Thirsting for Efficiency: The Economics and
Politics of Urban Water System Reform
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CHAPTER 4

INSTITUTIONS, POLITICS, AND CONTRACTS: THE PRIVATIZATION ATTEMPT OF THE WATER AND SANITATION UTILITY OF LIMA, PERU

LORENA ALCÁZAR, LIXIN COLIN XU AND ANA M. ZULUAGA

INTRODUCTION

In 1989–1990 Peru underwent a severe economic crisis with a 5.4% decline in GDP and inflation peaking at an annual rate of over 7600% (World Bank, 1998). The newly elected President, Alberto Fujimori, embarked on a program of sweeping structural reforms that turned Peru from a state-directed to a market-led economy. The reforms changed the role of the state through the sale of more than 200 state owned enterprises, sharply reduced state subsidies and price controls, and introduced tax, wage and other measures designed to improve the efficiency and financial soundness of government. Included in the program was a proposal to privatize the operation of Lima's water and sewerage utility, by means of a concession contract.

As we shall show, Lima's water and sewerage system was in a state of near collapse by the time of Fujimori's election in 1990. Water is scarce in the arid costal region where Lima is located, and leakage, waste, and contamination of water sources compounded this natural scarcity. The result was severe rationing and frequent interruptions for the 75% of the population connected to the system, and high costs and inconvenience for the 25% without direct access to piped water. In addition, almost a third of Lima's 1991 population of 6.5 million were not connected to the sewerage system. Sewerage treatment was almost nonexistent and Lima dumped raw sewerage into the ocean at a rate of 17 to 18 m^3 per second. Low tariffs for water services, lack of metering and low rates of bill collection had left SEDAPAL with neither the incentive nor the resources to expand or maintain the system, and gave consumers little incentive to curb water

consumption except during rationing.[1] The social and external costs of the system were large: high rates of illness and death from water-borne diseases, pollution of rivers used for irrigation and of the ocean used for fishing, depletion of the groundwater, and losses of exports and tourism during the 1991 cholera epidemic.

Conditions thus seemed ripe for Lima's water and sewerage concession. The water and sewerage system was in crisis and the political circumstances favored privatization. Yet the concession did not happen. Even though a number of reforms short of privatization were implemented, we shall show that the welfare gains to Peru from these were well below the potential gains had the concession gone ahead as planned. The objective of this chapter is to analyze the reforms that SEDAPAL underwent instead of the concession, to explore the consequences of that change for water services in Lima, and to explain why the concession was not signed.

The next section of this chapter discusses the circumstances in the water sector leading to reform, and the following section discusses the reforms that were implemented. The chapter then compares the welfare effects of reform with the concession. Next it explores the political circumstances that explain why the operation of the water system was not privatized. We conclude with a discussion of the remaining problems and the implications of the Lima case for policy.

CIRCUMSTANCES IN THE WATER SECTOR LEADING TO REFORM

Cost and Scarcity of Raw Water

Lima's sources of raw water are scarce and variable. Lima is located in the coastal region of Peru, a region that receives less than 15 mm of rainfall a year. The river flow through this region is strongly seasonal: 25 of the 53 main rivers dry up entirely during the dry season from May to December. As a result, the average availability of surface water in the coastal area is estimated at 2885 m^3 per capita, compared to an estimated world average of 8500 m^3 (Macroconsult, 1996).

Pollution aggravates the scarcity problem. The major source of Lima's water supply is the Rimac River, which is contaminated by heavy metals from nearby mines as well as untreated sewerage. About a third of Lima's water comes from wells, which depend on a shrinking supply of groundwater. The aquifer is increasingly polluted by salinity when the water table near the ocean drops because of increased pumping in the dry season (World Bank, 1994).

Demand and Water Tariffs

The potential demand for water was increasing rapidly in the period before reform. Lima was growing by an average of about 2.7% a year from 1981 to 1992 as terrorism and economic factors drove rural populations to move to low-income communities on the outskirts of the city. These so-called *pueblos jóvenes* accounted for 58% of Lima's population of 6.5 million by 1991.

[1] See Appendix A, Table A.2 for the rate of metering in 1988.

Throughout the 1980s and 1990s water and sewerage tariffs, which are combined in Lima, were well below the opportunity cost of supply in an arid area, nor did they reflect the social costs of pollution. Under the populist policies of President Alan García (1985–1990), the water and sewerage tariff was allowed to decline in real terms to the point that by 1989 the average tariff was about US \$0.17 m^3, less than half of the 1985 price in constant (1989) soles. Even if tariffs had been higher they would have done little to curb consumption, since only about a third of connections were metered in 1991 and only about 10% of users were billed according to a meter reading. Unmetered consumers paid a flat rate regardless of what they consume and hence had no incentive to conserve. Moreover, much water was free — only about 43% of billed amounts were collected.

The main constraint on demand was not the price but low coverage and rationing. Only about 75% of the population was connected, 48% of the connected population received water service for less than 12 h a day, and 28% for less than 6 h.[2] Nevertheless, water consumption in the city was 236 l per capita per day in 1987 during the wet season when rationing was low, which is high compared to European averages (150–200 l.p.d.). Consumption varied widely across the city, however; for example in 1993 it ranged from highs of 567 in wealthier neighborhoods with high rates of connection to lows of 105 in poorer zones (World Bank, 1994, annex 8). About a third of those without connections relied on standpipes or group taps, another third on water vendors and the rest on other sources such as wells. Vendor water was expensive, about US \$2.50–2.75 per cubic meter (m^3) and persons who relied on vendors consumed only about 30 l.p.d. (World Bank, 1994).

Management

Mismanagement added to the water shortages and serious sanitation problems. Massive amounts of water were wasted: unaccounted-for water was 43% of production in 1991. Some two thirds of these losses were due to leakage; the rest was consumed but not billed.

The utility, SEDAPAL (Servicio de Agua Potable y Alcantarillado de Lima) had little incentive to reduce UFW in order to sell more water. SEDAPAL's tariff did not cover even its operating costs and it was unable to cut off and punish non-payers. More importantly SEDAPAL did not have the money to replace leaking pipes or increase metering in order to reduce waste. Not only was it making losses, but also it could not borrow after President García unilaterally reduced foreign debt payments to 10% of the owed amount in 1988. As its liquidity situation worsened, the company also stopped paying its debts and by 1993 had US \$45 million of external debt in arrears. SEDAPAL depended on government transfers to meet its current expenditures and these were also declining as the central government's fiscal crisis worsened under President García. As

[2] Rationing costs have been estimated at US \$0.27 m^3, assuming the cost of a household water storage reservoir is US \$1000; operation and maintenance costs are 5% of the investment costs; the economic life of the investment is 15 years with a discount rate of 10%. If physical losses are 30%, than the cost per m^3 consumed is about US \$0.38 (World Bank, 1994).

a result, in the late 1980s the company reduced its investment in expansion and even maintenance investment fell: investment per 1000 connections fell from US $28.6 in 1987 to a low of US $16.6 in 1988. From 1987 to 1989 only about 3 km of water pipe were replaced in a system with more than 6700 km (World Bank, 1994).

SEDAPAL's lack of resources also meant that close to two million people were not connected to the sewerage system. In addition, the sewerage system was suffering from lack of maintenance: close to 85% of the pipes needed to be replaced in older parts of the city. Only about 5% of sewage was treated.

Externalities

The scarcity of water and the pollution problems had major social costs. Because of supply interruptions, even people with connections were storing water under unsanitary conditions. People without connections spent hours queuing at public standpipes.[3] Lack of water also meant that personal hygiene was often substandard. Inadequate sewerage disposal added to health problems; in particular, foodstuffs were contaminated by the dumping of raw sewerage into rivers used for irrigation and into the ocean used for fishing. As a consequence, water-borne and water-related diseases were a major cause of morbidity and mortality, especially in poorer neighborhoods of Lima.[4] The medical costs and lost wages from such diseases were a high part of household income for the poor, 27% by one estimate.[5] The situation contributed to a cholera epidemic centered in Lima in 1991 during which almost 3000 people died throughout Peru.

REFORM OF LIMA'S WATER AND SEWERAGE SYSTEM

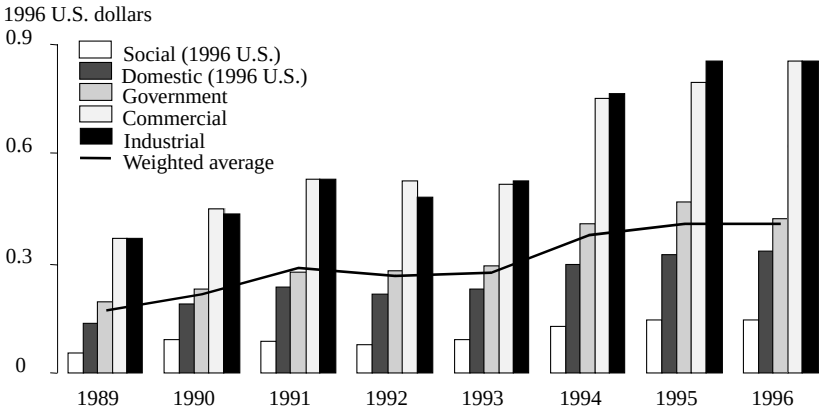
Partly in preparation for privatization and partly in compliance with the World Bank project, the government instituted a number of important reforms in water regulation and in the operations of the utility. This section presents and discusses the consequences of the main changes.

Tariff Reform

As Fig. 1 shows, the government reversed the decline in the real price of water and sewerage (SEDAPAL does not charge separately), raising real tariffs from an average of US $0.17 per m^3 in 1989 to US $0.41 in 1995 and 1996 (1996 prices). Notwithstanding these increases, average tariffs were still below the 1994 estimated marginal cost of water and sewerage of US $0.45 (World Bank, 1994).

Furthermore, tariffs continued to be badly distorted. By the end of 1998, SEDAPAL was still charging a small fixed charge (US $0.90) and five different variable charges: (i) social (for hospitals, charities and public standpipes), (ii) residential, (iii) government,

[3] One person reported a total time of 7 h a day queuing during the dry season (Webb and Associates, 1992).
[4] The pueblos jóvenes reported eight episodes of diarrhea per person a year (World Bank, 1994).
[5] Webb and Associates estimated the medical cost of water-borne diseases at US $13 per capita a year in 1992. Average family size is five persons and household income is US $240.



Source: Authors' calculations based on data from SEDAPAL Annual Reports

Figure 4.1. Average water tariff.

