

How Far Does It Go?

The Buenos Aires Water Concession a Decade after the Reform

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Acronyms

BBT	basic bimonthly tariff
CF	connection fee
CIS	cargo de integración al servicio (<i>service integration charge</i>)
CMC	connection maintenance charge
CPI	Consumer Price Index
EBIT	earnings before interest and taxes
ETOSS	Ente Tripartito de Obras y Servicios Sanitarios (<i>Tripartite Body for Sanitary Works and Services</i>)
INDEC	Instituto Nacional de Estadística y Censos (<i>National Institute of Statistics and Census</i>)
IC	infrastructure charge
MA	mejora ambiental (<i>environmental improvement</i>)
OFWAT	Office of Water Services
OSN	Obras Sanitarias de la Nación (<i>National Sanitation Works</i>)
OXERA	Oxford Economic Research Associates Ltd.
PSI	Plan de Saneamiento Integral (<i>Comprehensive Sanitation Plan</i>)
SU	servicio universal (<i>universal service</i>)
TFP	total factor productivity
TPP	total price performance
TBC	total basic consumption
US	United States
VAT	value added tax
WACC	weighted average cost of capital
WTP	willingness to pay

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Summary/Résumé/Resumen

Summary

Sanitation services in Argentina had traditionally been provided by a state-owned utility until 1982, when the national government transferred the responsibility of service provision to local governments. The city of Buenos Aires and a few adjacent districts were excluded from this move, retained under the control of Obras Sanitarias de la Nación (OSN). The performance of the decentralized sanitation system revealed reduced rates of network expansion, little innovation, poor-quality service and operating deficits of the utilities. General dissatisfaction with the system's performance and ever-increasing pressures to enhance service provision and to ease the burden of financing underperforming assets led the way to private sector participation in the industry, a policy that was probably also influenced by the massive privatizations adopted by the Menem administration since 1989. As a result, by the end of the 1990s private operators were serving two-thirds of the population covered by the sanitation network.

The Buenos Aires concession is the largest and best-documented episode of privatization in the sanitation sector in Argentina. In May 1993, OSN's responsibility for the water and sewerage services of Buenos Aires was handed over to the Aguas Argentinas consortium under a 30-year concession contract with the main objectives of reducing the government's funding, and expanding coverage according to a plan of specific targets aimed at achieving both quality of service standards and universal service by the end of the concession period. The franchise was awarded to the consortium offering the largest reduction over prevailing OSN tariffs. Since privatization, the government's regulatory role has been in the hands of the Ente Tripartito de Obras y Servicios Sanitarios, a regulatory agency responsible for monitoring the concessionaire and enforcing the contract and regulations.

The decade that has elapsed since the privatization offers a substantial body of evidence on the performance of Aguas Argentinas. Opposing views about private management have emerged following the reform. Some observers argue that the Buenos Aires concession brought about large benefits to consumers' welfare, while others emphasize that privatization goals have not been fully achieved because of the firm's opportunistic behaviour and the regulator's limited ability to protect the interest of consumers.

This paper examines the evolution of the Buenos Aires sanitation system during the post-privatization period. Its purpose is to evaluate the private management experience and assess the empirical validity of the main concerns voiced in its favour and against it. The analysis therefore concentrates on the evolution of system performance as it relates to the privatization objectives of expanding coverage, reducing consumers' tariffs and increasing service standards. The paper is organized into eight sections. Section 2 examines the completion of the contract's targets as they relate to service coverage and investment outlays. Section 3 describes the taxonomy of unexpected tariff reforms. Section 4 reviews the financial performance of the licensee, while section 5 uses a simple model of index numbers to provide a comprehensive assessment of the concessions' economic performance. Section 6 considers the role of the regulator, section 7 comments on actual pro-poor policies and explores alternatives leading to the achievement of universal service, and section 8 is the conclusion.

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Résumé

Les services d'assainissement en Argentine étaient entre les mains d'une entreprise d'Etat jusqu'en 1982, date à laquelle le gouvernement national a confié aux gouvernements locaux le soin de fournir ces services. Cette mesure n'a pas visé la ville de Buenos Aires ni quelques zones voisines, qui sont restées sous la responsabilité des Obras Sanitarias de la Nación (OSN). Le bilan du système d'assainissement décentralisé a fait apparaître un ralentissement de l'extension du réseau, peu d'innovations, un service de piètre qualité et des déficits d'exploitation pour les entreprises en question. Le mécontentement général devant les prestations fournies, une demande de services en augmentation constante et le désir d'alléger la charge que représentait le financement d'une entreprise peu performante ont concouru à ouvrir ce secteur au privé, mesure qui a été probablement influencée aussi par les privatisations massives auxquelles a procédé le gouvernement Menem à partir de 1989. Résultat : à la fin des années 90, les deux tiers de la population ayant accès au réseau d'assainissement étaient desservis par des opérateurs privés.

La concession de Buenos Aires est l'épisode le plus important et le mieux documenté de la privatisation du secteur de l'assainissement en Argentine. En mai 1993, les services de l'eau et le réseau des égouts de Buenos Aires, qui dépendaient jusque-là des OSN, sont passés sous la responsabilité du consortium Aguas Argentinas qui a obtenu une concession de 30 ans. Les principaux buts du contrat étaient de réduire la participation financière du gouvernement et d'étendre peu à peu le réseau selon un plan comportant des objectifs spécifiques et tendant à obtenir à la fois le respect de certaines normes relatives à la qualité des services et un accès universel au réseau au terme du contrat. La concession est allée au consortium qui offrait la plus forte réduction par rapport aux tarifs appliqués par les OSN. Depuis la privatisation, l'organe de contrôle n'est plus le gouvernement mais l'Ente Tripartito de Obras y Servicios Sanitarios, qui est chargé de surveiller les prestations du concessionnaire et de s'assurer qu'il respecte le contrat et la réglementation.

Pendant la décennie qui s'est écoulée depuis la privatisation, une masse d'informations a pu être réunie sur la prestation d'Aguas Argentinas. A la suite de la réforme, des avis contraires se sont exprimés sur la gestion privée. Certains observateurs font valoir que la concession de Buenos Aires a eu de gros avantages pour les consommateurs tandis que d'autres soulignent que les objectifs de la privatisation n'ont pas été totalement atteints en raison du comportement opportuniste de l'entreprise et de la capacité limitée de l'organe de contrôle à protéger les intérêts des consommateurs.

Les auteurs étudient ici l'évolution du système d'assainissement de Buenos Aires depuis la privatisation. Leur objet est de dresser le bilan de la gestion privée et d'apprécier la validité empirique des principales préoccupations exprimées pour et contre elle. L'analyse se concentre donc sur l'évolution des prestations par rapport aux objectifs de la privatisation : extension du réseau, baisse des tarifs pour les consommateurs et qualité des services améliorée. L'étude se divise en huit sections. La section 2 s'interroge sur la réalisation des objectifs énoncés dans le contrat concernant la couverture et les dépenses d'investissement. La section 3 décrit la taxinomie des réformes inattendues des tarifs. La section 4 passe en revue les résultats financiers du concessionnaire tandis que la section 5 utilise un modèle simple d'indices pour procéder à une évaluation complète des résultats économiques des concessions. La section 6 s'attarde sur le rôle de l'organe de contrôle tandis que la section 7 évoque les politiques qui favorisent effectivement les pauvres et explore les diverses voies susceptibles de conduire à l'universalité de l'accès au réseau. La section 8 tire les conclusions de l'étude.

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Resumen

Los servicios de saneamiento en Argentina estuvieron a cargo de una empresa del Estado hasta 1982, cuando el gobierno nacional decidió transferir dicha responsabilidad a los gobiernos locales. La ciudad de Buenos Aires y algunos distritos adyacentes quedaron fuera de esta decisión y bajo el control de Obras Sanitarias de la Nación (OSN). Tras la adopción de estas medidas, el sistema descentralizado de saneamiento registró una disminución del ritmo de expansión de la red, poca innovación, un servicio de baja calidad y deficiencias operativas de las empresas proveedoras del servicio. La insatisfacción general con el desempeño del sistema, aunada a las incesantes presiones en pro de la expansión y el mejoramiento del servicio y la disminución de la carga que representaba el financiamiento de activos de bajo rendimiento, abrieron el camino a la participación del sector privado en la industria; política que probablemente acusara también la influencia de la privatización generalizada que acometiera el gobierno de Menem desde 1989. Para finales de los años 90, operadores privados prestaban servicio a dos tercios de la población cubierta por la red de saneamiento.

La concesión de Buenos Aires constituye el episodio más amplio y mejor documentado de la privatización del sector de saneamiento en Argentina. En mayo de 1993, la OSN transfirió la responsabilidad de los servicios de agua y el sistema de alcantarillado de la ciudad de Buenos Aires al consorcio Aguas Argentinas, por medio de un contrato de concesión a 30 años, con los objetivos de reducir el financiamiento público y ampliar la cobertura de acuerdo con un plan de objetivos específicos dirigidos a alcanzar determinados niveles de servicio y brindar un servicio universal para finales de la concesión. La franquicia fue concedida al consorcio que ofreciera la mayor reducción de las tarifas vigentes de la OSN. Desde la privatización, la función de regulación del gobierno ha estado en manos del Ente Tripartito de Obras y Servicios Sanitarios, organismo normativo responsable de monitorear las actividades del concesionario y velar por el cumplimiento del contrato y las regulaciones.

