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PRIVATISATION AND RENATIONALISATION: WHAT WENT WRONG IN BOLIVIA'S WATER SECTOR?[1]

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ABSTRACT

This paper investigates the concentration of access to safe water across income levels in Bolivia. In particular, it focuses on how privatisation has changed coverage, affordability and the concentration of access to water on the part of the poor. We compare the performance of cities in which the service was privatised (La Paz and El Alto) with a city in which it is managed as a cooperative (Santa Cruz de la Sierra) and one where the service is publicly provided (Cochabamba). We examine the pre- and post-privatisation periods. Close inspection of the household surveys reveals that access to water by low-income consumers increased in the periods when the service was provided under private concessions. Coverage has expanded significantly in the bottom quintiles of the population in the cities where water was privatised, and thus access to water is more equitable. The state, however, renationalised the water utility. What went wrong, then, in Bolivia's water sector? The answer is that the private concessionaire failed to meet the targets stipulated in the concession contract. The tariff increases required for full cost recovery eventually led to public outrage that forced the government to terminate the contract.

JEL Classification: L95, L33, L43, I39.

Keywords: access to water, poverty, privatisation, utility regulation.

1 INTRODUCTION

According to the *Human Development Report 2006* by the United Nations Development Programme (UNDP), over 1 billion people in the world live in extreme water deprivation. The report also stated that "not having access to water and sanitation is a polite euphemism for a form of deprivation that threatens life, destroys opportunity and undermines human dignity" (UNDP, 2006: 5). International concerns about access to water have long been acknowledged. One of the Millennium Development Goals (MDGs) is to halve the proportion of people without access to safe drinking water by 2015.[2]

Access to water is a right in itself and also contributes to the achievement of the seven other MDGs. It reduces child mortality and combats disease. It empowers women by freeing them from the burden and dangers of carrying water, and it brings about higher schooling rates: children often skip classes because of illness or because they are helping their mothers to fetch water. In rural areas, moreover, access to water can help eradicate hunger by improving crop irrigation.

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Safe access to water is defined as "the availability of at least 20 litres per person per day from an improved source within 1 kilometre of the user's dwelling" (WHO and UNICEF, 1990). This is the minimum required for drinking and hygiene. When bathing and laundry are included, the consumption threshold reaches 50 litres a day.

Not only is quantity of water consumption important; so too is the distance from the water source. It is women and children who are mostly hurt by the long distances travelled and the heavy weight of water (Costa et al., 2009). For instance, a household with five members, living strictly on the water poverty line and 1 kilometre from the water source, requires 100 litres to be carried daily. The several trips involved and the hours consumed in this hard physical work often force households to consume below the water poverty line. Additionally, this places constraints on the amount of time that adults can dedicate to income-generating activities. Consequently, the vicious circle of disease, poor education and low human development remains unbroken.

From a human development perspective, having access to improved water sources is the most favourable objective. "Improved" means water in enough quantity, of reasonable quality and as close to the dwelling as possible. Piped water, through in-house connections, is the sort of access that best fulfils the improved water requirements. The quality of the water from a utility provider is the most reliable, and the per unit price from utility companies is cheaper than that from alternative sources (UNDP, 2006; Israel, 2007; Komives, 1999). For the water utility, the marginal cost of delivering water to an additional (already connected) household is minimal. Usually, where a water grid exists, the greatest barrier for the poor is the connection fee.

Water privatisation has been a polemical topic in Latin America, leading to a series of political debates, protests and even riots.[3] This paper aims to contribute to the growing literature by evaluating the performance of the water sector under private concession in Bolivia. We chose Bolivia because of the early termination of privatisation contracts and the renationalisation of the water sector in the cities of La Paz and El Alto. In other large Bolivian cities, water utilities operate differently: as a cooperative in Santa Cruz, and by means of public provision in Cochabamba.

The research in this paper is guided by three questions. Did privatisation increase access to safe water for the poor in Bolivia? How affordable was water during the period of privatisation? And why were the private contracts terminated early?

Close inspection of the household surveys reveals that, under private concessions, low-income consumers' access to water increased. Coverage has significantly expanded, particularly for the bottom quintiles of the population. We certainly see an improvement in equitable access to water. These findings suggest a successful privatisation. But there is more to the story. When the concession contracts were drafted, the government and the private company agreed on targets for wider coverage. The targets were to install 71,752 new water connections in La Paz and El Alto by December 2001, with 25 per cent of the target being reached annually. This goal entailed universal coverage in La Paz and 82 per cent coverage in El Alto.