(iv) commercial, and (v) industrial.[6] Initially, the rate of increase for social and residential tariffs was somewhat higher than for other uses, which reduced cross subsidies slightly, but this has been reversed somewhat since 1993 (Fig. 1). For example, in 1989 industrial rates were 170% higher than residential; this fell to 130% in 1993, then rose to 160% in 1996.[7] Although rates are highest for industrial users, these fall mostly on smaller industries, since large industries can afford to drill their own boreholes.

Only 39% of connections were metered by 1996, and only 15% of connections had meters that were read (see Appendix A, Table A.3); an unknown but even smaller number were actually charged according to their meters.[8] Metering varied by type of user, with a greater proportion of industrial users charged according to a meter.[9] Consumers who were not charged according to their meter reading were charged on the basis of estimated consumption volumes that varied by type of consumer and type of neighborhood (see Appendix A, Table A.4) as well as by number of interruptions. SEDAPAL's consumption estimates were often higher than actual consumption because interruptions in service were not fully taken into account, a source of consumer complaints.

Notwithstanding the increase in real tariffs, Lima's pricing regime provided no incentive for unmetered consumers to conserve water. Indeed the price increases had the opposite effect, encouraging consumers to try to increase consumption at least to the amount for which they are billed and encouraging large industrial users to drill their own wells. Currently SEDAPAL estimates that average demand in Lima has increased to the equivalent of 460 l per capita per day, above that of cities with ample water

[6] The connection charge in 1998 for water was US $224 and for sewerage US $296.

[7] The residential rates were US $0.18 per m^3 compared to industrial tariffs of US $0.49 in 1989; by 1996 the rates were US $0.33 and US $0.85, respectively.

[8] In 1992 only 8% were charged according to a meter (LMG Consultants). These data are not strictly comparable, however, because SEDAPAL has contracted out metering and meter reading.

[9] In 1988 about a third of industrial consumers were charged according to a meter versus 16% of residential users (see Appendix A, Table A.3).

sources, although rationing keeps per capita sales much lower. On the other hand, higher prices gave SEDAPAL the incentive and wherewithal to reduce physical water losses and pursue bill collection more rigorously, as we discuss in more detail in the section on SEDAPAL's operations below.

A weakness of the reform was the failure to implement an objective price setting formula. Tariff regulation was defined in the water and sanitation law (Ley 26338, 1994) and its Reglamento (DS 09-95, 1995). However, SUNASS determined that the application of the new tariff regime would be gradual. The implementation of the new tariff system has three stages: preparatory, improvement, and definite. During the preparatory stage, the financial feasibility of the water utility will be stressed so that the enterprises will cover their operation costs. During the improvement stage, the enterprises should index, in a term of five years, their tariffs to the variation of wholesale price index — every time 3% is surpassed. Finally, at the definite stage, tariffs should reflect the long-term marginal cost and they would simply be adjusted according to the inflation. However, the schedule established to advance through the system stages has not been fulfilled and tariffs are still basically adjusted to cover operating costs. In mid-1997 the regulator ordered SEDAPAL to bring estimated consumption closer to actual hours of water supply and to reduce the dispersion in tariffs, the number of categories for commercial and industrial users and the number of categories of residential consumers from 10 to 4 (SUNASS, Boletin Informativo, No. 3, 1997). Even with these changes, however, the price regime continued to send distorted signals to consumers and the utility.

Regulatory Framework

In preparation for private participation several laws were passed from 1991 to 1994 that, among other things, established financial viability as one of the principles for tariff setting. They also consolidated water regulation under MIPRE and created a new regulatory body for water services, the National Superintendence of Sanitary Services, SUNASS (Superintendencia Nacional de Servicios de Saneamiento).[10] The new framework had several serious weaknesses, all described below, that most notably included the following: (i) it lacked a clear delineation of the function and purpose of the regulator and other actors in the sector; (ii) the regulator was not sufficiently autonomous from government; (iii) the regulator was organizationally weak; (iv) there were no viable mechanisms for conflict resolution; and (v) the regulation contained provisions not fully supportive of private participation in water. As a result, the framework would not support reforms of the type envisioned in the concession. The regulation failed to

[10] Specifically, the private investment law (D.L. No. 697) of November 1991 incorporated SEDAPAL into the privatization process; D.L. No. 25738 consolidated regulation of the sector under the Infrastructure Vice-Ministry and PRONAP (Programa Nacional de Agua Potable y Alcantarillado). D.L. No. 25965, in December 1992, created SUNASS with responsibility to supervise water and sewerage enterprises; and the general law of sanitation service, D.L. No. 26338 in July 1994, defined new institutional responsibilities for the sector and established transparency, financial viability and social equity as the basic principles to govern tariff setting and called for autonomous and commercially viable water companies.

provide credible commitment to future private investors that their returns would not be threatened by politically motivated under-pricing or other forms of confiscation and credible assurance to consumers that the regulator could not be captured.

The first problem, a lack of clarity in roles, arose because SUNASS was not only supposed to regulate the water service enterprises, but also to promote and strengthen them. As other countries with this mix of roles have found, Chile for example, the task of promotion harms the arms length relationship a regulator must maintain to assure objectivity and neutrality. This role confusion was illustrated by the remarks of the former Superintendent, Ms. Lidia Oblitas, who stated that SUNASS could not regulate very weak water service enterprises that lack resources. She explained that SUNASS instead tries to strengthen these companies first, and only then demand that they comply with the rules (*El Comercio*, issue of November 9, 1994, confirmed in field interviews in 1997).

Another confusion arose because of the conflict between the role of SUNASS and PRONAP. Some of PRONAP's responsibilities overlapped with SUNASS' regulatory powers. For example, PRONAP was empowered to propose a subsidy policy similar to Chile's income support for water bills (Ochoa, 1997), and to develop accounting techniques and financial models for water enterprises. Conflicts between the two entities were regarded as a major problem by officials of both SUNASS and PRONAP as well as sector authorities in MIPRE and experts consulted in the World Bank and Inter-American Development Bank (field interviews).[11] Autonomy was the second regulatory problem. SUNASS received 2% of all tariff revenues, making it financially self-sufficient, yet it was still vulnerable to political intervention. Unlike other regulatory bodies in Peru, such as the regulator for telecommunications, SUNASS did not have a board or governing council in which government was only one of several stakeholders, as a way to insulate it from direct intervention by the ministry. Instead, all power was vested in the Superintendent, who was a political appointee and until recently reported to MIPRE and could be removed by the Ministry at any time. This was a problem for relations with SEDAPAL, which unlike the other water companies that were attached to their municipality or province, reported directly to MIPRE. The new law (No. 26922, February 1998) partly solved this problem by putting all regulatory agencies under the Presidential Council of Ministers.

A third problem was SUNASS' organizational weaknesses. Although SUNASS, like other regulatory bodies, could pay as much as other regulators and above civil service levels, it had proportionately fewer technically qualified staff — less than 5% of professionals have graduate degrees — than regulators for telecommunications, electricity or consumer- and market-loyal competition protection. Moreover, over one fourth of SUNASS staff came from the former supervisory body for water, and brought with then an approach that focussed more on control than on regulation (field interviews).

Fourth, there were no adequate mechanisms for enforcement or conflict resolution. The law allowed SUNASS to assess a penalty of up to 30% of an enterprise's revenues for failure to comply with the regulation, but at least until the end of 1998 this power had never been used. According to SUNASS' tariff supervisor, the regulator

[11] PRONAP was designed as temporary and scheduled to disappear but its existence has been expanded.

had never assessed a penalty because there was no provision for what would happen if the enterprise failed to comply with the penalty (field interview). Under the present circumstances with a weak regulator and a publicly owned utility, the absence of a neutral mechanism for conflict resolution has not been an issue, but it might become one should private participation be used in the future. The law provides for a water company to appeal SUNASS' decisions to the courts, but the weakness of the judiciary reduces the credibility of the regulatory framework. In interviews, foreign investors cite the corruption and political nature of the judiciary as a particularly negative aspect of Peru's current investment environment (Barthelemy, 1996).

Finally, the water system regulation did not fully support private participation. For example, the general law of sanitary services included a provision stating that "tariffs can be modified in the event that the interest of the population is affected by the privatization process" (law No. 26338, July 1994, authors' translation). None of the legislation specifies how private enterprise tariffs will be set and is ambiguous on details of the concession process.

Reforms in SEDAPAL

In preparation for the concession and to comply with the requirements of the World Bank project, SEDAPAL began a program of restructuring in 1992, that continued after the concession was postponed. The project funds combined with the increased revenues resulting from tariff increases allowed the company to improve its financial performance and increase investment. These changes also helped ease the pressure for the concession.

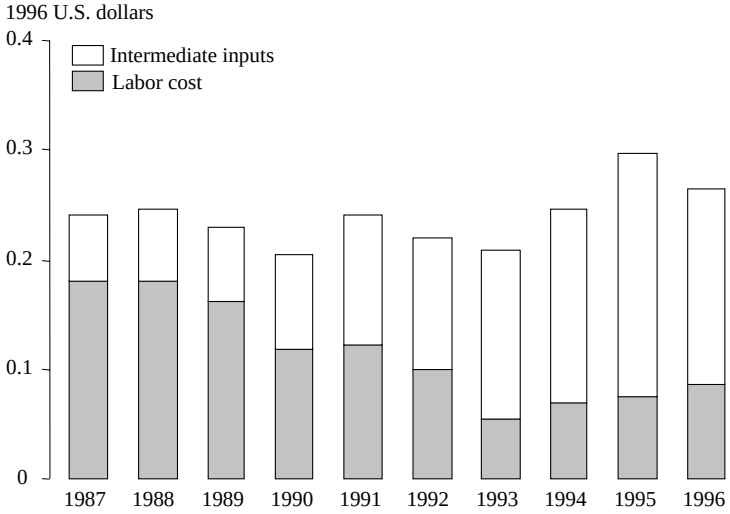
Through voluntary retirement the number of SEDAPAL workers was reduced from 3769 in 1988 to 1359 in 1996; at the same time the number of connections was expanding, so workers per 1000 connections fell from over 6 to 2. This reduction in the labor force was accomplished partly by removing redundant workers and partly by outsourcing activities that were previously done in-house, especially bill collection and maintenance, installation and repair of connections. As a result, labor costs fell sharply. Even though outsourcing raised administrative and maintenance expenses and electricity costs increased, overall operating expenses per cubic meter of water sold stayed fairly constant (Fig. 2).

SEDAPAL also introduced a number of reforms designed to change management and personnel incentives in 1996. This included a performance-based pay system with specific targets for each employee and quarterly bonuses of up to 10% of pay.[12] Partly as a result, the average annual salary of SEDAPAL's personnel began to increase in real terms, as can be seen in Fig. 3.