Los diez años que han transcurrido desde la privatización han permitido acumular un volumen considerable de pruebas sobre el desempeño de Aguas Argentinas. Luego de la reforma han surgido opiniones divergentes sobre la gestión privada. Algunos observadores sostienen que la concesión de Buenos Aires ha generado grandes beneficios en cuanto al bienestar de los consumidores, mientras que otros destacan que no se han alcanzado plenamente las metas de la privatización, en razón de la conducta oportunista de la empresa y la limitada capacidad del ente regulador para proteger los intereses de los consumidores.

En este documento se examina la evolución del sistema de saneamiento de Buenos Aires durante el período posterior a la privatización. El propósito es evaluar la experiencia de la gestión privada y sopesar la validez empírica de las principales manifestaciones a favor y en contra de esta. Para ello, el análisis se concentra en la evolución del desempeño del sistema en cuanto a los objetivos de la privatización: ampliar la cobertura, reducir las tarifas y elevar los niveles de servicio. El ensayo se divide en ocho secciones. En la sección 2 se analiza el cumplimiento de las metas del contrato en cuanto a cobertura del servicio y gastos de inversión. En la sección 3 se describe la taxonomía de las reformas inesperadas de las tarifas. En la sección 4 se examina el desempeño financiero del concesionario, mientras que en la sección 5 se utiliza un modelo simple de números indexados para realizar una evaluación integral del desempeño económico de las concesiones. En la sección 6 se estudia la función del ente regulador, mientras que en la sección 7 se compilan comentarios sobre las políticas a favor de los pobres y se exploran las alternativas que conducirían a la prestación de un servicio universal. Finalmente, la sección 8 reúne las conclusiones.

José A. Delfino era miembro de la Facultad de Ciencias Económicas de la Universidad Nacional de Córdoba, Argentina hasta su fallecimiento el día 2 de septiembre de 2005. Ariel A. Casarin y María Eugenia Delfino son docentes de la IAE, Escuela de Dirección y Negocios de la Universidad Austral, Argentina.

1. Introduction

Sanitation services in Argentina had traditionally been provided by a national state-owned utility until 1982, when the national government transferred the responsibility of service provision to local governments except for the city of Buenos Aires and a few adjacent districts, which remained under the control of the Obras Sanitarias de la Nación (OSN). The performance of the decentralized sanitation system resulted in reduced network expansion, too little innovation, poor service quality and utilities' operating deficits, which in many cases originated from high operating costs and low "political" tariffs. A general discontent with the system's performance and ever-increasing pressures to enhance service provision and to ease the burden for financing underperforming assets led the way to private sector participation in the industry, a policy that was probably also influenced by the massive privatizations adopted by the Carlos Menem administration that began in 1989. As a result, by the end of the 1990s, private operators served two-thirds of the population covered by the sanitation network.

The Buenos Aires concession is the largest and best-documented episode of privatization in the sanitation sector in Argentina. In May 1993, OSN's responsibility for Buenos Aires' water and sewerage services was handed over to the Aguas Argentinas consortium under a 30-year concession contract with the main objectives of reducing the government's funding and expanding system coverage according to a plan of specific targets aimed at achieving both quality of service standards and universal service by the end of the concession period.¹ The franchise was awarded to the consortium offering the largest reduction over prevailing OSN tariffs. Since privatization, the government's regulatory role has been in the hands of the Ente Tripartito de Obras y Servicios Sanitarios (ETOSS), a regulatory agency responsible for monitoring the concessionaire and enforcing the contract and regulations.

The decade that has elapsed since privatization offers a substantial body of evidence on Aguas Argentinas' performance. Opposing views about private management have emerged following the reform. Some observers argue that the Buenos Aires concession brought about large benefits to consumers' welfare (Alcazar et al. 2000), while others emphasize that privatization goals have not been fully achieved because of the firm's opportunistic behaviour and the regulator's limited ability to protect the interests of consumers (Water and Sanitation Program 2001). These positions have become more conflicting since the Economic Emergency Act was passed in January 2002, which abolished the Convertibility Act, paved the way for the devaluation of the peso, converted utilities' tariffs into pesos (at pre-devaluation exchange rates), suspended contractual procedures and called for a renegotiation of franchise contracts.

This paper examines the evolution of the Buenos Aires sanitation system during the post-privatization period. Its purpose is to evaluate the private management experience and assess the empirical validity of the main concerns that were voiced both in favour of and against it. The analysis, therefore, concentrates on the evolution of system performance as it relates to the privatization objectives of expanding coverage, reducing consumers' tariffs and increasing service standards. The paper is organized into eight sections as follows. Section 2 examines the completion of the contract's targets as they relate to service coverage and investment outlays. Section 3 describes the taxonomy of unexpected tariff reforms. Section 4 overviews the financial performance of the licensee, while section 5 uses a simple model of index numbers to provide a comprehensive assessment of the concessions' economic performance. Section 6 overviews the role of the regulator, and section 7 comments on actual pro-poor policies and explores alternatives leading to the achievement of universal service. The last section provides concluding comments.

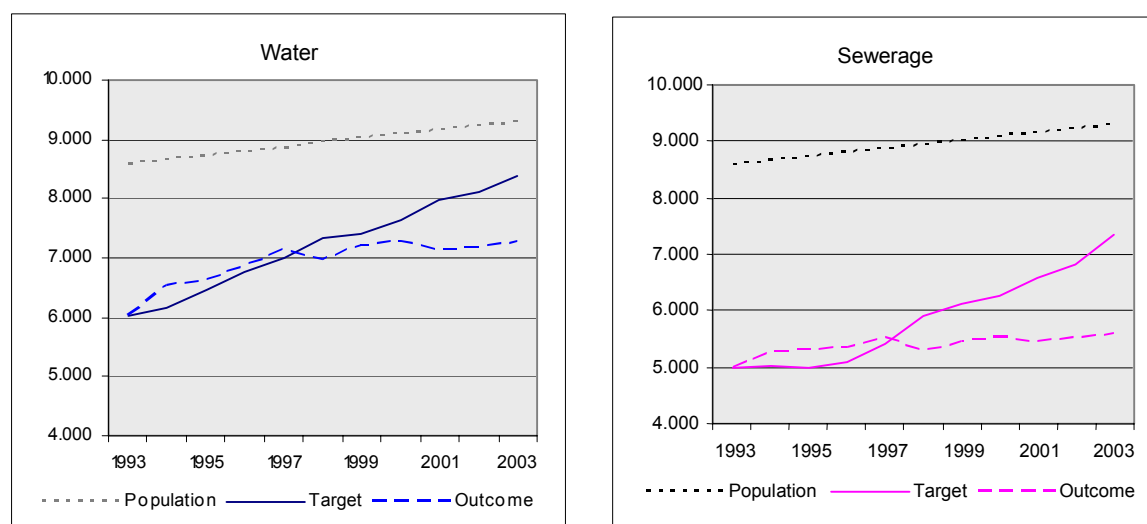
¹ The consortium was led by Lyonnaise des Eaux, which subsequently became Suez. Lyonnaise des Eaux was one of the three firms serving the French sanitation market. Other firms with stakes in the consortium were Sociedad Comercial del Plata, Sociedad General de Aguas de Barcelona, Meller, Banco de Galicia y Buenos Aires, Compagnie Generale des Eaux and Anglian Water. Only 10 per cent of equity remained in the hands of employees.

2. The Fulfilment of Expansion Targets

The decade prior to privatization was characterized by large shortfalls in industry investment that most likely originated from the difficulties of passing on infrastructure costs to new users; the persistence of tariffs that do not reflect cost, and poor collection rates; and the little autarky of OSN's management. Probably because of these reasons, coverage rates declined, the rate of spilled water increased, pressure and service quality deteriorated and summer shortages abounded (Artana et al. 1999). The privatization of OSN was, thus, aimed at overcoming these difficulties by means of a three-decade investment plan based on private sector participation. The objectives for private management were laid down in the concession contract, which specified a thorough schedule of precise coverage targets, disaggregated into six five-year periods at the district level, and aimed at achieving both universal service and quality of service standards by the end of the concession period.

According to coverage targets, expansion of sanitation services largely had to be directed toward low-income sectors located in marginal areas, as central regions were already connected to the network. System expansion was mandatory. This entailed that, once the network was made available, residents in the new service areas were obliged to connect to the system. Table 1 summarizes both coverage expansion targets and outcomes for the first two five-year periods of private management. The data show that the population served increased significantly following the reform, though not as laid down in the contract. Expansion of water and sewerage services did not surpass the contract's targets in 1998. The analysis for the whole decade, up to 2003, indicates that 1,270,000 and 605,000 new users were added to the water and sewerage system, respectively. Despite the increase of new users, by the end of 2003, coverage rates for water and sewerage were still behind the contract's targets, indicating failures to comply of about 46 per cent and 70 per cent, respectively. Figure 1 shows the annual evolution of coverage targets and outcomes for water and sewerage services.

Figure 1: Evolution of coverage targets and outcomes: Aguas Argentinas franchise area, 1993–2003 (*thousands*)



**Table 1: Coverage targets and outcomes:
Aguas Argentinas concession contract, 1993–2003**

Indicators	1993	1993–1998		1993–2003		Completion	
	Initial level	Target	Outcome	Target	Outcome	Per cent	
<i>Population served (thousands)</i>							
Potable water	6,007	1,331	949	2,359	1,270	–1,089	–46
City of Buenos Aires	2,931	45	37	60	46	–14	–23
Municipalities	3,092	1,328	897	2,268	1,209	–1,058	–47
Sanitation services	4,978	929	279	1,994	605	–1,389	–70
City of Buenos Aires	2,931	15	48	60	50	–10	–17
Municipalities	2,024	903	254	1,949	578	–1,370	–70
Sludge treatment facilities							
Secondary treatment	343	805	696	1,301	751	–550	–42
Renovation of pipes (kms)							
Water mains	10,970	987	1,286	1,318	1,428	112	9
Sewerage network	7,210	343	498	588	689	101	17

Notes: Expansion targets for the first five-year plan should be reduced by 15 per cent for water and 13 per cent for sewerage, according to a 1997 contract renegotiation. Outcomes were adjusted by subtracting 464,000 and 308,000 people served with water and sanitation services from the municipality of Quilmes and other districts that became part of the franchise area as of 1995. **Source:** Authors' analysis based on the concession contract and Aguas Argentinas' customer reports.

