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The privatisation of the Peruvian electricity distribution companies:

A cost-benefit analysis

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General information

Edelnor,
Luz del Sur,
Ede Canete

Electro Sur Medio

PERU	
Capital	Lima
Area	1'285,220 km^2
Population (2007)	28.7 mio.
GDP (PPP,2007)	US$ 207.985
Per capita	US$ 7,410
HDI (2005)	0.773
Official language	Spanish
Currency	Nuevo sol

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The sector reform (1)

- Regulatory framework: Electricity Concession Law (LCE), Antimonopoly Law, NTSC (quality of service)
  - Segmentation of generation, transmission and distribution activities
  - Vertical (5%) and horizontal concentration (15%)
  - Creation of two markets: regulated and free market (1 MWh)
  - Creation of COES: Economic Operation Comission (generators and transmission companies)

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The sector reform (2)

market share (energy sold, 2006)	61.8%	3.19%	18.9%
sale, 2006 prices	(sale: US$ 1,188 mio.)	(sale: US$ 35 mio.)	(sale: US$ 181.2 mio.)
privatised companies	Luz del Sur Edeldnor Ede Chancay Ede Canete	Electro Sur Medio	Electro Norte Medio Electro Norte Electrocentro Electro Nor Oeste
	1994-1995	**1997**	**1998**
public companies	Electrolima	Electro Sur Medio	Electro Norte Medio Electro Norte Electrocentro Electro Nor Oeste

2001

Sector 2006 figures	Generation				Transmission				Distribution				Total	
	Energy production 1/ GWh	market share %	Energy billed US$ (mio.)	market share %	Lines Km.	market share %	Energy billed US$ (mio.)	market share %	Customers	market share %	Energy billed US$ (mio.)	market share %	Energy billed US$ (mio.)	market share %
Privatised	13,323.50	53.67%	770.55	53.51%	5,764.60	85.02%	108.68	89.55%	1,872,500	44.88%	848.01	65.00%	1,727.23	60.26%
Private	1,502.97	6.05%	116.97	8.12%	945.10	13.94%	12.69	10.45%	6,595	0.16%	4.83	0.37%	134.49	4.69%
Sub total	14,826.47	**59.72%**	887.52	**61.63%**	6,709.70	**98.95%**	**121.37**	**100.00%**	1879095	**45.04%**	852.83	**65.37%**	1,861.72	**64.96%**
Public 2/	9,999.32	**40.28%**	552.53	**38.37%**	70.88	**1.05%**	n.a.	n.a.	2,292,689	**54.96%**	451.88	**34.63%**	1,004.41	**35.04%**
Total	24,825.79	100.00%	1,440.05	100.00%	6,780.58	100.00%	121.37	100.00%	4,171,784	100.00%	1,304.71	100.00%	2,866.13	100.00%

1/ "Others" category is not included. See Table No 5

2/ Includes customers of distribution companies managed by local/regional Governments

Source: CEPREL (1997), COPRI (2000), MINEM (2006), OSINERGMIN (2006), Proinversión

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The market structure

Regulatory Authorities		Sub sectors	Electricity market structure	Price review
Ministry of Energy and Mines	Commission for free competition (INDECOPI)	a. Generation Liberalised	Companies: generation: 19 (97.3% of the national production) distribution: 11 (2.7% of the national production)	12 months
			Source of energy [1/]: hydraulic: 74.8% (19 125.8 GWh) thermal: 25.2% (6 432.9 GWh)	
	OSINERGMIN Tariff regulator division (GART)	b. Wholesale markets	Market: Regulated market: 54.6% energy sold (12 170.4 GWh) Free market: 45.4% energy sold (10 130 GWh)	
		c. System operations	Economic Operation Commission (COES). Members: generation and transmission companies representatives	
	OSINERGMIN Tariff regulator division (GART) and INDECOPI	d. Transmission Monopoly/concession	Companies: 7 National grid (SEIN)[2/] : 98.2% energy sold (21 888 GWh) Isolated systems: 1.8% energy sold (412 GWh)	12 months
	OSINERGMIN Tariff regulator division (GART) and INDECOPI	e. Distribution Natural monopoly	Companies: 22 (accounts for 63% energy sold)	48 months

1/ Includes production from electricity distribution companies

2/ The National grid (SEIN) is composed of the previous Central Northern Grid and the South Grid.