The reduction in labor expenses and the rise in tariffs allowed SEDAPAL to make a profit in 1993 for the first time in more than a decade. Further price increases, as well as improvements in billing and collection have kept SEDAPAL solvent (Fig. 4).

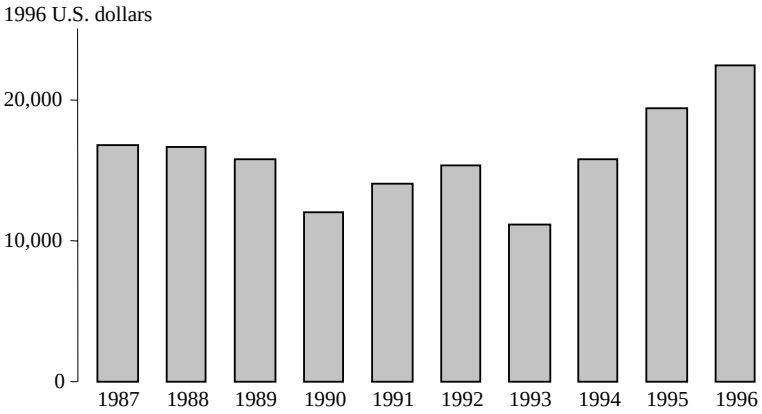
The increase in SEDAPAL's liquidity and the World Bank project allowed a surge in investment in expansion and maintenance. As Fig. 5 shows, investment per con-

[12] To implement this change management won agreement of the union for the 55% of staff that is unionized.



Source: Authors' calculations based on data from SEDAPAL annual reports

Figure 4.2. Operating cost per cubic meter of water sold.



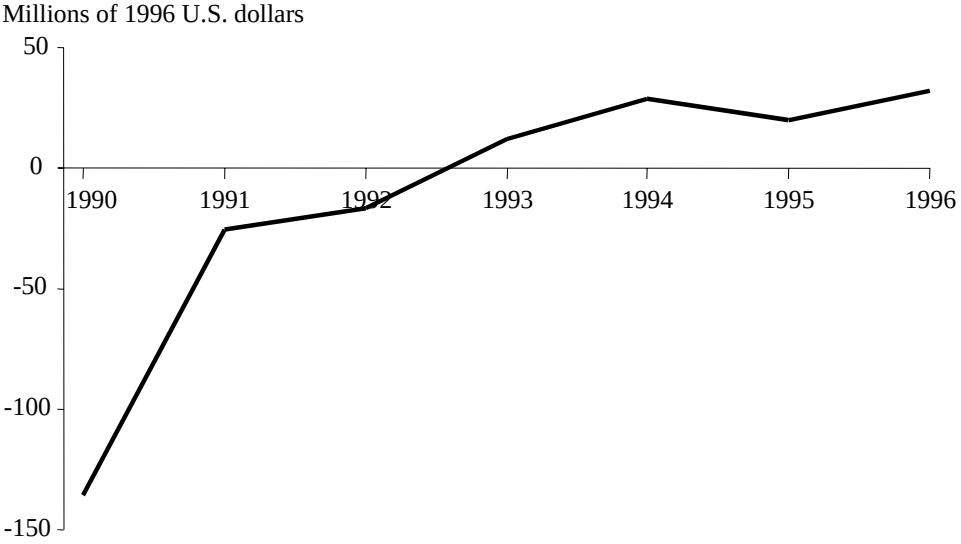
Source: Authors' calculations based on data from SEDAPAL annual reports

Figure 4.3. Average annual salary.

nection rose from US $26 in 1990 to US $80 by 1996. Most of the investment has been earmarked for expansion and there has been less emphasis on rehabilitation and maintenance of the existing network.

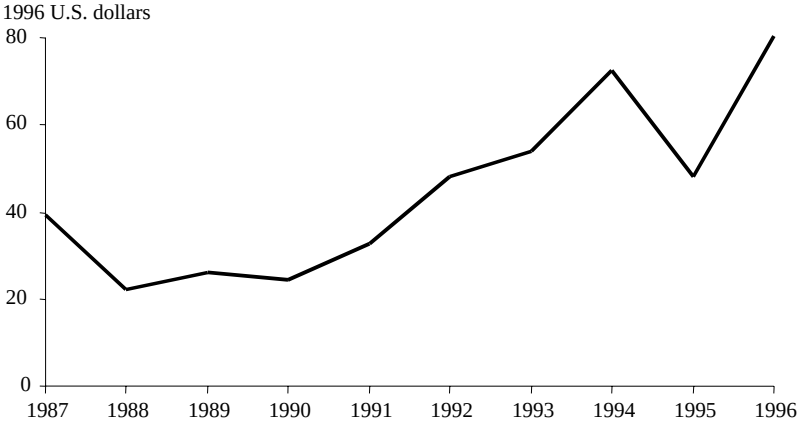
THE EFFECTS OF THE REFORM ON PERFORMANCE AND WELFARE

This section shows the impact of the reforms described in the previous section on several performance measures and then compares their welfare effects with those that might have been achieved under the concession.



Source: SEDAPAL annual reports

Figure 4.4. SEDAPAL profits.

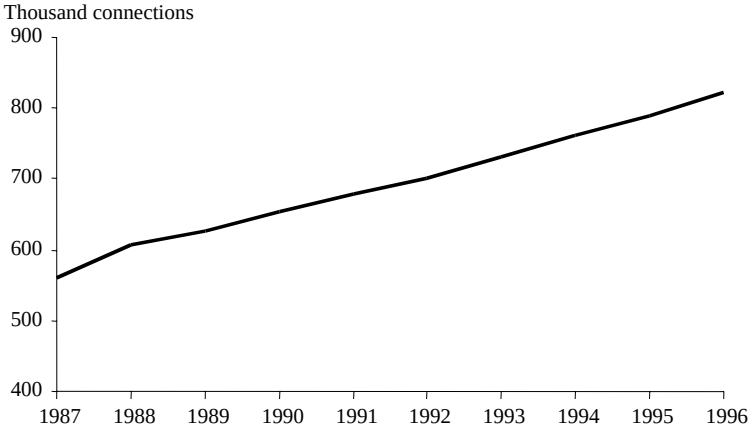


Source: Authors' calculations based on data from SEDAPAL annual reports.

Figure 4.5. Annual investment per thousand connection.

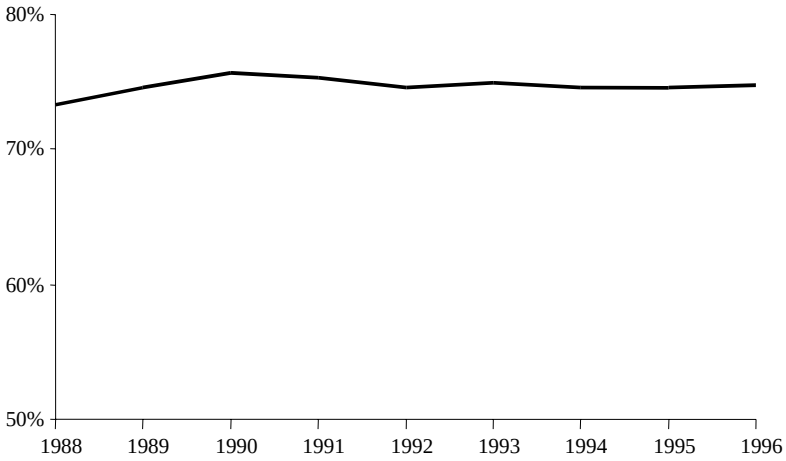
The Effects of the Reform on Performance

Additional funding from the World Bank project and higher water tariffs enabled SEDAPAL to add close to 200,000 additional water connections between 1989 and 1996 (Fig. 6). This growth in connections only allowed the company to keep pace with Lima's rising population, however, and the coverage ratio of 70% barely changed (Fig. 7). Moreover, the quality of service does not seem to have improved. For example, field



Source: SEDAPAL annual reports.

Figure 4.6. Thousands of water connections.



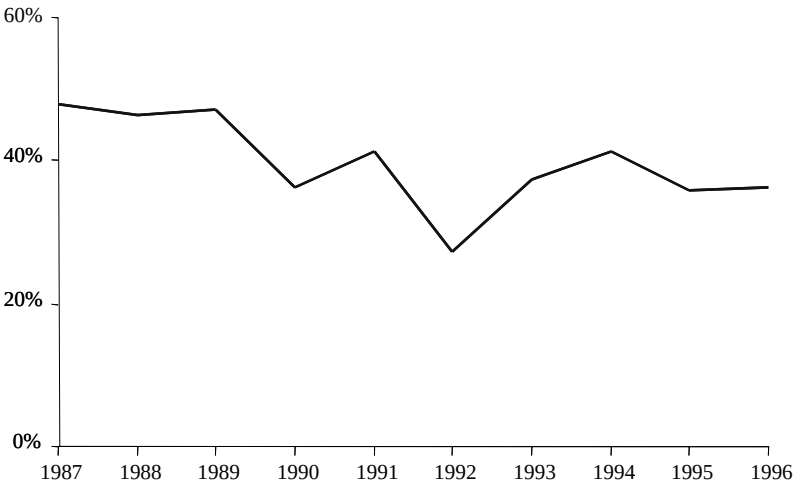
Source: SEDAPAL annual reports.

Figure 4.7. Percentage of water coverage.

interviews suggest that some districts of Lima received no water service for more than two months in 1997.

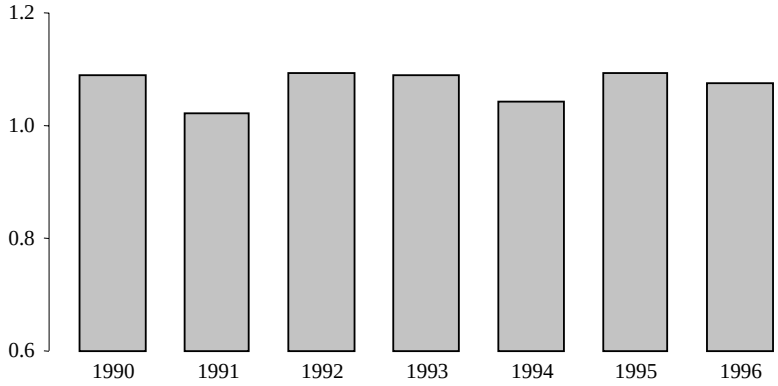
The efficiency improvements in SEDAPAL did not have a sustained effect on unaccounted-for water. UFW fell from close to 50% in 1987 to a low of about 27% in 1992 but then began to increase again (Fig. 8). By 1996 it was 36%.

Furthermore, the changes in management and incentives did not lead to any measurable improvement in total factor productivity (Fig. 9).