The data in table 1 also show that the completion of the first module of a new sludge treatment facility and the increased capacity of another existing unit have proved insufficient, as the firm was unable to comply with targets. By 2003, the total number of new users with sludge treatment facilities totalled 751,000 people, 42 per cent behind the goal. The renovation of pipes followed a different pattern because the extension of water and sewerage networks were 9 per cent and 17 per cent ahead of targets, respectively. The increase in the population served followed a 17 per cent increase of water production (from 3.65 cubic metres in 1993 to 4.27 million cubic metres per day in 2003), an improvement that essentially resulted from improved operation of existing facilities. Despite the limitations that a non-metered usage system imposes on unaccounted-for-water estimates, the figures provided by the concessionaire suggest a decline in spilled water from 1.45 cubic metres to 1.23 million cubic metres per day between 1999 and 2003.

The failure to comply with expansion targets has been uneven across districts. Table 2 disaggregates expansion targets and outcomes by 2001 for each of the municipalities that form the franchise area.² The figures reveal that expansion of water services surpassed the contract's targets in 10 of the 18 districts, though the firm underperformed in the remaining eight. The table shows that failure to comply with the contract's targets in those eight districts by 2001 left about 272,000 people unconnected to the water grid; the failure was mostly due to the delays in network expansion in La Matanza, the municipality with the largest population in Buenos Aires. Most notoriously, the figures show that sewerage coverage was clearly behind the goals in all districts but one, which leads to the failure of supplying sewerage services to 1.2 million people.

² These figures show slight differences with those of table 1 because they include the municipality of Quilmes and come from the population census.

**Table 2: Coverage targets and outcomes by district:
Aguas Argentinas' franchise area, 2001**

District	Target (per cent)	Water coverage (per cent)	Difference in population	Target (per cent)	Sewerage coverage (per cent)	Difference in population
<i>Total</i>			-272,271			-1,297,658
<i>City of Buenos Aires</i>	100	99.9	-3,059	99	96.6	-65,402
<i>Municipalities</i>	69	67.8	-269,212	49	32.6	-1,232,256
Almirante Brown	60	45.5	-74,163	24	15.3	-44,588
Avellaneda	95	99.5	14,645	85	56.4	-93,690
Esteban Echeverría	48	35.5	-30,458	23	11.4	-28,243
Ezeiza	2	9.5	9,054	10	9.6	-464
General San Martín	92	94.7	10,866	58	45.5	-50,086
Hurlingham	24	32.3	14,368	5	4.1	-1,542
Ituzaingó	4	8.3	6,925	2	0.7	-2,032
La Matanza	70	52.7	-216,003	65	41.0	-300,371
Lanus	97	99.2	9,850	95	26.1	-310,768
Lomas de Zamora	91	94.8	22,508	46	22.3	-139,299
Moron	80	74.1	-18,160	25	46.8	66,637
Quilmes	99	98.4	-970	60	49.0	-56,800
San Fernando	90	96.4	9,528	54	43.1	-16,349
San Isidro	97	98.0	3,008	97	64.8	-93,339
Tigre	62	58.2	-11,429	56	8.6	-142,382
Tres de Febrero	94	86.9	-23,851	80	76.7	-11,051
Vicente López	98	99.9	5,070	98	95.1	-7,889

Sources: Authors' analysis based on the concession contract; INDEC (2001).

The disparity in contract completion across districts could be related to the cost of service expansion, on the one hand, and to the net revenue potential associated with providing service to certain areas, on the other.³ It could, *a priori*, be expected that the likelihood of the firm failing to comply with expansion targets in a specific district be positively related to the magnitude of investments required for system expansion, but negatively related to the potential revenue to be earned from households residing in such an area. It is possible to examine these hypotheses by means of a simple discriminant analysis to determine the factors that best separate districts where, by 2001, the firm had complied with the franchise's targets and the districts where it had not. The dependent variable is binary, taking the value of 1 if the firm fulfilled the contract's targets in district *i* by 2001, and 0 otherwise.

Several independent variables are used as discriminants. It is expected that system expansion to larger and more densely populated communities would be less costly, all else being equal. Therefore, the *population* of each municipality was used as a proxy of system size. Similarly, population density was also included because the *density* of an area should relate inversely to the cost of service provision due to the presence of economies of scale or output density. Finally, as it is also expected that areas closer to existing pumping stations and treatment plants would be less costly to connect, a variable capturing the mean *distance* of each district from treatment plants was included. The impact of economic factors was proxied by the extent of *poverty*, as measured by the proportion of households with unsatisfied basic needs.⁴ It is expected that the

³ The costs of service expansion refer to the infrastructure capital investments associated with the layout of the grid and the construction of additional pumping stations and treatment plants. Net revenue potential refers to the possibility of obtaining sufficient revenues to cover operation and maintenance costs.

⁴ Household income was unavailable at the district level.

population, density and distance variables would be positively correlated with the probability of service coverage, while the poverty variable would be negatively correlated with coverage.

The discriminating power of the independent variables was examined by stages (or in steps). After entering all explanatory variables individually, poverty seems to be the best single discriminating variable. Matching poverty with the other variables, it appeared that a solution that used population, density and poverty as explanatory variables offered the best discrimination between groups. The statistics suggest that the discriminatory power of the discriminant function was statistically significant.⁵ The coefficients indicate that districts with high population, low population density and high levels of poverty are more likely to be in the group of districts for which, by 2001, the contract's water targets had not been fulfilled. In other words, the results seem to suggest that the licensee complied with targets in districts where the costs of service expansion seemed to be low and the economic well-being of users offered the most attractive income stream.

The contract's targets were also spelled out in monetary terms, which resulted in a total investment plan for the whole concession of \$4 billion,⁶ disaggregated into six five-year periods. Table 3 displays investment targets and outcomes for the first two periods (see query in table). The data show that the firm invested \$1,033 million throughout the first five-year period, a figure slightly more than the \$1,025 million set out in the contract. The analysis for the first decade of private management is more troublesome, however, because investment targets for the second five-year period of about \$700 million were increased to \$1,100 million in January 2001, when a contract renegotiation that included an Improvement and Service Expansion Plan took place. The renegotiation covered capital expenditure categories such as Comprehensive Sanitation Plan (PSI), pipes renovation and service expansion, which deviated from those considered in the concession contract.⁷ Despite the fact that the resulting reclassification of targets makes difficult both the aggregation of investments over time and the consequent comparison of targets and outcomes, a computation of accumulated investment targets for the first decade indicates that they should total \$2,126 million, a figure that exceeds by \$486 million, or 23 per cent, the amount of \$1,640 million of accumulated investments recorded by the firm until the end of 2003.

The information in table 4 adds to the analysis because it shows a simple cash flow statement that summarizes the sources of the firm's funds and their use throughout the decade of private management. The right-hand side of the table shows that about \$1.5 billion (or 70 per cent of total funds) was committed to investment in fixed assets, and \$429 million (20 per cent) was invested in current assets, while remaining funds have been paid out to the firm owners in the form of cash dividends and technical operators' fees. The left-hand side of the table indicates that investments have almost entirely been financed out of debt additions and the income the firm earned throughout the decade (that is, by current users); accumulated earnings of \$1 billion turned out to be the most important source of funds, with a similar contribution from net income and depreciation of fixed assets and amortization of intangibles. The table also highlights the irrelevance of initial equity investment, which accounts for only 5 per cent of the decade's total source of funds.

⁵ The coefficients of the discriminant function were: $Z = 0.456 + 0.002 \cdot \text{population} - 0.363 \cdot \text{density} + 1.797 \cdot \text{poverty}$. The canonical correlation coefficient (0.682) indicates a strong association between group membership and the discriminant function. Wilks' lambda (0.535) shows that the difference between the centroids of the two groups is significant at the 5 per cent level. The classification matrix indicates that the discriminant function correctly classified 89 per cent of observations.

⁶ \$ figures refer to US dollars.

⁷ New outcomes resulted in new planned investments of \$474 million for the rescheduling of service expansion targets in suburban areas and the adjustment of water treatment plants, \$318 million for the renewing of pipes, \$190 million for the PSI aimed at recovering Buenos Aires riversides and \$124 million for the updating of the information technology system, the maintenance of buildings and the renovation of equipment.

Table 3: Investment targets and outcomes:
Aguas Argentinas concession contract, 1993–2003 (*million dollars*)^a

Service	1993–1998		1993–2003		Difference between target and outcome, 1993–2003	
	Target	Outcome	Target	Outcome	Dollars	Per cent
Total investment	1,025	1,033	2,126	1,640 ^b	–486	–23
Water services	474	491	958	864	–94	–10
Water mains	328	400	812	700	–59	–
Water treatment plants	37	76	37	113	76	–
Water supply booster stations	109	15	109	50	–59	–
Sewerage services	551	212	855	443	–412	–48
Sewerage network	206	138	510	312	–198	–
Sewerage pumping stations	100	19	100	32	–68	–
Sludge treatment facilities	245	55	245	99	–146	–
Other investment	–	330	411	333	19	6
Computers, maintenance, repairs	–	93	125	145	21	–
PSI	–	–	189	–	–189	–
Buildings, structure, machinery	–	52	–	66	66	–
Works in progress	–	185	–	122 ^c	122	–

^a Investment for the period 1993–2001 are in US dollars; investments for years 2002 and 2003 of 42.4 pesos and 60.2 pesos, respectively, have been adjusted to 2001 prices and then converted into dollars at the pre-devaluation exchange rate of 1 peso = \$1. ^b Based on the 2001 Aguas Argentinas' annual report data plus 2002 total investment as available from the 2002 annual report. ^c Includes 2003 total investment from the 2003 Aguas Argentinas' annual report to ETOSS. **Source:** Authors' analysis based on the concession contract, Aguas Argentinas' annual reports and 2003 annual report to ETOSS.