Source: OSINERGMIN (2003), OSINERGMIN 2006 Annual Report

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Methodology (1)

Cost-benefit analysis by Jones et. al. (1990):

- $\Delta W = Vsp - Vsg + (\lambda g - \lambda p) * Z$ ……..(1)

  Where:

  Vsp : social value under private operation
  Vsg : social value under government operation (counterfactual scenario)
  λg : shadow multiplier on government revenue
  λp : shadow multiplier on private funds
  Z : actual price of the executed sale

- Net efficiency gains/loss = ΔW – R&P

  R&P: restructuring and privatisation costs

- Distributional impact:

  $\Delta W = \lambda c\, \Delta Con + \lambda g\, \Delta Gov + \lambda p\, \Delta Prod + (\lambda g - \lambda p) * Z$ …….(2)

- Notes:

  – Social value: net operating controllable costs = total operating costs – (generation costs+transmission costs+purchase of energy costs + depreciation+operating non-controllable costs)
  – Net operating controllable costs (NOCC) under counterfactual scenario: average per unit (NOCC), 1991-1993 (Electrolima), 1994-1996 (Electro Sur Medio), use of different counterfactual cost fall (0% - 3%)

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Methodology (2)

- Actual and counterfactual operating controllable cost: unit operating controllable costs (average 3 years before privatisation). Individual analysis.
- Efficiency Gains: Cost fall rate (0%-3%), discount rates (5% - 12%)
- Distributional impact: central-case scenario
  - Cost fall: 2.4 per cent (benchmark company: SEAL)
  - Discount rate: 7.3 per cent (reference interest rate – 1990's)
  - Shadow multipliers remain the same: $\lambda g=\lambda p=\lambda c=1$
- Total social welfare: central-case and more scenarios
  - Includes benefit of being connected (US$ 30.5/month) and others
  - Different values of shadow multipliers