Source: SEDAPAL annual reports.

Figure 4.8. Unaccounted-for water.



Source: Authors' calculations based on SEDAPAL annual reports.

Figure 4.9. Total factor productivity.

Methodology for Calculating the Welfare Effects

What would have been the net benefits to Peru had the concession with a private operator been signed and fully implemented? Using a partial equilibrium cost–benefit methodology developed by Jones et al. (1990), we compared the actual reform outcome with a counterfactual projected on the basis of the draft concession contract (CEPRI-SEDEPAL 1994).[13] We assumed that the private operator would invest to meet all of the minimum

[13] We projected performance under the concession for ten years (from 1995 to 2004), which required us also to project the actual case for eight years beyond our data, and compared the results under the concession with what actually occurred.

requirements in the concession, using retained earnings and borrowing. According to the concession document, the winning bidder would be responsible for all financial risk and capital expenditures as well as take over all the company's liabilities, in return for all profits from operating the concession for 30 years. The concession also required the company to increase the company's paid in capital by US $100 million in the first five years, increase water service from 15 to 24 h per day in five years, expand market coverage from 75% to 95% in ten years, and raise metered connections from 38% to 95% of total connections in ten years. Unaccounted-for water was required to drop from 36 to 25%.[14]

It is doubtless unrealistic to assume that the winner bidder will meet all the terms of the concession. However, without any reasonable basis on which to adjust the concession terms, we chose to project the concession as drafted and then consider the magnitude of the gain if we discounted it by 50%.

We assumed that a private operator would be able to improve further SEDAPAL's operating efficiency, hence we projected rather conservatively that the concession operator would reduce the use of intermediate inputs by 5%. However, we expected that any further improvement in labor over and above the cuts already introduced would be unlikely. Finally, we assumed that the opportunity cost of capital would not change.

The concession was to be awarded to the bidder who offered the lowest average water tariff. The maximum allowable increase for the first year was 40% and afterwards tariffs would be increased according to a factor K plus inflation. K was set to zero for the first five years, after which K would vary depending on investment and efficiency improvements. For our base projections we assumed that all bidders would increase prices to cover marginal costs (using the World Bank estimate of US $0.45) or by about 38%, with no further real increases during the projection period. A bidder, if offered lower price increases, would be more likely to renegotiate the concession to reduce the investment requirements, thus reducing the net effect on our projected consumer surplus.

We compared the concession projections with SEDAPAL's actual performance, projected to 2004 based on linear trends from 1988 to 1996. Residential and nonresidential demand was estimated for both the actual and counterfactual using the following methodology. We assume that total demand (TQ) is a function of population (N) times the individual demand curve ($a - bp$), where a is the demand when the marginal price (p) is zero, such that:

$$TQ_t = N_t(a - bp)$$

The elasticity of demand is assumed to be -0.30 for metered residential customers and -0.20 for nonresidential; unmetered customers are assumed to have an elasticity of zero since their volume of consumption is unaffected by price.[15] We assume that

? In the next equation a capital *P* occurs

[14] According to the concession document the qualified international operator must retain at least 25% of newly issued shares. Employees must receive at least 5% of new shares, and at least 20% of the new shares must be issued in the stock exchange. In the base scenario, we assumed that the international corporation retains 75% of the stocks.

[15] To our knowledge, there is no study of the demand elasticity for Lima. We thus arbitrarily assigned a plausible elasticity based on the literature and the elasticity in other Latin American cities. Later we shall check the sensitivity of the welfare results to these assumptions.

an individual's demand curve remains the same under the actual and the counterfactual and that the total demand consists of all the residents of the SEDAPAL service area, in other words that the unconnected population constitutes excess demand. Given the relative low price of water and sewerage when the reforms began, this assumption seems justified. We also assume that, when facing excess demand, rationing is based on willingness to pay.[16] From these assumptions we obtain two equations and two unknowns, a and b:

$$-\varepsilon_{\mathrm{d}} = \frac{\mathrm{d}\ln T Q_{\mathrm{metered}}}{\mathrm{d}\ln P_{\mathrm{metered}}} = -bN_{\mathrm{metered}}\frac{P_{\mathrm{metered}}}{T Q_{\mathrm{metered}}}$$

$$\frac{Q_{\mathrm{metered}}}{\mathrm{coverage} \times \mathrm{continuity}} = N_{\mathrm{metered}}(a - bP)$$

Coverage is the percentage of population with access to connections and continuity is the hours that a connected resident has access to water divided by 24 h. We assume that for half of the interrupted hours the residents still have access to water from personal water storage facilities. We arbitrarily take the last year of our data set, 1996, to calculate our demand function in order to estimate the consumer surplus associated with any price and quantity pair. The demand function for unmetered individuals is then assumed to have the same a and b parameters as for metered consumers, although we treated the marginal prices differently. We then estimated consumer surplus using the methodology described in Appendix B. In calculating consumer surplus, we assume that excess demand is allocated by willingness to pay.

Welfare Effects

The total welfare effects of the concession are the sum of the differences between the actual and counterfactual projections of consumer surplus, employee welfare, government revenue, and investors' revenue. This calculation suggests that the concession would have yielded significant gains totaling US $864.03 million (net present value in 1994 dollars) for the period 1995–2004. Many of these gains would have gone to foreign investors, but if we deduct their gains, the total improvement in domestic welfare is still substantial, US $557.80 million. Foreign gains are large because we assumed that they would own 50% of the stock of the private operator, although the concession draft only requires the strategic investor to own 25%. If we relax that assumption, domestic gains would be much higher, as we show in the next section. We can get a sense of the magnitude of the gains by calculating the annual gain as a percentage of the annual sales of SEDAPAL in the last pre-privatization year (1994). Thus, the domestic gain from the concession would have been almost 40% of annual sales, in perpetuity (see Table 1).

Despite price increases, consumers are better off by US $251 million or about US $33 per connection annually, thanks to the increased coverage and more continuous service projected under the concession. Employees are better off because they own 5% of shares; their gains amount to about US $1579 per employee per year. The new owners

[16] Later we shall present a sensitivity test with respect to random rationing.

Table 4.1
The distribution of welfare changes: base scenario

	NPV of cumulative welfare gain 1995–2004 (1994 US dollars, millions)	*Annual welfare gain/1994 sales (%)*	*Annual welfare gain per group (1994 US dollars)*
Government	12.45	0.9	–
Employees	30.02	2.1	1579.32 per employee
Domestic investors	264.20	18.6	–
Foreign investors	306.23	21.5	–
Consumers	251.12	17.7	32.92 per connection
Total domestic welfare	557.80	39.2	8.46 per capita
Total welfare	864.03	60.7	–

Source: authors' calculations.

of the company, foreign and domestic, are the biggest winners, while government is only better off by about US $12.45 million. This is because under the concession it would lose the quasi-rents that it received as owner of SEDAPAL, which would now accrue to the investors as the return on their capital. This reflects the fact that to encourage large new investment under private operation government can no longer confiscate these quasi-rents.

This calculation underestimates the benefits because it is not possible for us to include externalities or the direct social benefits to consumers. If indeed the concessions brought water and sewerage to 95% of Lima in 10 years, the health improvements and savings in time queuing would be considerable. The rapid increase in prices and metering would have reduced demand and the UFW targets would have brought down losses, conserving a scarce resource. Better sewerage coverage would allow the city to safely recharge the aquifer with rainwater.

Sensitivity Tests

To test the sensitivity of the results to alternative assumptions, we experimented with changing one parameter and kept the rest of the base scenario the same. In this way we tested our assumptions about how water demand was satisfied, price elasticity, price increases, foreign ownership shares and efficiency of private operation. As reported in Table 2, the total gain changes very little except when we assume that excess demand is rationed randomly instead of by willingness to pay. If the pool of consumers who were without a connection at the time of the reform included many people who were willing to pay a lot to be connected, then consumer surplus and total welfare gains would be much higher. Random rationing is not a plausible assumption for Lima, however, since we know that most of the unconnected population was poor and that wealthy people who were not connected had their own sources of water.

As Table 2 shows, changing assumptions about the initial price increase and elasticities change the consumer surplus only slightly. Changing assumptions about the

Table 4.2

Sensitivity analysis (annualized net present value of welfare gains in millions of 1994 US dollars as percentage of 1994 sales)

	Government	*Investors*		*Workers*	*Consumers*	*Total domestic welfare*	*Total welfare*
		Foreign	*Domestic*				
Base	0.88	21.53	18.57	2.11	17.65	39.21	60.74
Random rationing	0.88	21.53	18.57	2.11	31.53	53.09	74.62
Elasticity of 5% more	0.88	21.53	18.57	2.11	16.73	38.29	59.82
Elasticity of 5% less	0.87	21.53	18.57	2.11	19.02	40.58	62.11
Price increase 40%	2.10	21.92	18.91	2.15	17.04	40.19	62.11
25% foreign ownership	0.88	10.55	29.55	2.11	17.65	50.19	60.74
75% foreign ownership	0.88	31.66	8.44	2.11	17.65	29.08	60.74
Equal cost of international inputs	−1.99	20.64	17.81	2.02	17.65	35.50	56.14

Source: authors' calculations.

ownership of the company has large effects only on the distribution of gains between foreign and domestic owners of the private operating company. Not surprisingly, if the private operator is not more efficient in using intermediate inputs than the publicly operated SEDAPAL, then welfare will decrease, although the magnitude is not large because our base assumption was conservative.

Welfare Effects of Partial Reforms

Using the same methodology, we estimated the welfare gains from the reforms that actually occurred compared to no reform at all. Since the quality of the data for 1990–1991 was poor because of hyperinflation, we relied largely on data from 1987 to 1989 to predict the behavior of SEDAPAL without reform to 1996, our last year of observations for the factual. We assumed that SEDAPAL would have followed the trend from 1987 to 1989 without the reforms.

Table 3 reports the welfare gains of reforms as a percent of SEDAPAL's sales in 1992, the base year in which reforms started, and in 1994, to allow comparison with the gains from the concession shown in Table 1. The reforms led to total welfare gains of about US $40 million (net present value in 1994 US dollars), or an annual gain of 7% of SEDAPAL's 1994 sales in perpetuity. Government gains by some US $38 million, thanks to the increase in quasi-rents with higher prices. Consumers gained by US $54 million, which reflects the increase in connections net of the effect of higher prices. Workers were the only losers, worse off by about US $52 million, because of the effects of forced early retirements.

These calculations suggest that the welfare effects from the partial reforms are much lower than the gains under the concession. Consumer surplus is almost four and a half time larger with the concession. This suggests that even if only half the concession's goals had been attained, consumers would still be two and a half time better off than under the actual reforms.