Table 4: Cash flows statement: Aguas Argentinas, 1993–2001 (*million dollars*)

Source of funds	Dollars	Per cent	Resource allocation	Dollars	Per cent
Debts ^a	875	40	Fixed assets (investments)	1,546	70
Earnings ^b	1,010	46	Current assets ^c	429	20
Provisions bad debts and other	195	9	Dividends and operator's fees	224	10
Capital	120	5			
Total	2,200	100	Total	2,200 ^d	100

^a Commercial debts, loans and others. ^b Net income, depreciation of fixed assets, amortization of intangible assets and operator's fees (includes a discrepancy found in financial statements). ^c Cash and banks holdings, debtors and others. ^d Minor differences are due to rounding. **Source:** Authors' analysis based on the concession contract and Aguas Argentinas' annual reports.

3. Taxonomy of Unforeseen Tariff Reforms

One striking flaw of the concession was the decision to leave in place the existing inefficient tariff regime. According to the contract, basic bimonthly⁸ tariffs (BBT) for unmetered customers are determined as:

$$(1) \quad \text{BBT}_{ij} = \text{TG}_{ij} \cdot K \cdot Z \cdot (\text{SC} \cdot E + 0.10 \cdot \text{ST})$$

⁸ Throughout the paper, bimonthly refers to every two months.

where BBT_{ij} is the tariff for the i -th type of service (water or sewerage) for the j -th customer category (residential, non-residential and land lot), TG_{ij} is a general tariff for each service and customer category, K is an adjustment factor, Z a coefficient that varies with property location, E another coefficient related to the type and age of the property and SC and ST the dwelling's total built size and lot area. Naturally, this tariff structure ignores efficiency goals, as the marginal cost of water consumption is zero. Minimum tariffs are established for each customer category. Metered customers pay for their use of each sanitation service according to a two-part tariff. The first component is a fixed charge equivalent to half of the unmetered tariff, while the second relates unit prices with total water usage (above a monthly free consumption threshold of 15 cubic metres). Both the licensee and consumers enjoy the right to request a move from the unmetered to the metered regime, though at their own cost—that is, the party requesting the change has to pay for connection and meter-reading costs.

Privatization came, however, with the introduction of newer access costs. Newcomers were required to pay access costs that combined the infrastructure charge (IC), payable in instalments once the works were finished, with connection fees (CFs). The former was aimed at funding the expansion of the secondary network, while the latter at paying for the right to connect to the grid. Table 5 depicts the evolution of access costs and shows that initial access costs to the water and sewerage network totalled \$1,120, with \$785 for ICs and \$335 for CFs. These amounts, to which the cost of internal dwelling plumbing installations should be added, were well beyond the monthly income of poor households; they were also high according to international standards.⁹ Furthermore, in June 1994, ICs increased more than two-thirds for water and somewhat less than half for sewerage, while minimum CFs increased by about four-tenths for both services. Since May 1995, ICs for water services became a function of land and dwellings' features, thus reducing the cost for the poorest newcomers and, in July 1995, they decreased by about a sixth following an extraordinary tariff revision induced by lower social security taxes.

Table 5: Pre-tax access costs^a: Aguas Argentinas (dollars)

Access cost component ^b	May 1993	June 1994	July 1995	November 1997	May 1998	January 1999	January 2001	January 2002
IC ^c	785	1,271	1,021	–	–	–	–	–
Water	325	511	415	–	–	–	–	–
Sewerage	460	760	606	–	–	–	–	–
Service integration charge (CIS) ^d	–	–	–	240	253	253	265	277
Water	–	–	–	120	126	126	133	138
Sewerage	–	–	–	120	126	126	133	138
CF ^e	335	476	476	476	501	501	526	549
Water	135	192	192	192	202	202	212	221
Sewerage	200	284	284	284	299	299	314	328

^a The value added tax (VAT) rate should be added in all cases; the rate is 18 per cent until May 1995 and 21 per cent thereafter. ^b Newcomers also incur costs of about \$50 for water and \$400 for sewerage for the dwelling's internal connection (Mazzuchelli et al. 2001). ^c Payable in 12 bimonthly instalments. ^d Payable in 30 bimonthly instalments. ^e CFs vary according to the diameter of pipes; these are minimum values. **Source:** Authors' analysis based on ETOSS resolutions and Aguas Argentinas' annual reports.

High access costs created a general discontent among newcomers and a refusal to pay them. By the end of 1996, arrears in the collection of access costs had soared to about \$30 million, which led the concessionaire to halt system expansion to poorer areas. In February 1997, Aguas Argentinas began contract renegotiations with ETOSS (Decree 149). Soon thereafter, however, the regulator was by-passed by two federal agencies—the Secretariat of Public Works and the Secretariat of Natural Resources and Sustainable Development—which reached a direct

⁹ Estimates for the United States show that the average cost of basic water and sewerage infrastructure is about \$200 (Chisari and Estache 1999).

agreement with the licensee that became official in November 1997 (Decree 1,167). The renegotiation ended up introducing key changes in the terms of the license. On the one hand, ICs were replaced by a one-off service integration charge (CIS) plus a permanent universal service (SU) fixed charge for all users. The CIS consisted of a lower fixed charge of \$120 per service payable by new entrants in 30 bimonthly instalments, while the SU resulted in a fixed charge of \$2.01 per service applicable to all users. In practice, the introduction of the latter charge translated into an implicit cross-subsidy from existing to new customers. On the other hand, the PSI, as outlined by Aguas Argentinas, was introduced into the license, modifying the original sewerage disposal programme set out in the contract. The funding of the PSI resulted in the addition of an environmental improvement (MA) fixed charge of \$1.04 per service for all users, which became effective in 1999.¹⁰

The introduction of these fixed charges, several adjustments in basic tariffs and marginal tax changes not only increased the cost of sanitation services significantly, but they also distorted the nature of the pro-poor cross-subsidies set out in the concession contract, as they affected lower tariffs more severely. Table 6 illustrates the economic impact of those changes by summarizing the evolution of the bimonthly bill for an “average” water and sewerage residential consumer, as defined by both the firm and the regulator. The table shows that privatization came with a tariff reduction, since Aguas Argentinas won the bidding process by offering a discount of 26.9 per cent over prevailing tariffs, thereby setting the initial value of the *K* factor at 0.731. Consequently, the total bill for an average user totalled \$17.57 in 1993. Only a year later, however, the regulator authorized an increase of the *K* factor of 13.5 per cent (Resolution 84), which added to the—more significant—adjustment of access costs discussed above. The table also illustrates the inclusion of the SU that resulted from the contract renegotiation in 1997.

Soon after the renegotiation, the regulator authorized an extraordinary tariff revision that in May 1998 led the way to another increase of 5.31 per cent of the *K* factor (Resolution 131). Shortly thereafter, in January 1999, the MA fixed charge aimed at financing environmental improvements was also added to the bill. Additional annual tariff increases of 4.9 per cent, 4.4 per cent and 3.9 per cent were adopted from 2001 through adjustments of the *K* factor, which in all cases were aimed at compensating for past inflation. The cost of each service was further increased in January 2001 by the introduction of two new fixed charges: a charge for connection maintenance (CMC) of \$0.43, aimed at accounting for the eventual replacement of connection devices and meters, and the access imputed charge of \$0.25, which was added to the SU in order to finance works of the PSI.¹¹ Overall, table 6 shows that adjustments in basic tariffs, the inclusion of fixed charges and marginal tax changes caused the total nominal bill of an average residential consumer to increase by 93 per cent throughout the period.¹²

Figure 2 also brings all tariff changes together by presenting the evolution of three tariff series: the nominal tariff in local pesos shown in the second row of table 6 (during that period, 1 peso equalled US\$1), the real tariff in pesos as deflated with the Consumer Price Index (CPI) and the nominal tariff as deflated by the nominal exchange rate. It is important to recall that the data in table 6 do not go beyond January 2002 when the Economic Emergency Law (Decree 25,561) froze tariffs and that the series in figure 2 give a picture of annual averages. The figure shows that all series move practically as one until 2001 because the peso was pegged at par to the dollar and inflation rates were negligible. In any case, tariffs increased around 80 per cent during this period. The conversion of utilities’ tariffs into pesos at pre-devaluation exchange rates and the fact that their freeze was ruled out on 6 February 2002 broke the uniformity

¹⁰ The CIS, SU and MA are all adjusted by the *K* coefficient and subject to the VAT rate. The ETOSS fee is not levied on these charges. The restructuring of tariffs brought about a significant increase in revenues. Prior to the renegotiation, annual revenues collected from the ICs totalled about \$14 million, while by 2001, total revenues provided by the CIS, SU and MA increased to \$104 million.

¹¹ From January 2002 and throughout 2003 these fixed charges should be adjusted with changes in the *K* coefficient. From 2004, the CMC would be established in five-year ordinary revisions.