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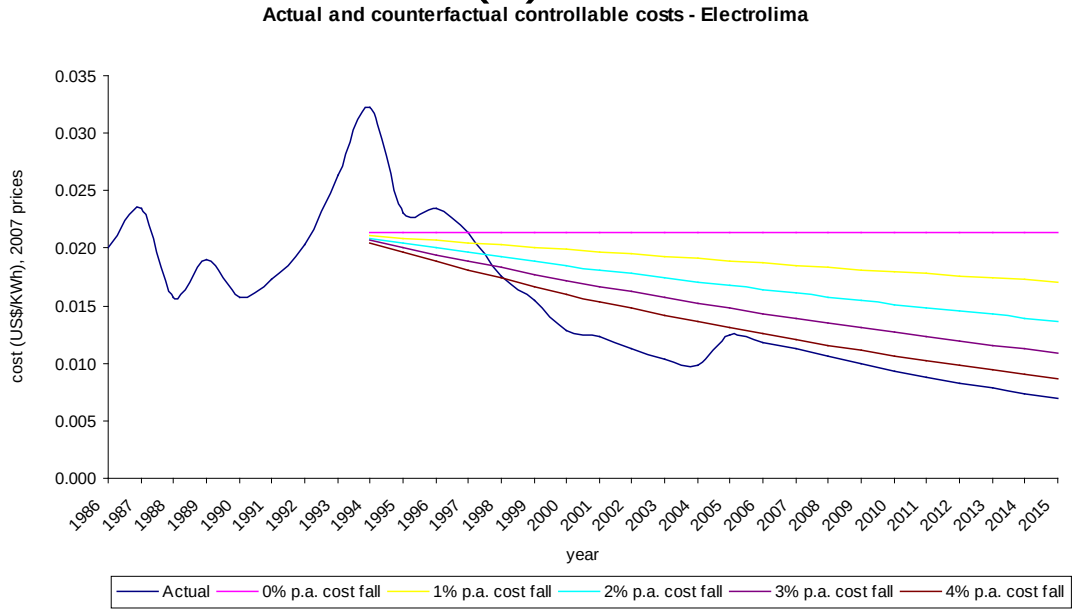
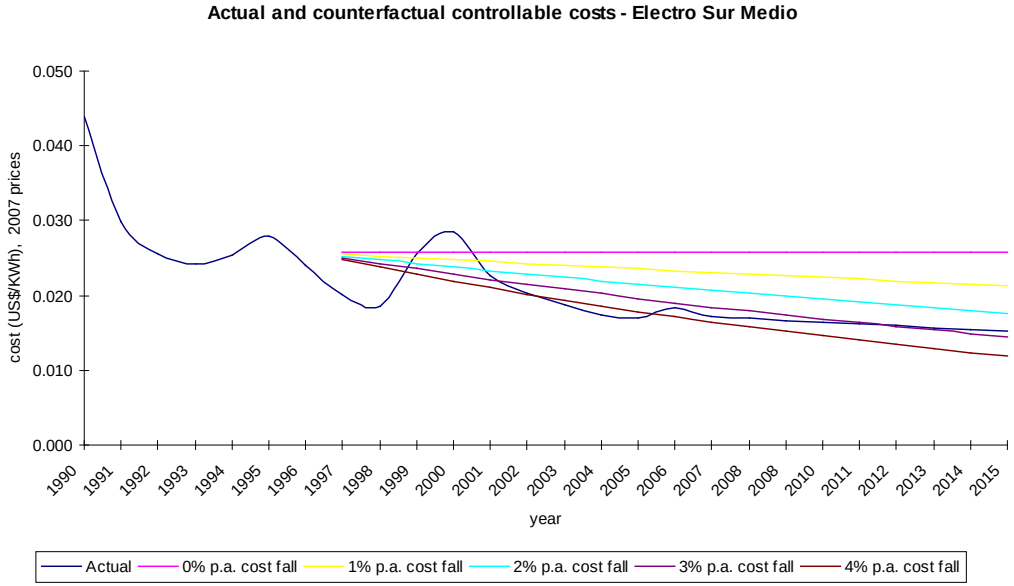
Results (1): Actual and counterfactual controllable cost





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Results (2): Efficiency Gains (ΔW)

Counterfactual cost fall 2007 prices (US$ million)		Discount rate				
		5%	6%	8%	10%	12%
Electrolima						
	0%	989.0	866.1	670.7	525.7	416.9
	1%	720.2	630.5	487.7	381.5	301.5
	2%	486.6	425.3	327.3	254.3	199.2
	3%	283.3	246.1	186.6	142.0	108.3
	4%	106.1	89.5	62.7	42.6	27.4
Electro Sur Medio						
	0%	41.8	37.3	29.9	24.4	20.1
	1%	27.6	24.7	20.0	16.5	13.7
	2%	15.0	13.6	11.2	9.4	8.0
	3%	3.8	3.7	3.4	3.1	2.8
	4%	-6.1	-5.1	-3.7	-2.6	-1.8
Efficiency gains						
	0%	1,030.8	903.4	700.6	550.1	437.0
	1%	747.7	655.2	507.7	397.9	315.2
	2%	501.6	438.8	338.6	263.7	207.2
	3%	287.2	249.8	189.9	145.1	111.1
	4%	100.1	84.4	59.1	40.0	25.5
Efficiency gains (% cost)						
	0%	36.4%	38.2%	39.5%	38.8%	37.0%
	1%	26.4%	27.7%	28.6%	28.1%	26.7%
	2%	17.7%	18.6%	19.1%	18.6%	17.5%
	3%	10.1%	10.6%	10.7%	10.2%	9.4%
	4%	3.5%	3.6%	3.3%	2.8%	2.2%
R&P		14.2	13.5	12.3	11.3	10.3

Counterfactual cost fall: 0-1%: Pro private scenario, 3-4%: Pro public scenario

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Results (3): Distributional impact