How unrealistic were the concession's goals? We have raised some doubts about Peru's regulatory credibility, but that did not prevent investment in other infrastructure.

Table 4.3

Welfare effects of the 1992 reforms (net present values in millions of 1994 US dollars and as a percent of 1994 sales)

1992 Reform	*Government*	*Investors*		*Workers*	*Consumers*	*Total domestic welfare*	*Total welfare* [a]
		Foreign	*Domestic*				
Cumulative welfare gain 1993–96 (millions of 1994 dollars)	38.1	0.0	0.0	−52.2	54.5	40.5	40.5
Annual welfare gain/ 1994 sales (percent)	6.7	0.0	0.0	−9.1	9.5	7.1	7.1

[a] Total domestic welfare is the same as total welfare since there were no foreign players.
Source: authors' calculations.

Moreover, Lima's concession tender attracted three bidders who invested an estimated US $1 million each to prequalify. One serious problem was affordability. The fact that the price of a house in the slums would increase fourfold if it had a water connection suggests that people would have been willing to pay a great deal more for piped water if they could finance the connection. Connection charges, however, would probably not have been affordable to many poor people without a better form of financing (better than the efforts made under the FONAVI program). If the experience of Buenos Aires is any indication, the operator might have pushed government to make new connections affordable to more people through cross subsidies or through the provision of subsidized credit to the poor. Another serious problem was scarcity. Even assuming reduced consumption through metering and better maintenance, and investment in storage and sources of supply, the water scarcity is such that the provision of water without interruption to all Lima's population in the medium term is likely to be very high.

The partial reforms are better for government than a concession because government can retain the quasi-rents from higher prices, but the consumers lose because of much lower investment. In other words, under a concession the higher prices give the private investors a return on their capital which they invest to expand and maintain the system, while under the partial reforms that actually took place, prices go up less quickly and government retains some of the quasi-rents and invests less.

POLITICAL CIRCUMSTANCES LEADING TO REFORM

Although the water system was in a state of collapse by 1990, that crisis was not a sufficient condition for reform. The circumstances that precipitated change were political. Politics also explain why the utility was not privatized. As we discuss below, reform occurs only when three necessary conditions are met: (i) the reform is politically desirable, i.e., the political benefits to the president or other reformers outweigh the political costs; (ii) the reform is politically feasible, i.e., those favoring reform control the levels of power (such as the legislature and the judiciary) and opposition to the reform cannot prevent its implementation; (iii) the reform is credible, i.e., the promises the government makes to implement and sustain the reform, to reward the winners and compensate the losers, are credible to investors, opponents and other groups who might otherwise derail the reform by refusing to go along (World Bank, 1995). As we shall show, the SEDAPAL concession initially met all three conditions, but a change in circumstances changed the political equation.

The Failure of Traditional Politics

To understand the politics of water privatization, we must first understand the circumstances that brought President Fujimori to power in 1990 and made reform of Lima's water system a possibility. Throughout the 1960s and 70s Peru was governed by a succession of authoritarian and democratic governments pursuing generally populist policies. A 1968 coup installed a military government that greatly increased the state's role in the economy and the number of state enterprises (from 18 to 174). As the eco-

Table 4.4
Attitudes towards market reforms in Lima (percentage in agreement)

	April 1989	*July 1990*	*August 1991*	*April 1993*
Foreign investment should be promoted	71	87	84	76
Private firms are favorable for the country	63	70	80	73
The market-oriented economy is the most convenient for the country	54	58	72	58
The state should give productive activities to the private sector	51	56	59	57
Most state-owned enterprises should be privatized	49	48	58	51

Source: Opinion Reports — Apoyo.

nomic situation deteriorated under their rule, the military decided to restore elections, and introduced a new constitution in 1978.

Although the two democratically elected presidents who followed came from different political backgrounds, both regimes were characterized by increased state spending, rule by decree, economic decline and corruption. President Alan García, who ruled from 1985 to 1990, froze the prices of many commodities including water, unilaterally reduced payments on Peru's foreign debt to 10% of obligations, and increased deficit spending, contributing to a deep financial crisis and hyperinflation.[17] In addition, rising terrorism contributed to a sense of widespread insecurity and growing disillusionment with government. By March 1989 only 23% of those polled in Lima reported that they trusted the President, 20% trusted the legislature or the judiciary and 17% trusted the political parties, compared to 42% who reported they trusted the military (see Table 5 below).

The economic crisis and hyperinflation also led most people to prefer a more market-oriented economy to the state-directed economy of the last three decades (Table 4). A poll in August 1989 found that 50% of the population in Lima agreed that state enterprises should be privatized (84% of those in the highest income group compared to only 32% in the lowest; Alvarez Rodrich, 1991).

The 1990 election was held in this context of crisis and distrust of traditional political organizations. Initially the independent candidate, Mario Vargas Llosa, with strong backing from the business community and right wing parties, won public support for his program of radical economic reform and privatization. However, he was ultimately defeated in a runoff by a relatively unknown independent, Alberto Fujimori, who had few ties to the political elite and promised vague, heterodox policies. Fujimori won the support of the lower middle and lowest income groups, partly because they feared that Vargas Llosa would institute an economic austerity program that would injure them, but also because they identified Vargas Llosa with the traditional 'rich' and 'white' political forces.

[17] Between 1987 and 1990 GDP decreased 23.4% in real terms while inflation reached 2775% in 1989.

Lima was an important source of Fujimori's support. In the first round of the election he won 33.5% of the votes in Lima, compared to 29.1% in the entire country; in the runoff he won 65.2% of Lima compared to 62.5% in all of Peru. Polls suggest that within Lima, poorer voters were his strongest base. A poll in July 1990, shortly after the election in April, found that among those with average monthly family incomes between US $200 and US $240 who comprise about 43% of Lima's households, Fujimori's rate of approval was 72% compared to only 32% approval among those whose average monthly family income was between US $3200 and US $5000, who make up the top 4.5% of households.[18]

? If Apoyo... should be in the ref. list, please make it complete with year, names, publisher etc.

Despite this support base, Fujimori proceeded to implement a program of radical reforms very similar to that of his opponent for reasons we will explain in the next section.

Political Conditions Favoring Reform

The economic crisis, hyperinflation and terrorism had reached a point where the new President had little choice but to institute change. By moving rapidly and decisively, he might be able to turn around the economic situation, defeat the terrorists, and win back his support group. Fujimori's decision to implement a reform program that was not favored by his constituent base was also based on the possibility that radical reforms could win the support of three important veto players. These veto players who could help him retain power and provide financing that he could use to regain support of his core constituency later were: the military, Peruvian private investors, foreign investors and financial institutions, and both private and bilateral and international aid agencies.

Shortly after taking office, President Fujimori radically reduced tariffs, subsidies and price controls. For example, the price of gasoline was increased by a factor of 30 in one day. He also drastically cut government spending and introduced restrictive fiscal and monetary policies. He began to redefine the role of the state in the economy by privatizing state enterprises, reducing regulation of financial and labor markets, and introducing monetary and tax adjustments. He also moved to reduce terrorism and capture the terrorist leaders.[19] He instituted these changes by decree, ignoring legislative and judicial obstacles and bypassing the traditional ministries and strengthening the Ministry of the Presidency (MIPRE). Tensions with the legislative and judiciary rose throughout this period and these two branches formed the principal opposition to the reform program.

This approach paid off both economically and politically. Economically the most important change was a rapid drop in inflation, from a monthly rate of 398% in August 1990 to 4% by the end of 1992. The decline in GDP was halted and then reversed; GDP grew by over 6% in 1993 and over 13% in 1994.[20] The reforms had negative effects on

[18] The Fujimori administration's approval rate for the two household income groups between these two extremes was about 50% (from *Apoyo Opinion Reports*, several issues).

[19] Culminating in the capture of Abimael Guzman, top leader of the 'Shining Path' or *Sendero Luminoso*, in September 1992.

[20] The GDP growth rates were: 1987 8.5%; 1988 −8.4%; 1989 −11.7%; 1990 −5.4%; 1991 7.0%; 1992 −1.8%; 1993 6.4%; 1994 13.1%.

Table 4.5
Do you trust the following institutions? (percentage of trust in Lima)

Institution	*1989 (March)*	*1990 (Sept.)*	*1991 (Sept.)*	*1992 (Sept.)*	*1993 (Sept.)*	*1994 (Sept.)*	*1995 (Sept.)*	*1996 (Sept.)*
Private firms	–	63	–	53	63	65	64	49
Military forces	42	58	47	57	66	59	68	55
President	23	57	26	54	60	63	72	56
Council of Ministers	–	–	24	37	43	44	48	43
Senate	20	47	19	–	44	42	52	41
Unions	–	35	–	20	32	32	35	34
Judiciary	20	23	22	28	34	33	36	39
Political parties	17	21	13	13	11	14	19	18

Source: Opinion Reports — Apoyo.

the poor, however. From 1990 to 1992 the number of people living in poverty increased from 9 to 14 million and real wages dropped by 40%.

Notwithstanding the adverse consequences for his poorer supporters, the political effects were strongly positive. After an initial drop in popularity, public approval of President Fujimori rose – from 30% shortly after the election to 60% in November of 1991 (Apoyo Opinion Reports). He won the support of the military, which in April 1992 collaborated when he dismissed the Congress and the Judiciary in a so-called *autogolpe*, or self-inflicted coup d'état. The *autogolpe* consolidated the President's power and added to his popularity. It was supported by 80% of the population according to polls (Apoyo Opinion Reports). The capture of the leader of the terrorist organization 'Shining Path' (Abimael Guzman) and a decline in terrorist activities further enhanced the new regime's political strength. Trust in the presidency, as an institution was very high by 1992, as was trust in Fujimori's allies: private firms and the military. Trust in the President's main opponent organizations, the traditional political parties, the judiciary, unions and, to a lesser extent, the Senate, continued being low according to surveys in Lima; see Table 5.[21]

Investors' perception also began to change; for example, studies comparing Peru's business environment with that of 30 other developing countries ranked Peru last in 1989; it had risen to third rank by 1991.[22] Another sign of growing confidence in Peru's economy was an improvement in the face value of Peru's external debt trading in world capital markets. It rose from 4% of face value in July 1990 to over 17% by July 1992 and 69% in July 1993. The government also won the support of bilateral aid agencies

[21] Other signs of weakness of the unions were the drop in union membership from one third of the labor force in the seventies to 12% at the beginning of the nineties, and a drop in strikes (man hours lost to strikes fell from 38 million in 1983 to 15 million in 1990).