The private company successfully increased coverage in the poorest areas, mainly because high-income areas already had high coverage rates. It made sense to expand services in the poorest areas in order to meet the targets set in the contract. But the company failed to meet the targets. The limits of cost recovery had been reached. Those who could afford the tariffs and connection fees had already been covered, and there was no longer an opportunity

to exploit further provision on a cost-recovery basis. When the company pushed against the limits, the result was public outrage. Eventually, failure to meet the legally binding targets and public anger prompted the government to terminate the contract and renationalise the utilities.

The rest of this paper is structured as follows. Section 2 introduces the general debate on water sector privatisation and discusses water pricing. It also describes the water sector in Bolivia. Section 3 outlines the methodology and data used in the empirical analysis. The results in Section 4 are split into three parts: analysis of coverage expansion along the income distribution curve; the concentration of access to water; and trends in water expenditure after privatisation. The renationalisation of the Bolivian water sector is discussed in the concluding remarks of Section 5.

2 WATER SECTOR PRIVATISATION: THE DEBATE

Private participation in the provision of basic utilities can take several forms (Table 1). In the water sector, the most popular form consists of concession contracts. Governments maintain ownership of the infrastructure and, through a public bidding process, transfer to the private sector the responsibility for management, service provision and investment during a concession period. When the contracts expire, the responsibilities of provision return to the public sector, ideally with improved management and infrastructure.

TABLE 1

Forms of Private Participation in the Water Sector

Form of contract	Term length	Private companies' responsibility[b]	Asset ownership	Investment duty
Service	1-2 years	SS	public	public
Management	3-5 years	M,O	public	public
Build-Operate-Transfer (BOT)	by product[a]	SC	public	private
Build-Operate-Own (BOO)	by product[a]	SC	private	private
Lease	10-20 years	M, O	public	public
Concession	20-30 years	M, O, I	public	private
Partial divestiture	unlimited	M, I, R	mixed	mixed
Full divestiture	unlimited	M, O, I, R	private	private

Source: Prepared by the authors.

Notes: [a] The contract does not follow a specific deadline but instead is completed upon the successful delivery of the product. [b] SS: specific service; M: maintenance; O: operations; SC: infrastructure-specific construction; I: investment; R: revenue collection.

Private participation in the water sector involves risks and uncertainties. Exceeding the expected costs poses construction risks; uncertainty about demand raises commercial risks; high interest rates and exchange-rate volatility generate financial risks; an uncertain regulatory environment creates regulatory risks; and, finally, political instability and asset expropriation are political risks (see Bayliss, 2009). Risks and uncertainties increase the cost of capital in poor developing countries relative to rich ones. Advocates of privatisation thus argue that, to achieve the desired rates of return, the private sector requires higher average tariffs in order to participate in the market (Estache, 2006).[4] Nevertheless, if the public sector operated well in the pre-privatisation period, few structural adjustments are needed and the transaction costs

and risks are minimised. Transparency before the concession is also said to lessen expectations and risks, and it helps win political support and the confidence of final consumers. But the rule of thumb should be this: given the aforementioned risks, there is no need for privatisation if the utility is operating well.

As Estache (2006) observes, Latin America's experience has shown that building support, as opposed to simply reforming by decree, is crucial to the effectiveness of reforms: without popular support, privatisation might lead to conflict. Protests against water privatisation had already happened in Cochabamba, Bolivia, in 2000; they led to Uruguay's Water Referendum and Constitutional amendment in 2004; and they were evident during the World Social Forum in Caracas in 2006.

Regulation has been advocated as a necessary bargaining process that strikes a "balance between providing private companies with the incentives to invest and operate efficiently, and protecting the interests of other social and economic actors" (Rees, 1998: 8). A strong regulator is seen as desirable to reduce the risks for private investors, as well as to protect consumers' interests as regards the concession commitments on coverage expansion, investment targets and price levels. Sound regulation also makes the concession bid more competitive by attracting more private bidders.

Supporters of privatisation argue that private sector participation improves water provision because it brings large investments in maintenance, network expansion and excellence in delivery. Managerial efficiency stems from higher rates of bill collection, a smaller number of personnel and lower rates of unaccounted-for-water (the water lost between production and delivery). Those who advocate privatisation regard the public sector as naturally inefficient: (i) utility monopolies ignore competitive market incentives; (ii) public companies are subject to short-run political interventions; and (iii) they are accountable to their own (government) interests rather than to final consumers, who are left with few channels to voice their demands. Moreover, supporters believe that if investments target low-income and undersupplied areas, privatisation will foster development and have a positive distributional impact (Kikeri and Nellis, 2004).