¹² A computation of tariff changes under two scenarios of a rich and a poor household, respectively, show increases of 33 per cent for the former, but 135 per cent for the latter.

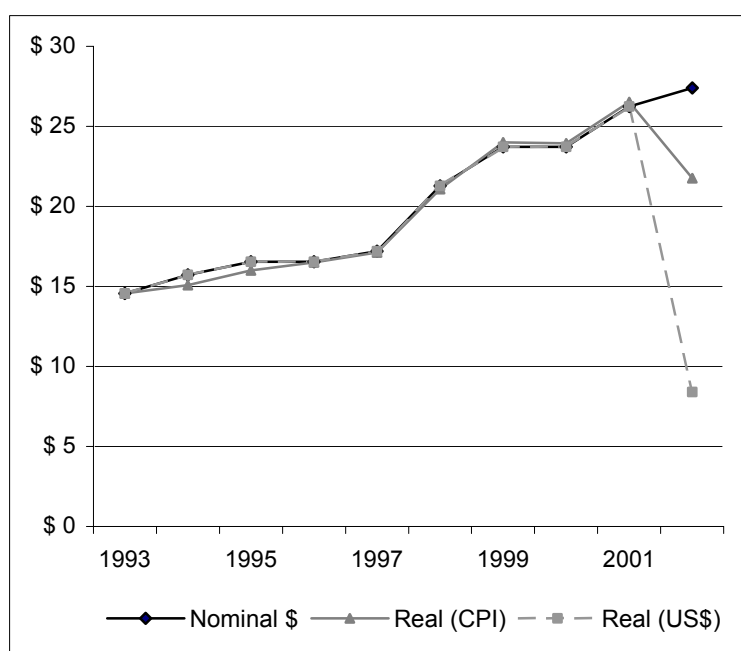
displayed up to that time. Real 2002 tariffs in pesos decreased about a fifth, though their levels remained well above privatization values. The tariff reduction is more significant when deflated with the nominal exchange rate, which jumped from 1 to 3.27 pesos, because it ended up being about two-thirds of 2001 values.

**Table 6: Water and sewerage bimonthly bills:
Aguas Argentinas' average customer (dollars)**

Bill component	May 1993	June 1994	November 1997	May 1998	January 1999	January 2001	January 2002	Increase 1993– 2002 (per cent)
Total bill (water+sewerage)	17.57	19.95	25.42	26.77	29.34	32.46	33.88	93
Tariff and fixed charges ^a	14.56	16.53	20.55	21.65	23.73	26.25	27.40	88
BBT	14.56	16.53	16.53	17.41	17.41	18.26	19.07	31
Fixed charges	–	–	4.02	4.24	6.32	7.98	8.33	–
SU	–	–	4.02	4.24	4.24	4.44	4.64	–
MA ^b	–	–	–	–	2.08	2.68	2.80	–
CMC	–	–	–	–	–	0.86	0.90	–
ETOSS ^c	0.39	0.44	0.55	0.58	0.63	0.70	0.73	–
VAT ^d	2.62	2.98	4.32	4.55	4.98	5.25	5.77	–
Minimum bill (water+sewerage)	8.00	9.08	9.08	9.56	9.56	10.02	10.48	31

^a At the time of the transfer, OSN's average tariff of \$18.90 decreased to \$14.56 because of Aguas Argentinas' winning bid. ^b In January 2001, the MA increased by \$0.50 because of changes in the PSI through the addition of the access imputed fixed charge. ^c The regulator finances its budget from a levy of 2.67 per cent on users' tariffs. ^d The VAT rate was 18 per cent until May 1995 and 21 per cent thereafter. **Source:** Authors' analysis based on ETOSS resolutions and Aguas Argentinas' annual reports.

**Figure 2: Evolution of nominal and real bimonthly tariffs: Aguas Argentinas
concession, 1993–2002 (US\$ and pesos)**



Source: Author's analysis based on ETOSS Resolutions, Aguas Argentinas annual reports and INDEC.

4. Financial Performance

Privatization provoked a shift from OSN's multiple optimization criteria, as revealed by the subsidization of consumption or the promotion of new jobs, for example, to another where the maximization of profits played a predominant role. Table 7 summarizes the evolution of Aguas Argentinas' financial statements. The data indicate that the firm's revenues more than doubled between 1993 and 2001, from \$245 million to \$566 million. Such an increase resulted from a combination of higher tariffs, a larger customer base, the addition of users excluded from OSN's billing system and the recategorization of others, the updating of property features and better collection rates.¹³ Operating costs also increased, though much more moderately, because they went up from \$277 to \$410 million. The faster growth of revenues compared to operating costs led the way to a rapid increase of earnings before interest and taxes (EBIT), which soared from 9 per cent to about 28 per cent of total income. Consequently, prior to the devaluation of 2002, total net income earned—after an initial equity investment of \$150 million—totalled \$419 million, a sum that goes up to \$534 million if operators' fees are considered; throughout that period, total cash dividends and operator's fees totalled \$224 million (see table 4).

Table 7: Aguas Argentinas' financial statements: Current values (*million dollars*)

Concept	1993 ^a	1994	1995	1996	1997	1998	1999	2000	2001
<i>Income statement</i>									
Total revenues	245	291	361	377	420	437	511	514	566
Operating costs ^b	-277	-265	-307	-314	-349	-367	-390	-360	-410
EBIT	-32	26	54	63	71	70	121	155	157
Net financial costs ^c	-2	-1	0	-5	-13	-20	-29	-33	-39
Taxes	-1	-2	0	0	0	-14	-30	-36	-43
Net income	-34	25	54	58	58	37	62	85	74
<i>Balance sheet</i>									
Debt	111	244	399	544	697	778	884	993	921
Equity	95	126	185	230	273	292	334	398	445
<i>Financial ratios (per cent)</i>									
Return on equity ^d	—	24.2	34.4	28.1	23.0	12.9	19.8	23.2	17.5
Gross profit margin ^e	—	8.9	14.9	16.8	16.8	16.0	23.7	30.0	27.6
Debt to assets	—	65.9	68.3	70.3	71.9	72.7	72.6	71.4	67.4
Interest coverage ^f	—	—	166.1	12.4	5.5	3.5	4.2	4.6	4.0

^a Data for 1993 have been annualized because the licensee took over in May of that year. ^b Includes depreciation of fixed assets. ^c The figure for 2002 takes into account an exchange rate loss of \$477 million. ^d Return on equity is computed as $[NI_t / 0.5 \cdot (E_t + E_{t-1})]$, where NI is net income and E the total equity value. ^e Gross profit margins result from the ratio of EBIT to total revenues. ^f Interest coverage is the ratio of EBIT to interest expenses. **Source:** Author's analysis based on Aguas Argentinas' annual reports.

The financial ratios displayed in table 7 highlight major features of Aguas Argentinas' financial structure. The figures indicate that return on equity was well above the 20 per cent rate for most of the period, with a 22.1 per cent average. The debt to total assets ratio shows that the concessionaire began its operations by adopting a highly leveraged capital structure. The data for the whole period indicate that, on average, debt holders have financed about 70 per cent of the firm's assets. The table also illustrates that a highly leveraged capital structure augmented interest expenditures and reduced the interest coverage ratio, potentially affecting the firm's ability to attend its debt services.

It could be expected that a significant leveraged capital structure may magnify a licensee's financial risk, with an ultimate effect on consumers. For instance, this concern gave way to regulatory debates in the United Kingdom when Anglian Water decided to pursue a capital

¹³ OSN's collection rates ranged at about 86 per cent, while Aguas Argentinas reported rates of 96 per cent, 98 per cent, 98 per cent, 99 per cent and 94 per cent between 1993 and 1997. This improvement is probably explained by the interest the licensee charged for the arrears and its right to cut off the service if arrears exceed three consecutive bills.

restructuring (see Ofwat 2002). The regulator allowed the company to carry on because it recognized that the capital structure is a decision that involves shareholders and lenders, but it modified the terms of the license in order to protect the consumers from any potential additional risk. The decision was based on the belief that the firm might not survive cost shocks or poor management, and that a reduced equity investment might weaken incentives for efficiency improvements, given the concern of debt holders on debt services.

The Buenos Aires water concession seems to offer a good example of this regulatory concern, as it exposes the effect of the peso devaluation of 2002 on the financial position of Aguas Argentinas. The devaluation caused the firm's debt to almost triple—as did the exchange rate—because it was mostly issued in foreign currency, while total income dropped by two-thirds to \$184 million. Consequently, the net loss recorded by the firm in 2002 is almost exclusively due to the effect of an exchange rate loss brought about by the devaluation.¹⁴ As a result, the firm's net worth was wiped out and total debts practically doubled the total value of assets. It could be expected that this financial position, which in practice means that debt holders have become—probably against their wish—the new owners of the firm, may not only impede the funding of further network expansion with the use of additional debt, but also divert the management's efforts from accomplishing the terms of the license.¹⁵ Despite the devaluation being exogenous to both the firm and the regulator, this experience seems to suggest that regulators should consider protecting the interests of consumers by setting capital requirements or leverage levels (Oxera 2002).