[22] Study by the Futures Group updated for 1991 by Apoyo. The ranking was based on trade liberalization, exchange rate policies, liberalization of financial markets, prices and salaries, fiscal and monetary policies, privatization, attitude towards foreign investment, information, property rights, government management, legal and accounting systems, and infrastructure.

(notably Japan) which provided funds to restore Peru's credit standing with the World Bank and the IMF.

The Political Conditions for the Privatization of SEDAPAL

Fujimori's strategy, as we just described, was to implement a very rapid and decisive reform that would concentrate the negative effects on the poorer population in the early part of the new administration's term in office ('honeymoon period'), and later in his period in office restore growth and support. Thus the administration began quickly to implement its plan to privatize more than 200 state-owned enterprises (SOEs) in two and a half years, i.e., by mid-1994. Included in this plan was a concession to operate the state-owned water utility, SEDAPAL.[23]

Privatization was critical to the success of the entire reform program. It would improve the fiscal situation by generating capital, including much needed foreign exchange, and reducing transfers to SOEs that were hemorrhaging funds — the SOE deficit was 0.5% of GDP in 1991. It would also attract funds for badly needed investments in key infrastructure services that the government could not afford to finance. Finally, privatization would help restore Peru's credibility with investors and foreign financial institutions. Because privatization is harder to reverse than less structural changes, such as reductions in price controls or tariffs, it would help signal investors that the Fujimori government was indeed committed to sustained reform (World Bank, 1995a). The government's strong commitment to privatization was evident through this period. The government's plan included more than 200 SOEs. By the end of 1994 over US $3 billion in revenues had been raised from privatization, over US $7 billion by April 1997 (see Appendix A, Table A.5).

For all these reasons, private participation in SEDAPAL was politically desirable at that time, at least to the market-oriented technocrats who were responsible for designing the concession transaction. The concession was a logical component of a sweeping privatization program designed to restore business confidence and remove bottlenecks to modernization. Additional funds would allow SEDAPAL to improve service, which would especially benefit the lower- and middle-income consumers who lived in communities that suffered the most frequent interruptions, and who could least afford to build private cisterns for water storage. Private operation would also remove a fiscal drain; government transfers to SEDAPAL in 1991 were US $12.2 million (LMG Consultants, 1993). However, political desirability was less strong in the top ranks of the administration, for reasons we describe below.

The reform was also politically feasible, in the sense that the government would

[23] The privatization process officially began in September 1991 with decree No. 674 (law for promotion of private investment) which created the body in charge of privatization, COPRI (Comisión de Promoción de la Inversión Privada or Commission for Promotion of Private Investment). Also in 1991 decree No. 662 guaranteed equal treatment for domestic and foreign investment and the right of foreign investors to repatriate their profits and dividends. In June of 1992 the government officially announced the inclusion of SEDAPAL in the privatization program (Resolución Suprema No. 349-92-PCM) and created a special committee, or CEPRI, to oversee the process (CEPRI-SEDAPAL).

be able to overcome opposition and implement the concession. The *autogolpe* had left Fujimori in complete control of the apparatus of the state with the backing of the military and most of the public. The main political opponents of SEDAPAL's privatization, the workers, were not veto players. High unemployment and the growth of the service and informal sectors had reduced union membership from one third of the workforce in the 1970's to only 12% by the early 1990's. As we saw in Table 5 unions had low public support, in part because they were associated with the discredited traditional political parties. Moreover, they were not constituents of Fujimori. Polls also suggest strong public support for personnel reductions in SOEs: in January 1991, 75% of those surveyed considered a reduction in the SOE labor force necessary (82% of high-income respondents and 71% of low-income; Alvarez Rodrich, 1991). Furthermore, compensation packages from US $5000 to US $6000 were promised to redundant personnel in SEDAPAL, which helped reduce opposition to layoffs.[24]

The concession was also credible, in the sense that potential investors had reason to believe that government would keep its promises to abide by the agreement. Government had carried through the rest of its reform program as promised, including selling large and politically important SOEs such as Hierro Perú, Compañía Peruana de Teléfonos and Edelnor and Edegel. One sign of the government's credibility was that international investors had been willing to sink large amounts in capital in sales of, for example, telecommunications and electricity. Another sign of the administration's credibility was the further drop in the discount on its foreign debt instruments; by the end of 1995 Peru's external debt was trading at 71% of its nominal value. It is possible that investors might not have seen government's commitment to raise prices as fully credible in a sector as politically sensitive as water, especially given adverse public reaction to tariff increases in other services. However, they probably expected that they could renegotiate their investment obligations under the concession down to levels that would allow adequate returns (as has occurred in concessions in Argentina and elsewhere).

Accordingly, based on recommendations of a consultant's study, the government decided on a thirty-year concession with a required minimum investment program of US $3 billion. The concession would be awarded to the bidder offering to meet all the quality and coverage targets in the contract at the lowest retail tariff. In November 1994 three international consortiums prequalified to bid on the concession.[25] The successful groups were headed by Canal de Isabel II from Spain, Compagnie Générale des Eaux from France and Lyonnaise des Eaux from France.[26] However, the ultimate bid for the concession itself was postponed until after the 1995 elections. It was then further

[24] The average annual wage in 1991 was US $4704.

[25] Bidders had to have experience operating systems with minimum sales of US $180 million and assets with a net value above US $750 million, in urban centers of more than 4 million inhabitants.

[26] The Spanish partnership also included Argentaria (financial company) and Aguas de Barcelona (which is also a member of the Aguas Argentinas partnership). The Générale des Eaux partnership also included Thames Water (which operates much of the system for London), Mitsui from Japan, and three Peruvian companies, Banco de Crédito, Cosapi and Gremco. Lyonnaise leads the Aguas Argentinas partnership, which also includes England Company Water, Mitsubishi from Japan, Graña y Montero from Peru and Aguas de Barcelona.

delayed, and finally in November 1997 President Fujimori declared the concession postponed indefinitely.[27] (It was probably not cancelled outright only because of concerns about litigation by the foreign investors, who are reported to have spent about US $1 million each in preparing their bids.) In the next section we explain why the concession was cancelled.

Why Was the Operation of SEDAPAL not Privatized?

There are three main reasons why SEDAPAL's concession was ultimately not implemented. First and foremost, it became politically undesirable, second the window of opportunity for the sale closed, and third the most serious problems in the sector were partly alleviated. Another important factor to mention that made the concession difficult from the beginning, contributing to its postponement and to lose the window of opportunity was the lack of a 'blueprint' or model to follow. In contrast to the other cases, such as telecommunications, there did not exist an international model or 'best practice' to help the team in charge in the design of the concession and regulatory drafts.

As mentioned before, the desirability of water privatization was always weak. Water had high political saliency for Fujimori's core base of support, Lima's poor.[28] The concession would deprive the government of this ability to direct investments to areas with high political payoffs, a factor that has delayed private participation in the management of water elsewhere, in Mexico City for example.

The benefits of the concession to Fujimori's poor constituents in Lima would be further reduced by an increase in prices. The concession allowed up to a 40% price increase, which would raise the average residential tariff for water and sewerage from US $0.30 in 1994 to US $0.42 per m^3. According to World Bank calculations, the average incremental cost for a smaller expansion in the system was US $0.45 m^3 (World Bank, 1994).[29] If this estimate is correct, any private bidder would have been strongly motivated to renegotiate the agreement to win a higher price or lower investment targets than allowed under the concessions. Although there may have been operational inefficiencies assumed in the World Bank estimate, marginal costs were indeed high in Lima because water was in scarce supply, the required expansion was large and so much of the system had deteriorated and needed replacement. New, deeper wells would have to be drilled to tap the reduced aquifer. From one third to 85% of the sewerage system

[27] In April 1996 Jorge González Izquierdo, the President of the privatization commission, COPRI, stated that government had decided to postpone the privatization of three controversial and complicated SOEs — SEDAPAL, the petroleum corporation and a large mining company — until the end of the whole process (*El Comercio*, April 1996). Later he stated that the government had decided to keep both SEDAPAL's property and operation public because " ... we think that water is something vital and there are some problems in this activity that the government must solve ... " (*Semana Económica*, No. 578, June 29, 1997).

[28] It is also noteworthy that Lima was not designated a region in the 1993 Constitution enacted by the Fujimori administration, which kept SEDAPAL under the direction of MIPRE rather than transferring it to the municipalities or provinces when responsibility for the other water companies was moved.

[29] Based on a project to bring new connections to over 300,000 persons and improve service by another 300,000 while increasing water supply by 5.2 m^3 by reducing water losses through rehabilitation and consumption (through metering).

needed to be replaced and half of the over 300 operating wells had diminished yields because of aquifer depletion or pumps beyond their design life.

A private operator would probably have been able to reduce SEDAPAL's operating costs by improving efficiency, but the effects on tariffs would be limited since by far the biggest part of costs would be investment. For example, SEDAPAL's operating costs before interest, depreciation and taxes averaged US $70 million a year from 1990 to 1993, average annual projected investment during the first three years of the concession would have been US $476 millions.[30]

The higher tariffs combined with connection charges would make water unaffordable to many unconnected poor consumers, even compared to water from vendors.[31] Poorer and middle-income consumers who were already connected would have faced higher bills, not only because of rate increases but also with the introduction of metering and better bill collection. SEDAPAL charged unmetered, low-income consumers on the assumption that they used 22 m^3 a month, but a very large, poor household could be using more.

? ... 2.42.1 to 2.92.5%... in footnote 31?

None of this means that poor consumers would not have been willing to pay more for a connection; a SEDAPAL survey in 1993 found that the average property value of houses in the *pueblos jóvenes* quadrupled after being connected to piped water (from US $1542 to US $6375). Moreover, poor consumers already paid high prices for water from vendors; a survey in December 1993 found that the average price was US $2.50 per m^3.

The cost to the poor could have been made affordable through subsidies, by including the connection costs in the variable water tariff charged to all consumers, or by extending longer-term, lower-interest loans for connections.[32] However, none of these arrangements were contemplated in the concession agreement, and would not have been easily added. Any efficient provider, public or private, would have wanted to reduce the already large cross subsidies in Lima's tariffs. Industrial tariffs were 130% larger than residential. An efficient operator would have also wanted to raise metering and change per meter prices closer to marginal cost, not only to assure a reasonable return on investment, but also to keep the demand for water down so as to reduce the

[30] US $100 million a year or US $3 billion over 30 years to increase coverage and US $59 million a year or US $1.8 billion in 30 years to improve the continuity of service (Black and Veatch, 1992).