There is scepticism, however, about whether profit-oriented concessionaires really invest in expanding coverage. Apart from operational efficiency, there is no reason to believe that private monopolies will serve users better than public monopolies. In fact, the contrary may be true if regulation is not enforced—which is the case in most developing countries. When they face inelastic demand, private monopolies have more incentives than a public monopoly (with a social planner) to undersupply, increase prices, underinvest and provide poor quality services.

Sceptics argue that because of a lack of market incentives, concessionaires will not expand the water grid to low-income areas (Bayliss and Kessler, 2006). Serving the poor is hardly profitable for the utility: the high rate of illegal connections and the low purchasing power of households in slum neighbourhoods hinder cost recovery and discourage private investment. Companies therefore tend to withdraw from non-profitable geographical markets. Moreover, governments might perform poorly in their new role as regulators, particularly if privatisation is a novel experience. For instance, the enforcement mechanisms might not be sufficient to make the private utility comply with contractual obligations. Additionally, private companies might capture the regulatory agency, thereby preventing governments from fulfilling their regulatory role.

Another possible negative effect of privatisation concerns inequality. Reducing companies' staff entails job cuts, which mostly affect the poor and the middle classes (Birdsall and Nellis, 2003). In addition, privatised utilities often remove "illegal connections" and force poor households off "free" piped supply. The search for profits requires full cost recovery; this tends to increase water tariffs, affecting the poor harshly and directly (Dagdeviren and Hailu, 2008).

2.1 WATER PRICING AND THE POOR

There are three main reasons why poor households lack access to piped water: the network utility does not reach their neighbourhood;[5] they cannot afford the initial investment in the network connection; or they do not have enough monthly income pay for the services.

Poor households without access or a connection to the water grid have to rely on alternative sources of water such as pipe trucks, private wells, kiosks and bottled water. Paradoxically, the private alternative market overcharges. Its per unit price of water is five to ten times higher than the price charged to households provided with in-house piped water (UNDP, 2006; Israel, 2007). For the poor, water bills can easily surpass the affordability threshold of 3 per cent of their total income.

The water supply chain in the private alternative market has several stages: collecting water at the source (usually a tap connected to the utility network); filling bottles or containers; and distributing water to a vendor or "reseller". This will eventually bring water to final consumers in the suburbs and slums, using pipe trucks, donkey-drawn carts or even bicycles. The quality of the water, of course, is not guaranteed.

There are various ways of offering safe water connections to poor households. Progressive block tariffs can be set according to geographical regions, consumer category, or quantity consumed. Individual consumers pay according to their own characteristics, in contrast to the flat rate, whereby all users face the same tariff. In a geographical block tariff scheme, households in rich areas subsidise the consumption of those in poorer neighbourhoods. High-income consumers pay tariffs that are higher than the cost of providing water, while their low-income counterparts pay less than the cost.[6] Another method is the consumer category scheme, which differentiates tariff blocks between household consumers, industrial consumers and others. The quantity scheme sets progressive tariffs according to the volume of water consumed (Whittington, 1992).

Progressive block tariffs are only efficient if the poor households are in fact connected to the utility network. If they are not, such tariffs can harm the poor even further. Vendors usually resell tapped water collected from the utility network. In a quantity block scheme, vendors take large amounts of water from the utility to store and resell. The poor who re-buy this water end up paying the higher block tariffs. The high initial cost of water is passed on directly to the poor, together with the value added in the supply chain between the water source and the final consumer. Hence the price of water in the utility determines the benchmark prices for vendors and has a significant impact on poor households, even if they are not connected to the utility network.

Another issue is the sustainability of cost recovery. The poor are harmed by full cost-recovery schemes, particularly as regards connection fees or higher tariffs, and thus universal access to water is hampered. Full cost recovery compromises the expansion of network provision to low-income areas. Often, insufficient demand among low-income groups

will not cover the fixed costs. Providing water only to households that can afford it is unprofitable for firms, and thus low-income neighbourhood tends to be unsupplied (Brown, 2009). If the water utility is not obliged to expand the water grid, or if legal enforcement fails, poor households will remain excluded from access to piped water.[7]

Lower tariffs from greater operational efficiency in utilities are unlikely to benefit the poor. There is little evidence of lower water prices after privatisation. Obligations to shareholders and the taste for profit make it difficult to reduce tariffs. Often, governments increase prices before privatisation in order to make the utilities more attractive to the private sector. A way of trying to minimise tariffs to final consumers is to use a low-tariff bid scheme in the tender for the utility. The concession is granted to the company willing to provide the services at the lowest cost.

