Dominican Republic	60	0	50
Ecuador	20	0	30
El Salvador	40	0	100
Guatemala	50	0	100
Mexico	10	0	0
Paraguay	0	0	0
Peru	60	20	80
Uruguay	0	0	0
Venezuela	20	10	40

Source: Espinasa (2001).

Table 2: Sample summary statistics

Variable	*Mean*	*Standard deviation*	*Maximum*	*Minimum*
Sales (in GWh)	5962	21628	175498	61
Number of customers	868290	2592453	19760000	17782
Service area (in km^2)	107558	302328	1889910	78
Distribution lines (in km)	29748	89861	595170	380
Transformer capacity (in MWA)	1790	4475	33078	38
Number of employees	2151	5929	41063	95

Table 3: Ordinary Least Squares Estimates

Variable	Dependent variable: number of employees, in logs (1)	(2)	(3)	(4)	(5)
Ln (Sales)	0.407	0.489	0.489	0.437	0.490
	(4.69)	(5.76)	(5.77)	(5.51)	(5.74)
Ln (Customers)	0.194	0.074	0.072	0.142	0.071
	(1.48)	(0.60)	(0.58)	(1.22)	(0.57)
Ln (Service area)	0.149	0.144	0.145	0.157	0.144
	(6.72)	(6.93)	(7.00)	(7.70)	(6.92)
Ln (Distribution network)	-0.023	0.025	0.023	0.016	0.025
	(-0.29)	(0.33)	(0.31)	(0.21)	(0.33)
Ln (Transformer capacity)	0.169	0.160	0.161	0.146	0.161
	(2.77)	(3.00)	(3.03)	(2.64)	(3.01)
Ln (GNP per capita)	-0.614	-0.199	-0.215	-0.288	-0.255
	(-3.57)	(-1.17)	(-1.26)	(-1.66)	(-1.40)
Time		-0.061	-0.061	-0.059	
		(-6.06)	(-6.08)	(-6.19)	
$(Time)^2$			-0.004	-0.005	
			(-0.85)	(-1.27)	
Time*Ln (Sales)				0.076	
				(3.35)	
Time*Ln (Customers)				-0.135	
				(-4.59)	
Time*Ln (Service area)				-0.018	
				(-3.35)	
Time*Ln (Distribution network)				0.077	
				(3.96)	
Time*Ln (Transformer capacity)				-0.012	
				(-0.54)	
Dummy 1995					-0.034
					(-0.47)
Dummy 1996					-0.084
					(-1.18)
Dummy 1997					-0.110
					(-1.50)
Dummy 1998					-0.184
					(-2.46)
Dummy 1999					-0.300
					(-3.93)
Dummy 2000					-0.331
					(-4.17)
Dummy 2001					-0.408
					(-4.23)
Country dummies†	Yes	Yes	Yes	Yes	Yes
Log likelihood	-99.23	-78.06	-77.58	-63.68	-77.06
R-squared	0.94	0.95	0.95	0.95	0.95
Number of firms	80	80	80	80	80
Observations	352	352	352	352	352

Notes: t-ratios obtained by using heteroskedasticity-consistent standard errors are in parentheses. In all cases I am estimating a translog form. To save space, second order terms are not shown. In all models the Cobb-Douglas specification is rejected against a translog at the 1% level.

† In all the country dummies are significant at the 1% level.

Table 4: Price changes vs. labor productivity changes

	Number of observations in the sample					Annual rate of change				
			Regulated by			Prices with taxes		Prices without taxes		LP
Country	Total	Private	PC	HR	RoR	H	I	H	I	
Argentina	117	70	70	0	0	0.010	0.014	-0.02	0.01	-0.046 (-2.29)
Bolivia	12	7	0	7	0	-0.083	-0.091	-0.10	-0.11	-0.003 (-0.08)
Brazil	113	44	44	0	0	0.032	-0.010	0.04	0.01	-0.091 (-3.79)
Chile	14	14	0	14	0	-0.118	-0.102	-0.11	-0.10	-0.061 (-5.90)
Colombia	17	2	2	0	0	0.060	-0.088	-0.01	-0.04	-0.173 (-2.64)
Costa Rica	2	0	0	0	0	-0.025	-0.044			-0.062 (-1.24)
Ecuador	40	8	0	8	0	0.030	-0.075			-0.012 (-0.44)
El Salvador	12	12	0	12	0	0.137	0.116			-0.020 (-0.64)
Mexico	8	0	0	0	0	-0.030	-0.011			-0.035 (-4.40)
Paraguay	7	0	0	0	0	0.088	0.042	0.09	0.04	-0.043 (-3.76)
Peru	64	24	0	24	0	0.007	-0.001	0.04	-0.01	-0.151 (-6.05)
Uruguay	8	0	0	0	0	-0.037	-0.063	-0.05	-0.08	-0.081 (-9.53)
Venezuela	36	23	0	0	23	-0.029	-0.282		-0.33	0.036 (0.97)

Source: Estache and Rossi (2004a).

Notes: t-ratios obtained from heteroskedasticity-consistent standard errors are in parentheses.

PC = price cap; HR = hybrid regimes; RoR = rate of return; H = household prices; I = industrial prices; LP = labor productivity.

Panama was excluded from the analysis since there is data for only one period.

All KWh of electricity prices were converted into 2001 price levels using the US Consumer Price Index and expressed in terms of purchasing power parity.

Table 5: Average electricity prices by country

Country	Private sector participation in distribution (in %)	Regulatory regime	Prices corresponding to the year 2001			
			With taxes		Without taxes	
			Household	Industrial	Household	Industrial
Argentina	70	Price cap	13.50	10.94	10.79	8.07
Bolivia	90	Hybrid	14.90	14.02	10.02	9.67
Brazil	60	Price cap	21.47	9.84	17.64	8.07
Chile	90	Hybrid	16.07	10.30	13.64	8.73
Colombia	50	Price cap	23.10	15.07	6.79	12.33
Costa Rica	10	Rate of return	15.04	17.75		
Ecuador	20	Hybrid	16.28	18.94		
El Salvador	40	Hybrid	33.84	38.75		
Mexico	10	Rate of return	11.12	7.71		
Panama	100	Price cap	20.16	16.52	20.16	16.52
Paraguay	0	Rate of return	24.13	13.80	22.02	12.62
Peru	60	Hybrid	22.58	12.87	22.56	12.93
Uruguay	0	Rate of return	18.81	9.58	15.32	7.52
Venezuela	20	Rate of return	6.46	3.29		2.06

Source: Estache and Rossi (2004a).

Notes: All prices are at the country level, and correspond to the year 2001, except for prices without taxes in Colombia, which correspond to the year 2000 and were converted into 2001 price levels by using the US Consumer Price Index.

Regulatory regimes and the share of private sector participation in the distribution activity for all countries but Panama, were obtained from Espinasa (2001). The share of private sector participation in the distribution activity for Panama was obtained from the regulator of the public services in that country.

In order to harmonize electricity prices across countries, all prices are in 2001 US dollars per KWh of electricity and are expressed in terms of purchasing power parity.