[31] SEDAPAL assumed a minimum water consumption level of 22 m^3 a month for low-income households for billing purposes. At 1993 tariffs (US $0.22 per m^3 for domestic users) this amounted to $4.92 a month or 2.42.1 to 2.92.5% of the household income for the 43% of Lima's households in the lowest-income category (US $200–240 a month). Connection costs in poor-income neighborhoods were about US $850 and could be paid for by a loan, with a five year repayment period and monthly interest rate of 1.2%, which meant that water and sewerage charges would be 16% of income for a new connection. Raising tariffs to cover marginal cost would more than double rates. Without any comparable increase in income or some sort of subsidy, the poorest households would pay around 5% of their income for water and sewerage, or over 18% including the connection charge.

[32] Loans were in fact offered to water companies and consumers to finance construction of primary networks and to cover investments in secondary networks and costs of connection through a government fund financed by a social tax, FONAVI. FONAVI channeled about US $1000 million to the water sector at moderately favorable interest rates, out of which 75% went to customers. However, customers failed to repay the loans. By the end of 1998, the government recognized the big problem and lunched a plan to 'recover' the FONAVI debts offering the water companies the option to issue shares in favor of the central government.

need for further costly expansion. It was therefore inevitable that poorer consumers would face substantially higher prices, as indeed occurred under public ownership later, reducing the political benefits of the concession.

Not only would price increases reduce the net benefits from the concession for lower income consumers, the size of the projected benefits from investment was open to question. Even if prices could be increased to cover marginal costs, an investor might well be wary of sinking large sums in nontransferable assets given Peru's weak institutional environment. Barthelemy (1996) reports that foreign investors had concerns about the sustainability of Peru's reforms given the concentration of power in the hands of the President and the weakness of the judiciary and other institutions. Furthermore, should demand for new connections be less than expected once prices go up, the operator might well argue for renegotiation of the investment targets. In Buenos Aires, for example, the operator renegotiated the concession contract to win larger price increases and lower investment commitments than planned partly because high connection charges proved uncollectable. The possibility that renegotiation could happen in Lima was probably not lost on the President and his advisors.

The second reason why the concession for SEDAPAL was postponed and then abandoned was a problem of timing. Privatization of water had lower priority than other sectors. Although the proposed SEDAPAL concession would remove a fiscal drain and generate new investment, it would not bring any sales proceeds or other revenues to the government. In contrast, the sale of electricity, telecommunications or mining would attract investment and also generate substantial funds for the Treasury. For example, the sale of 35% of the telecommunications company in February 1994 raised US $1.4 billion for the Treasury and US $600 million of new investment. This initial lower priority of SEDAPAL's privatization worsened by the difficulties faced by the privatization process in general and by the SEDAPAL's bid process in particular. In addition, as was mentioned above, there were significant technical difficulties. It was more difficult to prepare the privatization of SEDAPAL than the others because of the lack of international experiences and of an appropriate model to follow.

Notwithstanding the government's best efforts, it proved impossible to privatize even the top priority SOEs as fast as the timetable required. By the end of 1994 only about 45% of the total value of transactions that ultimately would occur (by April 1997), had occurred (Tables 6 and 7). These other higher-priority privatizations delayed work on the SEDAPAL concession which only began in 1993. Also, its relatively weaker political desirability was reflected in a weak team responsible for the SEDAPAL concession (CEPRI-SEDAPAL). This group had lower incentives to privatize than the others and faced strong opposition from some politicians close to the President and to SEDAPAL. Because the concession would affect an important constituency of the President, considerable attention was paid to the design of the legal and regulatory framework by top officials in the Ministry of the Presidency (MIPRE) who were close to Fujimori. This further delayed the process, and, when the MIPRE officials refused to approve the bidding and concession documents, ultimately led to the resignation of the CEPRI-SEDAPAL team responsible for the privatization in April 1995. As a result of the delays in the privatization of SEDAPAL's operation fell perilously close to the 1995

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Table 4.6

Proceeds and investment from privatization transactions in Peru (in million US dollars)

Year	*Sale of shares*	*Concession*	*Transfer option*	*Other revenue*	*Total proceeds*	*Projected investment by buyer*
1991	2.59	–	–	–	2.59	–
1992	207.53	–	–	1.39	208.92	706.00
1993	316.70	20.70	–	6.49	323.89	589.34
1994	2648.57	–	2.21	2.52	2653.30	3137.55
1995	1089.01	48.76	1.18	6.45	1145.40	216.07
1996	2291.81	344.20	1.00	5.79	2642.80	2852.20
1997 [a]	67.13	–	–	1.32	68.45	218.19
Total	6623.34	413.66	4.39	23.96	7065.35	7719.35

[a] Till April.
Source: COPRI data.

Table 4.7

Rate of approval of privatization by socioeconomic level in Lima (percent)

Level (average monthly household income)	*Sept. 1991*	*Feb. 1992*	*Dec. 1994*	*Dec. 1993*	*Dec. 1995*	*Dec. 1996*	*Dec. 1997*
Total	52	59		48	49	42	28
High (US $3200–5000 [a])	87	83	84	80	77	65	67
High middle (US $750–1150 [b])	65	81	73	64	66	46	42
Low middle (US $330–470 [c])	55	63	58	45	43	39	25
Low (US $200–240 [d])	37	42	49	36	42	40	19

[a] Approximately 4.5% of total households in Lima.
[b] Approximately 19.5% of total households in Lima.
[c] Approximately 33% of total households in Lima.
[d] Approximately 43% of total households in Lima.
Source: Opinion Reports — Apoyo (income ranges from July 1997).

election. This was politically risky; a concession would sharply increase prices, an effect that would ran counter to Fujimori's need to win the support of his core constituency in Lima. Hence the concession lender was postponed.

After the elections the concession became less politically desirable because of growing public disillusionment with privatization. Although a new SEDAPAL privatization team was appointed in December 1995, government's interest in the concession was much weaker after the elections (field interviews). As Table 4 showed, support for privatization in general peaked among all income groups in 1993 and fell off gradually, then sharply in 1997. The decline in support stemmed from a perception that the benefits were concentrated in a small group of foreign investors and wealthy Peruvians, plus sharp increases in the prices of services, such as telephone and electricity rates. The SEDAPAL concession would also have combined large rate increases and higher returns

to investors in the short run, with most consumer benefits coming in the medium term as major investments are completed. Support for privatization of SEDAPAL was never as strong as for other SOEs and fell sharply over time. In 1989, 47% of those surveyed in Lima supported transferring SEDAPAL to the private sector; by 1997 this was down to 22% (Apoyo Opinion Reports).

Furthermore, support for Fujimori was sharply down by late 1997 (Appendix A, Table A.1) and it became even riskier to chance alienating his core supporters, especially when he was trying to change the constitution so he could run for President again in 2000.

Since 1997, although several privatization transactions were implemented, they severely lost public approval (63% of the population was against them in October of 1999) and partly government support, making even more difficult to complete the concession of SEDAPAL. However, the results of the privatization reform proved a success. Among many other benefits from the process, more than US $8000 million were obtained from privatization transactions (1991–1999); two thirds of foreign investment came from privatizations; the government received US $6391; privatized firms substantially increased internal production and exports; the Peruvian economy became more competitive (4th in Latin America); and 410,000 Peruvian citizens and 16,000 workers became shareholders of privatized firms (Apoyo Comunicaciones, 1999). Particularly noteworthy are the results regarding the coverage, quality, and prices of utilities. A 100% coverage was achieved in Lima with the privatization of the electric utilities and almost 50% in the case of telephones. Furthermore, from 1990 to 1998, water tariffs increased in real terms more than their privatized counterparts: electricity and telecommunications (17.6% increment of water tariffs versus −34.6% and −23.1 in the cases of electricity and telephones, respectively).

The third reason why the SEDAPAL concession was not implemented was that most of the quick gains from reducing the water sector problems were achieved without it. The World Bank and other aid agencies put together a US $600 million financing package to rehabilitate the distribution network for water and sewerage in Lima, expand connections in the poorest areas, install metering in high-consumption areas, and improve SEDAPAL's efficiency and the legal and regulatory framework for the water system, all within five years. Although the package was conditioned to the implementation of many changes to make privatization possible and contemplated the concession of SEDAPAL, this condition was revised to adjust for the changes in the political climate.

The aid-financed program of investment and reforms reduced the pressure for privatization because it alleviated some of the worse problems of the system. It was combined with a program of layoffs and management improvements in SEDAPAL that eliminated SEDAPAL's losses and improved operations. The reforms expanded service in the *pueblos jóvenes* for lower price increases than might have occurred with a concession since recovery of capital costs was not necessary. Although the net benefits from a concession would have been much greater, according to our above calculations, they would only come in the medium term, after major investment works were completed.

CONCLUSION

Although Lima's water system was in near crisis, that was not a sufficient condition for radical change. Partial reforms, carried out under public management partly due to the credible threat of privatization, reduced many of the problems but left a quarter of citizens without access to water or sewerage connections, supplied a service subject to frequent and extended interruptions, and wasted more than a third of the water in circumstances of very scarce supply.

The fundamental reason for Lima's failure to implement the concession was geographical — the scarcity of water sources meant that marginal costs were high, requiring pumping water from deep wells and building adequate storage for dry periods. High extraction costs were compounded by years of neglect, so that much of the system needed to be replaced. To attract a private investor, prices would have to be set to recover these high costs, including a reasonable return on capital. Since government had kept prices well below cost recovery for years, a concession would have required a sharp and sudden price increase to cover marginal costs. Not only that, but any forward looking investor would want to reduce the pace of future investment, by curbing demand through metering and more effective bill collection based on meters. This logic would also argue for reduced cross subsidies, since these reduce the incentive to conserve water.

Although the ultimate cause of the concession's failure was geographical, the proximate cause was political. Privatization of any utility is politically tricky if it involves higher prices and controversy over ceding monopoly powers to private parties, especially foreigners. Private participation in water suffers from all these problems, magnified by the social importance of water as an essential good and by the lack of international experience and thus technical difficulties to design a privatization reform in the sector. At the same time water offers fewer offsetting benefits compared to other utilities because it raises less or no revenues that can be used to reward supporters or compensate losers. In Lima's case the benefits were further reduced by the likelihood that the price increases would especially affect the urban poor who were important to the President's support base. Thus, despite initially favorable conditions, the political equation shifted against private operation of SEDAPAL as elections neared.

The failure to introduce the concession was costly for Lima, and not just because the welfare gains from the concession, even if the access goals were not fully met, would have been larger than the gains from the reform. The cost also included the adverse effects on health in a city where over 1.7 million people are not connected to water or sewerage and those who are connected suffer interruptions in water service that last for months at a time. In addition, the failure to curb consumption through metering has also meant that the aquifer continued to be depleted much faster than it was replenished, especially as the number of connections grew, and hence was increasingly contaminated by salt from the ocean.