2.2 THE WATER SECTOR IN BOLIVIA: PRIVATISATION AND RENATIONALISATION

During the 1990s, with the support of the World Bank and foreign donors, privatisation was regarded as a convenient solution in contexts of deteriorated infrastructure and unbalanced public finances. Privatisation of the water sector was attempted in La Paz, El Alto and Cochabamba, three large Bolivian cities.[8] The first private sector participation contract in the water sector was signed in 1997. The world's largest water consortium, Lyonnaise des Eaux, won the concession for water and sewerage provision in La Paz and El Alto through the company Aguas del Illimani (AISA). According to the concession contract, ownership of the assets remained public. The form of private participation was a concession contract for 30 years.[9] The concession bid was based on the highest number of new connections to be installed.

La Paz, the country's capital, and its rapidly growing neighbour El Alto, comprise the largest metropolitan centre in Bolivia, with over 1.4 million people. The wealthiest households are in the valley region of southern La Paz, while lower-income households are in El Alto and on the *laderas* (steep slopes) of La Paz. The landscape, as well as residential segregation by income, determine the provision of basic utilities. Poor neighbourhoods, often located on hills or close to other geographical barriers, are harder to reach, and thus the costs of installation and maintenance are higher.

The private concession contract in La Paz and El Alto stipulated that in-house connection was the only accepted type of water provision. The concessionaire was not obliged to provide water by alternative means, such as community standpipes, pipe trucks and so on. In fact, the concessionaire was required to close all public taps while installing metered piped water. The government tried to maximise network expansion to the lower-income areas of La Paz and El Alto, as stipulated in the concession agreement. The contract included expansion targets for every five years (expansion mandates), which were monitored at the end of each period. The Bolivian regulator was responsible for monitoring the targets, allowing tariff revisions and setting the maximum connection fees at the end of each five years (Komives and Cowen, 1999).[10]

In 2005, public discontent led to the termination of the concession contract. The water (and sewerage) utility was renationalised and Aguas del Illimani was replaced by Empresa Pública Social de Agua y Saneamiento (EPSAS), a municipal public provider. The expansion requirements placed on the private company involved targets such as absolute number of connections, overall percentage coverage, and coverage according to neighbourhood criteria

(for instance, demographic density). The targets stipulated in the contract for the period 1997–2001 included installing 71,752 new water connections in La Paz and El Alto by December 2001. This would have entailed 100 per cent water coverage in La Paz and 82 per cent coverage in El Alto (where 50 per cent should have been new connections).[11] The underperformance of the private utilities and the failure to fully reach the targets, together with public outrage about water tariffs, led to the early termination of the contract. Water concession contracts have been cancelled early in other countries. Table 2 gives examples of renationalisation in Latin America.

TABLE 2

Private Water Concessions Prematurely Renationalised in Latin America

Country	City	Concession date	Contract length	End date
Argentina	Buenos Aires	1993	30 years	2005
Argentina	Santa Fe	1998	30 years	2006
Argentina	Tucuman	1995	30 years	1998
Bolivia	La Paz and El Alto	1997	30 years	2005
Bolivia	Cochabamba	1999	40 years	2000
Uruguay	Maldonado	2000	-	2004
Uruguay	Maldonado*	1993	-	2004

Source: Prepared by the authors.

Note: * Balneario de Manantiales.

What happened regarding water provision in other cities, where utilities were not privatised? Santa Cruz de la Sierra is Bolivia's largest city, with 1,196,100 inhabitants. Its water utility was run as a consumer cooperative throughout the period. The water company's institutional structure consists of a general delegate assembly, a management board and a supervisory board. The latter body has veto power over the management board. The cooperative has a good reputation for transparency and efficiency in service delivery (World Bank, 2002).

We also analyse Cochabamba, Bolivia's third largest city, which has a population of 834,900. Its water sector was privatised in 1999 but the concession contract was cancelled after less than a year in the face of riots, known as the Water War, against high tariffs (an average 35 per cent increase) and poor service.[12] Water provision returned to Cochabamba's municipal water company in 2000 and prices were lowered.