5. The Link Between Profits, Prices and Productivity

This section uses a simple model of disaggregated performance measurement that allows for the decomposition of the firm's profitability into their productivity and price recovery components. The changes in the profitability of a firm can be explained by efficiency changes in the allocation of resources, variations in the relationship between the prices of outputs and inputs or by a combination of both. Following Waters and Tretheway (1999) and Saal and Parker (2001), it is possible to examine the linkage between profits, tariffs, input prices and productivity by writing profits as $\Pi = R/C = (P_1 \cdot Q_1 + \dots + P_m \cdot Q_m) / (W_1 \cdot X_1 + \dots + W_n \cdot X_n)$ where R is total revenues and C total costs, Q_i and X_j for $i = 1, \dots, m$ and $j = 1, \dots, n$ are the quantities of m outputs and n inputs and P_i and W_j their respective prices. After some manipulation, changes in profitability can be expressed as:

$$(2) \quad \frac{d\Pi}{\Pi} = \left[\sum_{i=1}^m 0.5 \cdot (u_{is} + u_{it}) \cdot (\log Q_{is} - \log Q_{it}) - \sum_{j=1}^n 0.5 \cdot (v_{js} + v_{jt}) \cdot (\log X_{js} - \log X_{jt}) \right] + \left[\sum_{i=1}^m 0.5 \cdot (u_{is} + u_{it}) \cdot (\log P_{is} - \log P_{it}) - \sum_{j=1}^n 0.5 \cdot (v_{js} + v_{jt}) \cdot (\log W_{js} - \log W_{jt}) \right]$$

where Q_{it} and X_{jt} represent the i -th output and j -th input in period t , $u_{it} = P_{it} \cdot Q_{it} / P_t \cdot Q_t$ is the revenue share for output i at t , $v_{jt} = W_{jt} \cdot X_{jt} / W_t \cdot X_t$ the cost share of input j at t , and P_{it} and W_{jt} the respective output and input prices. Expression (2) is the logarithmic form of a Tornqvist index that shows that profitability changes can be disaggregated into both changes in efficiency and in the relative prices of outputs and inputs. The first term of (2) is the usual measure of total factor productivity (TFP) (Coelli et al. 2000), while the second can be referred to as total price performance (TPP). Naturally, increases in both TFP and TPP lead to profitability improvements.

¹⁴ The 2002 average exchange rate was 1US\$ = 3.2 pesos. That same year, the Wholesale Price Index increased 75 per cent and the CPI increased 26 per cent.

¹⁵ If tariff adjustments are disregarded, it seems that the licensee will not be able to fulfil the targets of the concession contract without a capital increase. A rough projection of its financial statements suggests that profits will not be sufficient to fund additional investments and that the financial fragility of the firm will deteriorate its credit rating, ultimately increasing the financial cost of eventual additional debt.

Aguas Argentinas' TFP and TPP were estimated using (2) as follows. Output was proxied by the total number of customers, as more disaggregated data were unfortunately unavailable. An average output price was computed dividing total revenues by the number of users. Three inputs were used in the estimations. The capital stock was estimated using the perpetual inventory method. The residual value of fixed assets received from OSN was used as a benchmark, while gross annual investments as well as depreciations were obtained from Aguas Argentinas' financial statements.¹⁶ The price of capital input is the sum of depreciation rates and the opportunity cost of capital; depreciation rates were estimated for each year as the ratio of total depreciation to gross capital stocks, while the opportunity cost was computed using the weighted average cost of capital (WACC).¹⁷ Total capital costs resulted from multiplying capital stock by the rental rate.

The quantity of labour was approximated by the total number of employees, while labour expenses result from the sum of wages and social security charges as reported in the firm's annual accounts. The price of labour results from dividing labour expenses by the number of employees. The quantity of other inputs used in production, hereafter referred to as the materials input, was estimated residually by first computing materials expenses, which result from subtracting labour and depreciation costs from total operating costs. Materials expenses were then divided into three groups: energy, chemical products and other material expenses, which were each adjusted by a suitable price index and finally added up to provide a proxy for the quantity of materials used in production. Total costs are the sum of capital, labour and materials expenses, while cost shares s_j for each input at t result from dividing those input expenses by total costs.

Table 8: Profits, TFP and TPP: Aguas Argentinas, 1993–2002
(average annual growth rates in percentages)

Indices	Total	Output Q, P	Capital K, W_K	Labour L, W_L	Materials M, W_M	Input index
TFP	-0.10	2.44	4.31	-0.80	1.55	2.55
TPP	6.05	7.20	-0.08	3.01	1.98	1.09

Note: The average input shares are as follows: $s_K = 50$ per cent; $s_L = 18$ per cent; $s_M = 32$ per cent. **Source:** Authors' analysis based on Aguas Argentinas' annual reports and INDEC price series data.

Table 8 summarizes the productivity results. The data show that Aguas Argentinas' productivity appears to be poor, as it decreased at an average annual rate of 0.10 per cent: while output increased by 2.44 per cent per year, on average, inputs did so more rapidly at 2.55 per cent. Input growth was in turn mainly driven by the capital input, which contributed with 2.12 per cent, or 83 of total input growth, as capital accounts for about 50 per cent of total input costs and the stock increased at an average annual growth rate of 4.31 per cent ($2.12 \approx 4.31 \cdot 0.50$). The contribution of labour of -0.12 per cent was actually negative due to reductions in the labour force, while the 0.54 per cent added by materials, though positive, was moderate.

The evolution of TPP shows a different story because of the dissimilarity between the growth rates of output and input prices. In this case, the results indicate that the noticeable annual increase of about 6.05 per cent in the prices gap was the consequence of the fact that the annual growth in tariffs of 7.20 per cent was well above the more moderate increase of input prices, which totalled 1.09 per cent. Note that tariffs increased twice as much as the labour cost did. As a result, expression (3) shows that the firm's profits increased at an annual growth rate of 5.95 per cent.¹⁸

¹⁶ The value of OSN's fixed assets (\$1,699 million, as recorded in OSN's financial statement) was depreciated using an average rate that assumes an assets' life equal to the length of the concession.

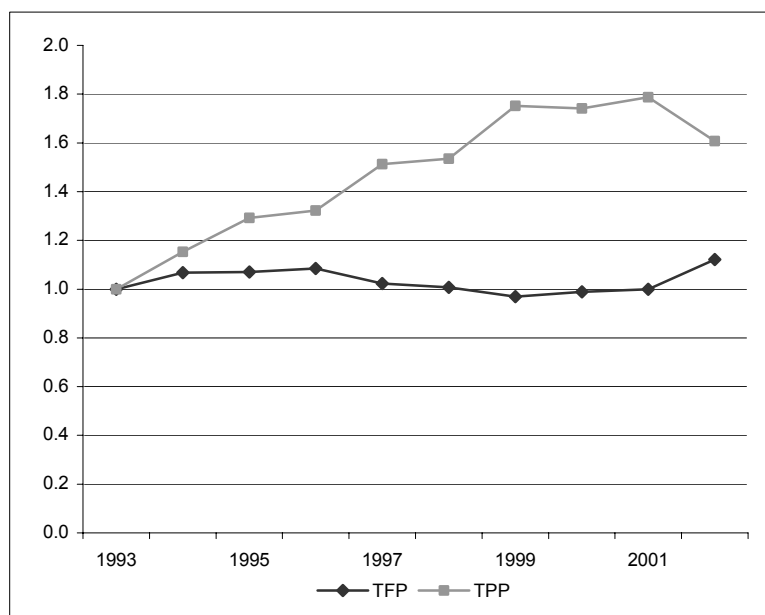
¹⁷ The average of depreciation rates is 3.9 per cent. It was not possible to obtain WACC estimates from the regulator; thus, we computed our estimates using the Capital Asset Pricing Model. The average WACC value is 10.6 per cent. After adjusting for leverage and systematic risk, our results proved consistent with those available for other utilities sectors in Argentina.

¹⁸ A dot over a variable indicates rates of growth, for example, $\dot{\Pi} = d\Pi/\Pi = d \log \Pi = \log \Pi_t - \log \Pi_{t-1}$.

$$(3) \quad \dot{\Pi} = \dot{\text{TFP}} + \dot{\text{TPP}} = -0.10\% + 6.05\% = 5.95\%$$

The results of expression (3) go together with both the tariff and financial performance analysis developed above because they indicate that the increase of the firm's profitability is a direct consequence of sustained tariffs adjustments that very much exceeded the increase of input prices, and also because improvements in productivity were nil. Figure 3 displays the evolution of the TFP and TPP indices.¹⁹

Figure 3: TFP and TPP: Aguas Argentinas, 1993–2002 (*Index 1993 = 1*)



Source: Authors' analysis based on table 9.

However, the findings related to TFP performance should not obscure significant improvements in other directions. Several usual partial productivity indicators, for instance, show that since the date of transfer, water production jumped from 174,000 to 411,000 cubic metres per year per employee and also that the population served increased from 1,400 to 3,500 users per staff. The ratios that relate the number of customers to employees and to network length, clearly linked to output density, increased as well: the former from 493 to 1,262 and the latter from 207 to 229. Finally, the relationship between network length and number of employees, related to the intensity of capital usage, practically doubled. However, it may be recalled that these improvements are to a great extent explained by the large staff layoffs that followed privatization, when the workforce declined from 7,365 to 3,770 employees. There was also important progress in service quality. In fact, quality of service indicators as measured by improvements in the quality of drinking water, leakage repairs, water pressure and delays in repair requests displayed in table 10 suggest significant changes for the better. As pointed out by Dore et al. (2004), improvements in service quality are most probably one of the strongest benefits of privatization.

¹⁹ The profit growth rate as defined by $\Pi = R/C$ is obtained by adding to the firm's operating costs the cost of capital imputable to OSN's fixed assets transferred to the licensee, which constitutes an implicit subsidy.