Although the reforms introduced some important improvements in the operation of SEDAPAL, especially in reducing labor costs, these too were far short of what a private operator might be expected to implement. Our assumptions about efficiency gains

under the concession projections were very conservative; it would be more realistic to assume that a profit maximizing operator facing price cap regulation would sharply curb unaccounted-for water, and try to minimize the consumption of electricity and other inputs.[33]

Our assumptions about the benefits from the concession do not take into account Peru's regulatory weaknesses, however. The improvements introduced since 1992 have been very partial and left the regulator vulnerable to either political manipulation or capture. Had the concession been signed, the government might have had greater motivation to protect the regulator from capture and the investor would had an incentive to push for safeguards against politically motivated regulatory changes. Peru's institutional weaknesses, and in particular its lack of an autonomous judiciary, would limit how much could have been achieved. Nevertheless, considering the net gain from private operation in much weaker institutional settings in Africa, it seems safe to conclude that Lima would have been better off with a concession.

ANNEX 4A: STATISTICAL APPENDIX

Table A.1.

Rates of approval in Lima of Fujimori as president of the country (percentages)

Month/Year	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
January		43	65	60	66	64	75	47
February		35	64	62	58	74	66	46
March		38	53	61	61	66	64	67 [a]
April		49	81	63	60	75	62	48
May		45	76	59	61	80	59	47
June		35	76	66	64	76	65	34
July		31	65	61	65	68	58	23 [b]
August	46	39	62	65	68	77	62	34
September	51	32	74	63	68	78	60	39
October	53	54	68	70	65	76	55	34
November	59	58	65	67	63	70	52	37
December	61	60	64	64	67	73	45	34

[a] After the release of the hostages of the Japanese Embassy.
[b] After accusations of telephone conversation interventions.
Source: Apoyo Opinion Reports.

[33] That there was scope for this is supported by the fact that the cost of intermediate inputs for Santiago's water and sewerage company were half those of SEDAPAL in 1996 (when Santiago had about 1 million connections compared to 823 thousand in Lima).

Table A.2

Metering of connections in 1988 (percentage distribution)

Type of Connection	*Social*	*Residential*	*Commercial*	*Industrial*	*State*	*Total*
Unmetered	72.4	71.2	62.3	51.6	74.8	70.5
Metered:	27.6	28.8	37.7	48.4	25.2	29.5
Charged according to meter-reading	9.4	16.2	13.6	29.3	12.2	16.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: SEDAPAL Gerencia de Planeacion y Presupuesto, "Analysis of Demand in Lima and El Callao."

Table A.3

Trends in connections, metered connections and meter reading

Year	*Connections (1000s)*	*Metered connections (%)*	*Connections read (%)*
1987	559.44	56	Not applicable
1988	607.40	60	Not applicable
1989	626.59	59	Not applicable
1990	654.14	57	11
1991	678.54	54	9
1992	700.16	52	7
1993	732.26	50	4
1994	762.93	47	5
1995	790.69	45	6
1996	823.16	39	8
1997	839.34	39	16
1998	871.72	40	32

Source: SEDAPAL data.

Table A.4

Estimated consumption per capita in Lima (liters per day)

District	*Consumption*	*District*	*Consumption*
SMP	172	Lima Cercado	372
Rimac	229	La Victoria	231
La Molina	560	San Miguel	235
San Luis	239	Brena	261
Chorrillos	243	Pueblo Libre	272
Santiago de Surco	405	Jesus Maria	264
San Borja	369	Magdalena	325
Surquillo	234	Callao Cercado	243
Miraflores	567	Bellavista	231
Linca	324	La Perla	254
San Isidro	465	C. de la Legua	252
Barranco	307	La Punta	312

Source: World Bank, 1994b.

Table A.5
Principal privatized enterprises (in millions of US dollars)

Enterprise	*Date of sale*	*Shares sold (%)*	*Basis price*	*Sale price*	*Investment commitment*
Sogewiese Leasing	10/06/91	15.0	1.00	1.08	–
Hierroperú	30/10/92	100.0	22.00	120.00	150.00
Cerro Verde	10/11/93	100.0	30.00	35.44	485.30
ENTEL/CPT	28/02/94	35.0 both	535.00	2002.00	1800.00
Edelnor	12/07/94	60.0	127.72	176.49	150.00
Edelsur	12/07/94	60.0	129.42	212.12	120.00
Banco Continental	18/04/95	60.0	–	195.70	–
Egenor	25/06/96	60.0	228.20	42.00	–

Source: COPRI data.

NOTES ON THE METHODOLOGY FOR MEASURING THE WELFARE GAINS OF CONCESSION

Actual Scenario. Since SEDAPAL did not charge separately for sewerage and water, they were treated as a composite product. To distinguish the differences in behavior and pricing, we decomposed the revenue from water services into domestic, non-domestic, and social sources. For domestic and non-domestic sources, we further classified them as metered and unmetered. In 1988 only 16% of the domestic consumers were charged based upon meter-reading in 1988 (Table A.2); and in 1994, 7%. Although the company reported that 29% of the connections were metered, that number did not represent accurately the number of connections billed based on meter-reading. Most metered connections were actually charged either the company's estimated consumption or the actual reading, whichever was higher.

We calculated water revenues based on the quantity and the average price reported by SEDAPAL. For the period before 1994, due to data limitation, industrial discharges ware calculated based on the quantity reported by the company and the total revenue recorded by the World Bank.[34]. From 1994 on, the data used were from SEDAPAL reports. Connections and 'other revenues' were the residual, and its price was assumed to increase at the same rate as the consumer price index.[35]

When a connection was metered, the demand elasticity was assumed to be -0.30 for domestic usage, -0.20 for non-domestic usage.[36] When a connection was not metered, the elasticity was assumed to be zero. This assumption aimed to capture the idea that the prices underlying unmetered connections were represented by a fixed charge and a marginal price of zero.

[34] "Analysis of the Financial Situation of SEDAPAL (1987–2003)". Luz Marina Gonzáles.
[35] The issue of connection fee is not treated explicitly in this analysis.
[36] To our knowledge, there is no study of the demand elasticity for Lima. We thus had to somewhat arbitrarily assign a plausible from the literature about water demand. We used sensitivity analysis to check the robustness of the welfare results.

Excess demand for water estimated based on service coverage and water continuity. The percentage of people not served and the hours of interruption of service were translated into cubic meters of excess demand for water.[37] There were no specific records of discontinuity of service in Lima except by the Living Standards Measurement Survey done by the World Bank in 1991. This suggested that 48% of Peru's population received water service for less than 12 hours a day, and, another 28%, less than 6 hours a day. We also know that some districts of Lima in 1997 received no service for more than two months. To be consistent with these observations, we used 15 hours a day, which was the amount estimated by the Consortia for SEDAPAL Privatization.

Counterfactual Scenario. The bidding variable for the concession contract was the tariff. The operator could increase prices at the beginning of the contract and then adjust them every year by inflation plus *K*%. *K* must be equal to zero for the first five years and from then on, it could vary depending on investment and efficiency improvements. The bidding documents mandated that the maximum price increase for the first year would be 40%, and the percentage of price increase we assumed was 38.24%. This increase, well within the ceiling of price increase of 40%, allowed the price to rise to equal to the estimated long-term marginal cost (World Bank estimated it to be $0.45 or 0.99 soles in 1994). After the first-time increase, the price increase was assumed to be zero per year afterwards.

The bidding document also provided some minimum targets, which were used for the assumptions about the counterfactual. The service coverage was required to increase from 15 to 24 hours a day in 5 years, and the market coverage, from 75% to 95% in ten years. These conditions were directly quantified in output quantity and excess demand under the counterfactual. In addition, unaccounted-for water was required to drop from 36% to 25%, and metered connections to rise from 38% to 95% of total connections in 10 years. Finally, in terms of ownership of new issues, the qualified international operator was required to retain at least 25% of newly issued shares. Employees must have at least 5% of new shares. And at least 20% of the new shares must be issued in the stock exchange. In the base scenario, we assumed that the international corporation retains 50% of the stocks.

Although the contract would be extended for 30 years, we projected only up to the year 2004, 8 years after the end of the actual series, and 10 years after the beginning of the presumed concession. Simulation about further time series would entail too much prediction error; moreover, large discounting factors beyond the year 2002 would render this omission unimportant.

Since there was no evidence that SEDAPAL would have improved its performance at a faster pace than it had in the past years under public ownership, we projected the future for the factual scenario based on the linear trends from 1988 to 1996. For prices, we used the data after 1990 when the World Bank project required that tariffs rise

[37] Note that the rising tariffs did not bring about the reduction of monthly consumption per connection. While the tariff rose between 1992 and 1996, the average monthly consumption per connection increased for two years and then decreased for another two years. This suggests that the unmet demand should be treated as excess demand.

Table B.1

Assumptions used in the counterfactual scenario

Key elements	*Assumptions for counterfactual time series (i.e., the private enterprise scenario)*
Price of water	Increase of 38.24% in first year prices to cover long-term marginal costs. In all the following years, prices only keep up with inflation.
Quantity of water	*Continuity:* increase continuity to 24 hours a day in 5 years. *Coverage:* domestic water coverage increases to 85% in 5 years and 95% in 10 years. All other categories are assumed to increase based on the historical trend.
Investment	Under both the factual and the counterfactual, retained earnings are used for investment. Additional funding for investment is financed through loans. Capital stock was also adjusted by inflation. Paid-in capital increases by US $100 million in the first 5 years. At the beginning of the contract, it increases by US $25 million and the following 5 years by US $15 million.
Unit cost of intermediate inputs	The unit cost of intermediate inputs is assumed to drop by 5% in 1995 and 1996, then stay constant after 1996 (i.e., the projection period). This assumption is somewhat arbitrary, but in sensibility tests turns out not to be important for the welfare outcomes.
Unit cost of labor	The unit cost of labor is assumed to be the same as the actual. Since the factual already witnessed a very large reduction in labor force, there is no reason to assume that private ownership could slash the labor force further.
Opportunity cost of working capital	The same as the actual. There is no reason to assume that the market rate would change with the reform of SEDAPAL.

to cover marginal costs. Unit costs of labor and intermediate inputs for the projection periods were assumed to be the same as the actual in 1996.

The deposit and the loan rate were assumed to be equal under the public and private scenarios. The loan rate was set to the average between 7.32% for multilateral organization loans and 11% for other sources. The Consortia estimated this rate for the privatization of SEDAPAL, using the last 50 Latin American bonds issued plus a country risk of 3.5% and an industry risk of 4.5%. A summary of the main assumptions used for the counterfactual is presented in Table B.1.

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