3 METHODS AND DATA

To gauge the performance of the various forms of water provision, we analyse access to water from three perspectives: delivery (coverage rate), equity (concentration), and affordability (expenditure). We use data from national household surveys (see Table 3) carried out by Bolivia's Instituto Nacional de Estadística (INE). Water provision was privatised in 1997 and there are two periods of interest in our analysis: before and after the reform. To investigate whether changes in delivery were more than proportional in cities that adopted private provision, we compare La Paz and El Alto to Santa Cruz de la Sierra (where the water utility was never privatised) and to Cochabamba (where provision has been public except for a brief period of less than a year when it was under private concession). We chose those cities

because, in many respects, Santa Cruz and Cochabamba are closer to La Paz and El Alto than any other Bolivian cities for which there are available data (see Table 4).

TABLE 3

Data Sources

Dataset	Year	Non-weighted total household sample size	Household sample size by city			
			La Paz	El Alto	Cocha-bamba	Santa Cruz
Encuesta Integrada de Hogares	1992	3,169	855	652	664	998
Encuesta Nacional de Empleo I	1996	2,138	611	316	515	696
Encuesta Continua de Hogares	2001	1,197	579	56	225	337
Encuesta Continua de Hogares	2005	807	214	197	174	222

Source: Datasets from INE Bolivia.

TABLE 4

Average Household Characteristics before Privatisation (1996)

	Cochabamba and Santa Cruz	La Paz and El Alto
Number of rooms in the dwelling	2.77	2.61
Hard material walls	0.95	1.00
Electricity provision	0.97	0.96
Household per capita income*	488.65	478.63
Household per capita income (20% poorest)*	99.13	90.72

Source: Authors' calculations based on INE.

Note: * Bolivian pesos.

Herein, "having access to water" is defined as access to piped water for drinking, cooking and hygiene purposes through a connection in-house or on the property's land. Since the scope of this study is water utility privatisation and, thus, access to piped water, alternative sources (such as public taps, private boreholes, wells, rivers, lakes) were not considered as proper access to water. Neither was consideration given to water sources located outside the household's property, since this is an inferior form of access that does complies neither with the proximity requirement nor with the contractual agreements for private provision.

3.1 DELIVERY

Water delivery is measured by the total coverage rate and by income quintiles of the population. This is the most fundamental performance indicator and is easily calculated from most household surveys that have information on the characteristics of dwellings. The quintiles are calculated by ranking individuals according to per capita household income, in such a way that all five quintiles have 20 per cent of each city's population.

Since point estimates calculated from survey data are subject to sampling errors, we used a Welch t-test to evaluate the statistical significance of the changes in coverage rates over time. Because of poor documentation it was not possible to incorporate the sample design, and the test was conducted as though the data had come from a random sample.

We also analyse the change in the coverage rate taking initial conditions into account—that is, the fact that the cities initially had different levels of coverage. This is better understood by considering a hypothetical scenario. Imagine two cities, A and B, that have roughly similar landscapes and urbanisation patterns. In city A, 50 per cent of the population has access to the water grid; in city B, 95 per cent has such access. In city B, the unsupplied population lives in slums situated on hills where the subsurface is solid rock. After some years, coverage in city A has increased to 75 per cent and in city B to 98 per cent. Considering the absolute or relative advance in coverage rates, city A would be judged a better performer than city B. However, although the water utility in city A required a higher overall investment to increase the coverage rate, the per capita cost of the expansion was much smaller than in city B, where many obstacles had to be overcome in order to deliver water to a hard-to-reach neighbourhood. In this sense, the water utility in city B was the better performer because it put more effort into network expansion.

Hence a measure of performance that accounts for initial coverage rates would enable a better comparison of the performance of the water utilities of each city. Kakwani (1993) proposed a performance indicator that takes account of the initial coverage rate and allows the degree of effort appreciation to be specified. This indicator is based on what he called an "achievement function", which is a non-linear transformation of the original indicators. Kakwani's performance indicator is calculated as follows:

$$A = \begin{cases} \dfrac{(W - x_1)^{1-\varepsilon} - (W - x_2)^{1-\varepsilon}}{(W - W_0)^{1-\varepsilon}}, \forall\ 0 < \varepsilon < 1 \\ \\ \dfrac{\ln(W - x_1) - \ln(W - x_2)}{\ln(W - W_0)}, \forall\ \varepsilon = 1 \end{cases}$$