Table 9: Other indicators of Aguas Argentinas' performance

Indicators	OSN 1993	1993	Aguas Argentinas 1998	2003
Water turbidness (units)	–	2.3	1.0	1.0
Customers with appropriate water pressure (per cent) ^a	17	54 ^b	60	74 ^d
Water leakage repaired (thousand/year)	42	–	105	69
Sewage blockages repaired (thousand/year)	100	–	167	123
Delay in repair requests (days)	180 ^b	32	6	5.5
Attended repair requests (thousand)	–	446 ^c	351	258 ^d

^a Higher than 10 metres. ^b 1992. ^c 1996. ^d 1999. **Source:** Authors' analysis based on Aguas Argentinas' annual reports.

6. And the Regulator?

The regulation of sanitation services within the concession area is centralized at ETOSS, an agency established in 1993 by the legal framework that regulates the concession (Decree 999/92). According to the decree, ETOSS is an independent regulatory office whose duty is to enforce the license conditions. Other objectives as set out in the regulatory body (article 14) consist of monitoring the concessionaire's five-year investment plans, determining tariff provisions and investigating customer complaints. ETOSS is governed by a board of six full-time directors appointed in equal parts by the national government, the government of the Buenos Aires Province and that of the city of Buenos Aires; the members are appointed by the executive branch of each jurisdiction without legislative intervention. Directors are appointed for six years, but can be re-elected once. The funding of the regulator's budget comes from a fee levied on users' tariffs (article 25).

The Buenos Aires concession seems to be a very unusual case where a single watchdog regulates a single firm. Some observers point to several arguments that challenge the office's regulatory efficacy. For instance, the Water and Sanitation Program (2001:3) argues that ETOSS "was staffed mainly by former employees of OSN who were poorly qualified for the responsibility of tariff settings and had no experience in regulating a commercial venture", while others warn that its staff could be tempted to adopt pro-concessionaire attitudes, as the firm is the most likely employer of the office's members (Artana et al. 1999). Other factors add further concerns. First, funding of ETOSS's budget through a proportional charge levied on users' bills creates a direct link between tariff increases and the office's resources. Unlike other utilities sectors, fines do not increase ETOSS revenue, which could attenuate incentives to punish unobserved contract duties. Second, the office seems to retain a striking discretionary power, as its ruling is kept out of public hearings – though its decisions are subject to innocuous audits and legal overviews from the Tribunal de Cuentas de la Nación.

These concerns seem to be confirmed by several ETOSS rulings, which appeared to be most frequently biased toward the regulated firm. For instance, Artana et al. (1999) indicate that the regulator: (i) allowed the firm to set unusual high tariffs for meter installation; (ii) granted unexplained tariff adjustments with little economic analysis; (iii) transferred business risk to consumers through adjustments in the IC; and (iv) gave consent to delays in the installation of meters. However, one of the most remarkable episodes of regulatory failure seems to have been the first contract renegotiation, which modified basic features of the concession. By passing on the role of ETOSS, the Natural Resources and Sustainable Development Secretariat: (i) established that some network expansion costs should be financed by all users through fixed charges, thereby introducing a cross-subsidy from existing to new customers; (ii) relaxed some water and sewerage expansion targets; (iii) cancelled fines for investment delays, setting the

precedent that the licensee may not be imputable for contractual failures; (iv) approved a plan for wastewater treatment not contemplated in the concession contract, which also resulted in the addition of another fixed charge; and, most surprisingly, (v) disposed that, in cases of peso-dollar parity changes, the firm's tariff will remain in dollar terms. The latter basically stands for the granting of exchange rate insurance to the licensee.

The regulator might also have disregarded its responsibility as it relates to the monitoring of the licensee capital structure. The economic proposal built into Aguas Argentinas' bid stipulated upper limits to the debt to equity, debt to cash flow and interest expenses to revenues ratios, among others, which then resulted unobserved throughout the first five-year period of the concession. By 1998, the ratio targets of 0.73, 2.42 and 0.04 had been surpassed, quite remarkably, because they increased to 2.67, 4.34 and 0.088, respectively. In 1999, and during a second contract renegotiation, the Natural Resources and Sustainable Development Secretariat gave way to the non-fulfilment of leverage targets ruling out (*ex post*) an increase of the debt to equity ratio from 0.73 to 2.65 (Resolution 602). Such a ruling seems not only to confirm the concerns related to regulatory capture, but also those linked to the office's expertise. For instance, industry studies indicate that the consistent convergence of debt to equity ratios in the 0.66–1.0 range suggests that high levels of leverage are not the norm in the water sector (Oxera 2001:8). The evidence seems to indicate that neither the Secretariat nor the regulator were aware of the increasing risks to which customers were exposed through the licensee's increasing leveraged financial structure.

7. Tariffs, Universal Service and the Poor

Even though the precise definition of universal service is, to a large extent, country-, industry- and, most likely, even period-specific, the crucial elements that have consistently been associated with this concept refer to the obligation of an operator to provide all users with a range of basic services of good quality at affordable rates. In general, the criteria considered in the process of identifying which services fall into the definition of universal service include the extent to which: (i) the service is essential to education, public health or public safety; (ii) the service has been subscribed to and by a substantial majority of residential customers; (iii) the service is being deployed in public networks; and (iv) the service is consistent with public interest, convenience and necessity (Cremer et al. 2001). Sanitation services do not escape such criteria, and the notion of universal service in sanitation, therefore, refers to the obligation for the operators to provide water and sewerage services of good quality to all users at affordable rates. This section combines household-level data with access costs and use-of-service tariffs to examine alternatives toward universal service in the Buenos Aires concession.

Table 10 displays access, income and expenditure data untying the city of Buenos Aires from the municipalities that form the Greater Buenos Aires area.²⁰ Households were first sorted according to their total income and then grouped into quintiles. The most notable difference between the two areas relates to access rates. While the network completely covers the city of Buenos Aires, penetration into the municipalities is much lower, where the water and sewerage networks reach 63 per cent and 40 per cent of households, respectively. Access to sanitation services in the municipalities increases with income. On aggregate, only 55 per cent of poor families have access to water services in contrast to about 76 per cent of the rich; differences in sewerage are larger. Common to both districts is the increase in mean expenditure as a proportion of income as households become poorer. The average income of the poor is about one-tenth that of the rich, though sanitation bills for the former are about two-thirds those of the latter. The data also indicate that water and sanitation expenditure of the poor ranges from 2.1

²⁰ The data include seven municipalities that are not part of the franchise area. It is not possible to split that data from the sample, as the INDEC data impede identification at the municipality level. This fact should not, however, bias the socioeconomic nature of the results related to the concession.

per cent to 3.3 per cent of household income, the burden being heavier for those residing in the municipalities.

**Table 10: Access and expenditure data at the household level,
March 1996–March 1997** (*dollars*)

Income quintile	Total households (thousands)	Total population (thousands)	Average income^a	Water coverage rate^b (per cent)	Sewerage coverage rate^b (per cent)	Average expenditure^c	Expenditure over income (per cent)
<i>City of Buenos Aires</i>							
Average	1,022	2,877	19,650	100.0	99.9	135.09	0.99
Poorest	205	366	5,190	100.0	99.6	97.64	2.11
Second	204	517	10,237	100.0	99.7	122.76	1.20
Third	205	635	15,076	100.0	100.0	132.33	0.88
Fourth	204	636	22,325	100.0	100.0	140.29	0.63
Richest	204	723	45,522	100.0	100.0	172.22	0.33
<i>Municipalities</i>							
Average	2,402	8,948	12,211	63.4	40.3	125.45	1.386
Poorest	481	1,369	3,238	55.4	32.2	106.14	3.297
Second	480	1,669	6,330	57.1	33.7	115.57	1.846
Third	481	1,819	9,349	59.5	35.0	120.50	1.314
Fourth	480	2,007	13,780	68.7	45.0	121.06	0.869
Richest	480	2,084	28,616	76.3	55.7	148.78	0.550

^a Average annual income per household. ^b Percentage of total households. ^c Average annual expenditure per household. **Source:** Author's analysis based on Household Expenditure Survey (INDEC 1998).

Difficulties in connecting new users to the network had probably been related to the high access costs, which seemed to have acted as an insurmountable barrier to system expansion into the poorest areas. By mid-1997, CFs accounted for about 176 per cent and 90 per cent of household monthly income in the first and second income quintiles, for example. Moreover, the addition of an IC's instalment to the use-of-service bill implies that a poor newcomer would have ended up paying about \$125 for every two-month period, or 23 per cent of income.²¹ The restructuring of tariffs brought about by the contract renegotiation of 1997—which replaced the IC with the lower CIS and introduced the SU and MA for all users—could have alleviated the burden of access costs, but at the price of bringing in additional difficulties to afford use-of-service tariffs. Between 1997 and 2002, the proportion of sanitation expenditure of total household income for poorer households increased, on average, from 2.1 per cent to 5.9 per cent in the city of Buenos Aires and from 3.5 per cent to 7 per cent in the municipalities.²² In the same way, Aguas Argentinas' non-payment of bills statistics indicate that the amount of accumulated unpaid bills from domestic consumers totalled 78 per cent of domestic users' revenues in 2002, while the yearly increase of unpaid bills with arrears exceeding 360 days increased severely, mainly in the municipalities.

As the most pressing barrier to universal service since the tariff restructuring appears to be related to consumption affordability, ETOSS proposed a "Social Tariff Program" that Aguas Argentinas put into practice in 2001. This programme was oriented toward households whose socioeconomic characteristics placed them below the poverty line; the aim of the programme was to keep sanitation expenditure below 4 per cent of household income. The programme was

²¹ Anecdotal evidence also suggests that even new consumers who could afford access charges resented the requirement to connect, partly because they had alternative sanitation systems that were outlawed. Another source of resentment was the fact that customers who had been connected before the concession had not paid any infrastructure fee (Alcazar et al. 2000).