Distribution of the net efficiency gains from restructuring and privatisation
Central-case scenario

Central-case scenario (2.4% cost fall) 2007 prices (US$ million)	Discount rate					
Net Distributional Gains	5%	6%	7.3%	8%	10%	12%
1. Electrolima						
ΔGov	354.5	320.7	283.2	265.7	223.5	190.7
ΔCon	-481.5	-436.1	-386.3	-363.1	-307.9	-265.6
ΔProd	515.0	452.8	385.3	354.1	281.0	226.2
ΔW	388.0	337.4	282.3	256.8	196.7	151.4
2. Electro Sur Medio						
ΔGov	8.9	8.2	7.4	7.0	6.1	5.3
ΔCon	-2.9	-2.3	-1.6	-1.3	-0.6	0.0
ΔProd	4.2	3.4	2.5	2.1	1.2	0.5
ΔW	10.2	9.3	8.3	7.8	6.7	5.7
Total net distributional gains						
ΔGov	363.4	328.9	290.7	272.7	229.6	196.0
ΔCon	-484.5	-438.4	-387.9	-364.4	-308.5	-265.6
ΔProd	519.1	456.2	387.8	356.2	282.1	226.6
ΔW	398.1	346.6	290.5	264.5	203.3	157.1

-Use of benchmarks companies to determine the counterfactual cost fall (SEAL company)
-Selection of discount rate based on annual average reference interest rate (1990's)
-Government and producers benefit the most, consumers the least – (increase in prices, 11.5% p.a.)

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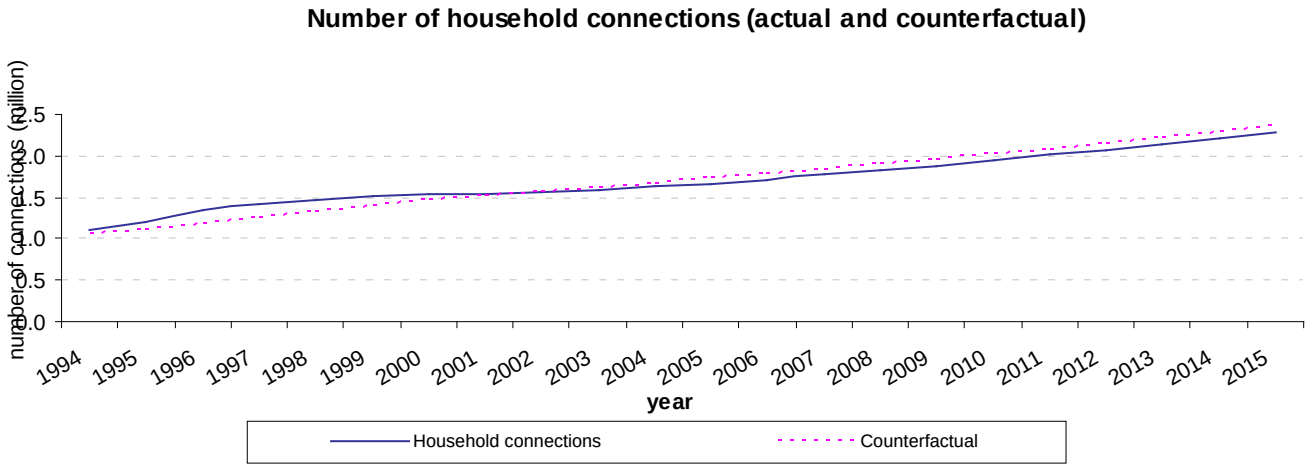
Results (4): Benefits of being connected



-Social welfare of being connected based on value given by World Bank (US$ 30.5/month)
-For counterfactual: use of 2 rates (1994-2000, 2001-2015), benchmark company: SEAL.
-Total social welfare net of connection costs
-Household connections increase: 6% p.a. (first 5 years after privatisation) and 3.3% p.a. (1994-2007)

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Results (5): Total social welfare

Social welfare from restructuring and privatisation under different values of social weights
Consolidation of results