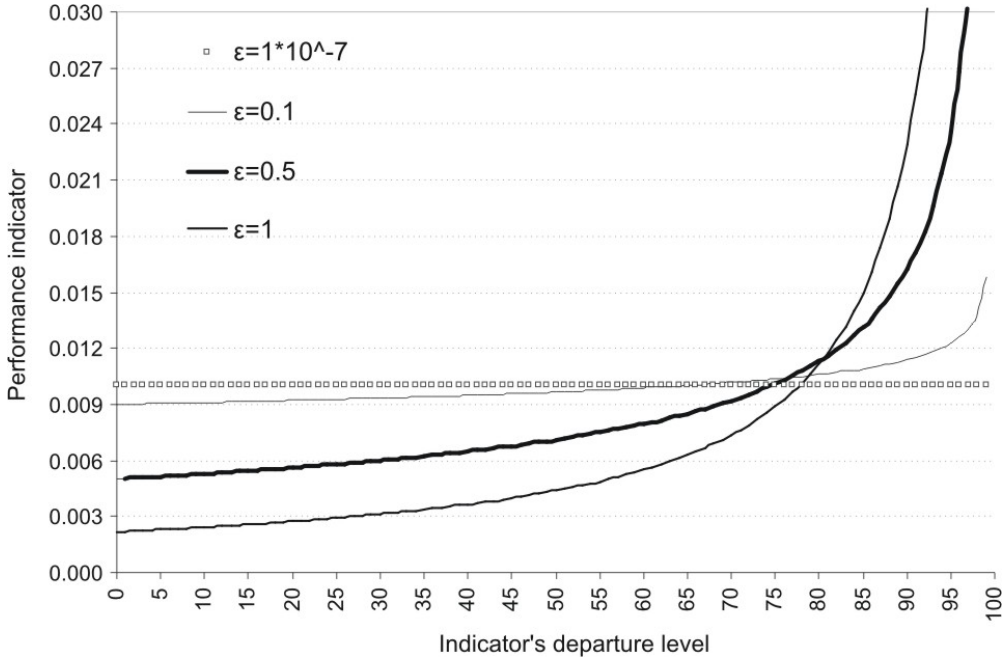
where *W0* and *W* are the lower and upper bounds of the original indicators; *x1* is the departure level of the indicator; *x2* is the final level; and ε is the parameter that sets the degree of effort appreciation. An interesting and handy property of the performance indicator is that it is additively decomposable, allowing the calculation of the performance by period, simply by dividing its value by the number of periods between each observation. As lower and upper bounds, we used the logical limits of the coverage rate, zero and 100 per cent.

Parameter ε is similar to the parameter of inequality aversion in Atkinson's social welfare function (Atkinson, 1970). The choice of values for it is arbitrary, and for that reason we use different degrees of effort appreciation in the analysis: 0.1, 0.5 and 1. When ε approaches zero, the performance indicator gives more importance to the absolute change than to the departure level. When ε values increase, more weight is attached to the departure level.

Figure 1 shows the behaviour of the performance indicator for different degrees of effort appreciation and for 1 percentage-point changes from the departure levels 0, 1, 2, 3, … 99. Considering our previous example, with a low degree of effort appreciation, 0.1, the performance indicator of city A was 0.25 and that of city B was 0.04; for a high degree of effort appreciation, 1, the performance of city A was 0.15 and that of city B was 0.20.

FIGURE 1

Behaviour of the Performance Indicator for Distinct Degrees of Effort Appreciation



Source: Prepared by the authors.