²² The burden of tariffs on the poor was computed by updating 1997 expenditures according to the evolution of tariffs described in section 3 and income with INDEC's household surveys.

based on a \$24 annual discount or \$4 per bill per service.²³ The programme was financed out of the firm's revenues with an annual budget of \$4.2 million, which implies that 176,000 modules are on hand. Local governments select nine-tenths of recipients, while the regulator decides on the rest. By 2003, a total of 113,000 modules were granted, benefiting about 54,000 users. The fact that one-third of subsidies remained unassigned is unexpected, given the burden of sanitation tariffs on the poor.

It is possible to examine the capacity of the Social Tariff Program to alleviate the burden of user fees on households as follows. From an economic perspective, it is generally accepted that a subsidy S to a vulnerable household should equal the difference between the cost of purchasing a subsistence level of total basic consumption (TBC) and the household's willingness to pay (WTP) for the service, or $S = TBC - WTP$. Unfortunately, it was not possible to establish a subsistence consumption level, as the service for the most part is not metered, nor was it possible to obtain WTP estimates. The subsidy estimates provided below are, thus, based on estimates for other countries that identify a range of feasible WTP estimates that for poorer households invariably fall in the range of 3 per cent to 5 per cent of income (Gómez-Lobo et al. 2000).²⁴ The subsidy estimates required to secure affordability of charges are based on the 1996–1997 Household Expenditure Survey. Predicted 2002 sanitation expenditure for households with access to both services was computed by updating 1997 expenditure according to the evolution of tariffs. Expenditure for households not yet covered by the grid was predicted using an econometric estimation based on data from households covered by the grid.²⁵ Household's annual income was in all cases updated using Instituto Nacional de Estadística y Censos' (INDEC) income surveys.

The data in table 11 show that the total number of recipients of a use-of-service subsidy would reach 523,000 households and that the total annual amount of subsidies required under 2002 tariff levels would total \$51 million. The table shows that 307,000 households already connected to the network would be recipients of a subsidy. If those not yet covered by the grid were considered, the results also indicate that two-thirds of households (or 466,000 families) in the poorest income quintile would be recipients of such a subsidy, which would equal \$96 per year, on average. A subsidy would become necessary only for a few households in the second quintile; note that the grid covered most of the would-be recipients of the second quintile by 2002. If transfers from the government are ruled out, these estimates seem to suggest that the adoption of a profit neutral cross-subsidization policy would require a tariff rebalancing measure whose magnitude would be far from modest.

The simulations also show that a few richer households would be recipients of subsidies. This result should, however, be treated with caution, as it does not necessarily reflect an error of inclusion, but the fact that a few rich households have high expenditure levels. In fact, the implementation of a use-of-service subsidy with individual eligibility criteria requires the creation of an administrative apparatus for the screening of potential candidates. Typically, this process includes a standardized household interview conducted by a social worker in order to collect the information required to apply the eligibility criteria. A significant drawback of the individual subsidy system is that this selection process can absorb a significant volume of resources. However, a preliminary estimate suggests that the interview procedure could easily cost as much as \$15 per beneficiary household, excluding the fixed costs of running the subsidy programme.²⁶ With average consumption subsidies in the range of \$100 to \$124 per year, and

²³ The subsidy for each service is referred to as "module"; therefore, a household with both water and sewerage would receive a subsidy of two modules, or \$48 a year.

²⁴ Such estimates are in order with those prescribed by the Pan American Health Organization, which suggests that sanitation expenditure should not exceed 5 per cent of household income (3.5 per cent for water and 1.5 per cent for sewerage).

²⁵ These data are available from the authors upon request.

²⁶ Following Gómez-Lobo et al. (2000), this figure is based on the assumption that a social worker earns a monthly salary of about \$1,500 and is able to conduct 10 interviews per day, and that for every three interviews only two eligible beneficiaries would be identified. To these labour costs, which include social security charges, transport and materials costs of about \$3 per interview must be added.

supposing a three-year eligibility period, the administrative costs would absorb about 4 per cent of the value of the subsidy payment.²⁷ This percentage is so low so as not to question the overall case for making such subsidy payments at all.

Table 11: Total use-of-service subsidies and number of recipients whose WTP equals 5 per cent of total income, 2002 (*thousands*)

Income quintile	Households	Households with water and sewerage services		Households with water services only		Households without both services		Total
		Recipients	Subsidies	Recipients	Subsidies	Recipients	Subsidies	
Poorest	686	122	12,209	132	11,239	212	18,807	42,255
Second	685	35	4,306	2	52	5	90	4,448
Third	686	10	3,326	0	0	0	0	3,326
Fourth	684	5	509	0	0	0	0	509
Richest	684	1	26	0	0	0	0	26
Total	3,424	173	20,376	134	11,291	217	18,897	50,564

Note: Results comprise households residing in municipalities excluded from the franchise area (see footnote 20). It could be expected, however, that any subsidy policy would most probably be followed by other service providers within the Greater Buenos Aires area.
Source: Authors' analysis based on the Household Expenditure Survey.

8. Conclusion

Beginning in the late 1980s, Argentina embarked on a large-scale privatization process as a way to enhance the provision of public services, though critical economic conditions put privatization at the core of a broader reform programme. Similar to other public utilities, the privatization of Buenos Aires sanitation services was motivated by a general discontent with OSN performance characterized by underinvestment, sluggish system expansion, poor service quality and long-standing operating deficits. The privatization process was quickly activated, and the franchise was granted to the bidder offering the largest tariff reduction. The concession contract specified precise expansion targets aimed at achieving both full coverage and quality of service standards, and created a single agency to regulate a single firm. Since the very beginning of the concession, some observers have argued that privatization benefited consumers, while others contest this, mainly because of the opportunistic behaviour of the licensee and several regulatory failures. This paper contributes to such debates by examining key economic features of the concession as they relate to the fulfilment of the contract's targets, the evolution of tariffs, the economic performance of the firm and the achievement of pro-poor proposed policies.

The comparison of the contract's targets against the firm's outcomes shows that, despite a noteworthy increase, coverage rates by the end of the first decade of private management remained behind targets by half in the case of water and by about three-quarters in the case of sewerage. The non-fulfilment of targets implies the failure to supply water to more than 1 million people and sewerage to about half a million people. A closer examination of coverage targets at the district level indicates that failure to comply was more severe in the poorest areas. In other words, the evidence seems to suggest that the licensee did fulfil the targets in those districts for which the costs of service expansion seemed to be low and the economic well-being of users offered the most attractive income stream. The treatment of sludge effluents also remained behind targets, which were only surpassed by network renewing. In monetary terms, the figures indicate that investments, mainly funded by earnings and debts, were on aggregate a quarter behind goals. Such a financial policy induced a highly leveraged capital structure that

²⁷ For example, this is the practice in Chile. The administrative costs of running a water subsidy could be reduced if the scheme were integrated with other subsidy measures operating within the area.

not only imposed severe financial risks, but also casts doubts on the adequacy of initial equity requirements.

Difficulties in the collection of initially high access costs seem to have contributed to restrain network expansion mainly to the poorest areas and subsequently to lead toward a contract renegotiation that introduced fundamental changes in key features of the concession. The renegotiation ended up relaxing some licensee contractual duties related to expansion targets and cancelling fines imposed on the firm. It also came with significant tariffs changes. On the one hand, the one-off access cost levied on newcomers was replaced by another of lower value, a reduction that in revenue terms was more than compensated for by the adoption of fixed charges applicable to all users. On the other hand, another fixed charge aimed at funding investment in sanitation facilities not contemplated in the original contract was also imposed for all users. The first decade of private management has also witnessed five tariff adjustments and the introduction of additional fixed charges. On the whole, the addition of all tariff changes indicates that the nominal and real bill for an average residential customer have increased about nine-tenths and eight-tenths, respectively.

The adjustment of tariffs contributed to a noticeable increase in the licensee's total revenues, which seem to have transformed the concession into one of the most profitable water operations worldwide. The total net income earned prior to the devaluation more than tripled the initial equity investment. High shareholder returns came from a combination of a highly leveraged capital structure and tariff increases. In the first case, the high profitability was by and large due to a combination of a modest equity investment with a financing policy that mostly rested on debt. This was, however, at no cost, as the devaluation of 2002 wiped out the firm's net worth in such a way that total debts almost doubled the total value of assets. The subsequent burden of financial costs drained its capacity to attend debt services and, therefore, appeared to have closed any possibility to fund further investments with debt. In the second case, the breakdown of changes in economic profits into productivity and price components indicates that the marked increase of profits originated almost exclusively in tariff increases, as the contribution of TFP improvements and of input prices have been negligible. Partial productivity indicators improved significantly partly as a result of large staff layoffs, and there also was important progress in service quality.

A good part of the concession's failures seem to have been in turn explained by the presence of a weak and inexpert regulator, which also had to confront several issues not clearly addressed by the government at privatization. These all favoured an opportunistic behaviour of the licensee. Structural design problems related to the agency financing, the incompatibilities between the staff and their duties, the office's discretionary power and political pressures help to explain its ineffectiveness, a fact confirmed by several agency rules most frequently in conflict with customers' interests. Contract renegotiations turned an initial access problem into an affordability one. The joint response of the regulator and the licensee designing a social tariff programme aimed at easing the burden of user tariffs on poorer households, despite its relevance, appeared to be insufficient. A simple estimation of a customer subsidy that followed most usual economic criteria indicated that the social tariff programme reached only about one-tenth of potential targeted beneficiaries, an outcome that resulted from a combination of both insufficient funding and an increasingly poorer user base. This clearly went against the declared objective in the privatization process of achieving universal service by the end of the concession period.

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