Central-case scenario (2.4% cost fall) 2007 prices (US$ million)	Discount rate					
	5%	6%	7.3%	8%	10%	12%
Base Scenario (*λg = λc = λp = 1)*						
ΔGov	363.4	328.9	290.7	272.7	229.6	196.0
ΔCon	-484.5	-438.4	-387.9	-364.4	-308.5	-265.6
ΔProd	519.1	456.2	387.8	356.2	282.1	226.6
Social welfare	398.1	346.6	290.5	264.5	203.3	157.1
Including additional benefits and costs						
ΔGov	452.5	417.1	377.8	359.3	314.6	279.5
ΔCon	-240.2	-190.0	-136.4	-112.1	-56.8	-17.4
ΔProd	430.1	368.0	300.6	269.6	197.1	143.1
Social welfare	**642.4**	**595.1**	**542.0**	**516.7**	**454.9**	**405.2**
Scenario 1 (*λg = 1, λc = λp = 0.5)*						
ΔGov	363.4	328.9	290.7	272.7	229.6	196.0
ΔCon	-242.2	-219.2	-194.0	-182.2	-154.2	-132.8
ΔProd	259.6	228.1	193.9	178.1	141.1	113.3
Social welfare	893.0	850.0	802.8	780.8	728.6	688.7
Including additional benefits and costs						
ΔGov	452.5	417.1	377.8	359.3	314.6	279.5
ΔCon	2.1	29.2	57.6	70.1	97.4	115.4
ΔProd	170.5	139.9	106.7	91.5	56.1	29.8
Social welfare	**1,137.2**	**1,098.4**	**1,054.3**	**1,033.1**	**980.3**	**936.9**
Scenario 2 (*λg = 1, λc = 0.5, λp = 0.8)*						
ΔGov	363.4	328.9	290.7	272.7	229.6	196.0
ΔCon	-242.2	-219.2	-194.0	-182.2	-154.2	-132.8
ΔProd	415.3	364.9	310.2	284.9	225.7	181.3
Social welfare	741.4	679.5	611.8	580.3	505.9	449.4
Including additioinal benefits and costs						
ΔGov	452.5	417.1	377.8	359.3	314.6	279.5
ΔCon	2.1	29.2	57.6	70.1	97.4	115.4
ΔProd	326.2	276.7	223.0	198.4	140.7	97.8
Social welfare	**985.7**	**928.0**	**863.3**	**832.6**	**757.6**	**697.6**
Social benefits from being connected	244.3	248.5	251.5	252.2	251.7	248.2
Debts from producers (companies)	89.1	88.2	87.2	86.6	85.0	83.5

Social welfare includes the sales component (scenario 1 and 2)

-Notable increase in social welfare due to the use of different social weights
-Sales component important participation
-Consumers benefit only in scenario 1,2 and when additional benefits and costs are included
-Values of social weights based on literature review (developing countries)

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Results (6)

- Some quality Indicators were also analysed
- Use of benchmark companies for making comparisons
- SAIFI and SAIDI indicators have improved notably especially those refer to the biggest companies (Luz del Sur y Edelnor)
- Distribution losses (private and public ownership) have reduced significantly in average

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Conclusions

1. The partial privatisation and restructuring of the electricity distribution market was worthwhile The benefits of being connected contribute to these gains.

2. From distributional impact, government and producers benefit the most and consumers benefit the least. Consumers start to gain with the introduction of the benefits of being connected

3. The actual average prices p.a. is higher than the counterfactual in 11.5 per cent, for the period 1994-2015. An increase in prices was expected (price calculation methodology: “price sincerity”)

4. The increase of net revenues relate to the privatised companies during the first years after being privatised, is noticeable. Main reasons: price increase and the better collection of revenues (bills)

5. Improvements in quality indicators such as number and time of interruptions are more noticeable in the biggest companies that operate in areas with high density. Sectors in which the electricity companies operate have a strong influence on these indicators, independently whether the companies are under private or public-ownership.

6. Restructuring and privatisation has contributed notably to the reduction of distribution losses. Important improvements were also observed in state-owned companies.

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Thank you