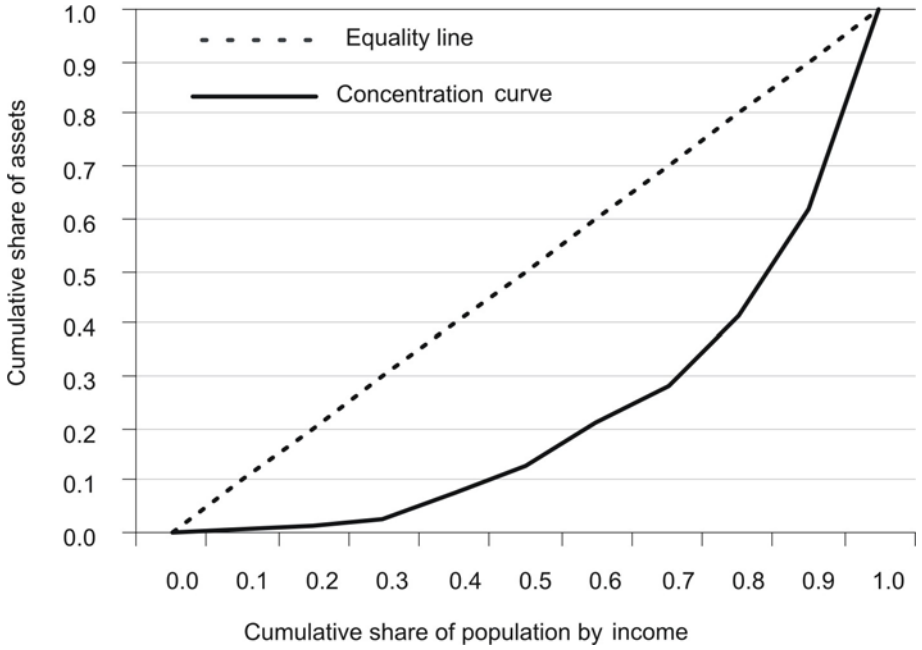
3.2 EQUITY

As far as equity is concerned, access to water refers to providing all households with the same level of utilities despite their income status. A social planner could perform distribution either by transferring assets from rich to poor households or by increasing provision to the poor more than proportionally (a pro-poor approach). The second approach seems more reasonable in the case of utility infrastructure. Equity is measured both by concentration curves and by concentration indices. A concentration curve graphs the cumulative share of population by the cumulative share of total assets (in this case, access to water) in a given community. A 45-degree line starting from the origin depicts a perfectly equal society, wherein the proportion of individuals holds equal proportion of access. The overall distance between the concentration curve and the equality line measures the level of inequality in the society. The greater this distance, the higher the inequality in access to water.

The concentration index assumes a value of zero when there is no inequality and a value of one when a single individual holds all the assets in the society: perfect inequality. The coefficient is usually positive; the more positive the coefficient, the higher the concentration towards rich households. As depicted in Figure 2, the concentration index is a ratio of the area between the 45-degree line and the concentration curve to the total area of the triangle below the 45-degree line. In other words, it is twice the area between the equality line and the concentration curve. In a few cases, the concentration curve lies above the 45-degree line and the coefficient assumes negative values. This occurs when poor individuals have proportionally greater access to the asset than richer individuals.

FIGURE 2

Standard Concentration Curve



3.3 AFFORDABILITY

Finally, affordability is assessed through households' per capita monthly expenditure. If households spend more than 3 per cent of their per capita income on water, then water is considered non-affordable to them. Data on expenditure is available for 1992, 2001 and 2005. A before/after privatisation comparison is not possible because of the lack of data for 1996. Hence households' expenditure on water is analysed in the four cities at two points in time: four and eight years after the concession in La Paz and El Alto.[13]

Household surveys usually lack information on the quantity of water consumed. In Bolivia, the household survey questionnaires ask households what monetary amount they spent on water in the month before the interview, but not the volume consumed. Given the complex block tariff structures in every city, it is not possible to reconstruct the amount of water consumed from the expenditure reported in the surveys. It is also recognised that expenditure analysis cannot fully capture the welfare impact on the poor (demand curves are required for this purpose). Nonetheless, we can reveal the direction and magnitudes of welfare changes by analysing expenditure data. See Foster et al. (2004) for a similar approach.

3.4 FURTHER ANALYSIS: ECONOMETRIC APPROACH

We use a probit regression model to further investigate the relationship between the expanded access to piped water and privatisation of the water utility. In a difference-in-difference (DID) approach, and controlling for households' living standards and city-specific characteristics, we compare two groups: households in cities were the utility was privatised, and households in the other cities. The data reflect two points in time, before and after privatisation, and models are run for the years 1996 and 2001, as well as 1996 and 2005.[14]

A DID approach captures the difference in the tendency of outcomes, having controlled for fixed effects. Two groups are said to be initially similar and they differ in the second period only because one group has experienced a policy shock. In our study, the water utility privatisation is the policy shock. In an ideal experiment, the group of households in the city where the utility was not privatised would represent a counterfactual to the group in the city were privatisation took place: how would the group in the latter city perform if it had not been subjected to the policy shock? The first difference in this double difference method refers to the difference in the outcomes between the two groups before and after the policy shock. The second difference is the one between these two first differences, and it highlights the true difference between the groups that can be attributed to the policy intervention. The difference-in-difference estimation is given by:

$$\delta = (\overline{w}ater_{a,p} - \overline{w}ater_{a,np}) - (\overline{w}ater_{b,p} - \overline{w}ater_{b,np}) \quad (1)$$

where *water* refers to access to piped water, the time subscripts refer to *b* (before) or *a* (after) privatisation, and the policy shock *p* (privatised) or *np* (non-privatised), respectively.

Finding a perfect counterfactual to conduct an impact analysis is usually tricky. In the case of cities it is even harder because there are no two places with entirely similar demographic characteristics and economic dynamics. It is simply not possible to observe what would have been the state of a city in which privatisation took place if it had not been privatised. We are aware of another caveat in selecting the cities to be analysed: since privatisation is not a casual event, the comparison cities were not randomly chosen and are not expected to have identical characteristics, though they are the most similar cities available in terms of demographic dimension and household characteristics (see Table 4). Hence we note the need for caution concerning the econometric results in any effort to infer a causal relationship between the expansion of water access and the utility reform.

Our model tests whether there is a more than proportional variation in access to water for the group of households in cities where water was privatised relative to their counterparts in cities where there was no reform. This would be indicated by a positive coefficient for *effect,* $\delta > 0$, in the reduced form the equation is estimated as:

$$water = \beta_0 + \beta_1 wealth + \beta_2 dcity + \beta_3 post + \beta_4 privatised + \delta effect + \mu \quad (2)$$

where *water* is a dummy for household access to piped water; *post* is a year dummy assuming a value of one for the period after privatisation, and *privatised* is a dummy indicating the privatised cities of La Paz and El Alto. *Wealth* is a vector of household characteristics to control for the wealth (electricity provision, number of rooms in the dwelling, and wall material). The choice of only these three variables to capture living standards is based on the limited compatibility of survey questionnaires as regards the characteristics of dwellings across the four years. One limitation is that other household characteristics may not be captured in this simple model. We include dummy variables for each city, the vector *dcity*, in order to capture place-specific characteristics and to minimise the effects of the lack of other household characteristics.[15]

Our parameter of interest is δ, where effect is built from the interaction term between post and privatised. Effect captures the relationship between privatisation and access to piped water, having controlled for the influence of other characteristics aside from the reform.

4 RESULTS

4.1 DELIVERING WATER

Descriptive statistics on water coverage rates just before privatisation allow us to identify two pairs of cities: in El Alto and Cochabamba, access was as low as 76 per cent; La Paz and Santa Cruz had better coverage rates. Delivery was especially deficient among the poor. Only 55.6 per cent and 63.3 per cent of households in the lowest quintile in El Alto and Cochabamba, respectively, had access to water in 1996. The lowest quintile in La Paz also had poorer access than the lowest in Santa Cruz. The post-privatisation period is characterised by an expansion of access to piped water for all quintiles in both La Paz and El Alto, benefiting the poor in particular. In 1996, the coverage rate difference between the poorest 20 per cent and the richest 20 per cent was about 30 percentage points in El Alto (Table 5). In 2005 this difference was reduced to about 5 percentage points, similar to the gap in La Paz (see next subsection for the concentration analysis).

TABLE 5

Water Coverage Rate: Lower and Upper Quintiles

	1996			2001			2005		
	Total	QI	QV	Total	QI	QV	Total	QI	QV
La Paz	87.9	83.4	97.9	88.6	79.2	98.2	96.6	96.2	100.0
El Alto	76.2	55.6	85.6	69.4	78.1	87.4	87.8	86.0	90.8
Cochabamba	76.5	63.3	84.7	78.6	58.5	93.1	61.8	25.9	74.2
Santa Cruz	95.5	90.2	98.6	95.8	92.2	100.0	95.6	90.1	100.0

Source: authors' calculations based on INE.

In the cities were water provision was not privatised, overall access to water remained constant over the period. Access to water was already higher in 1996, but it did not improve significantly. In Santa Cruz the estimated changes were not statistically significant, except for an increase of 2 percentage points in the upper quintile, taking the rich towards universal access.

Table 6 shows the expansion of access to water in the four cities by population quintile during the privatisation period (see Appendix for detailed data). There was a significant expansion of water coverage in the cities where privatisation took place, especially in the lowest quintiles of El Alto. Additionally, the poor benefited proportionally more than rich households, as shown by the magnitude of the coefficients. For the lowest quintile in El Alto, coverage increased by about 30 percentage points, and thus access to piped water rose from about 55 per cent to 86 per cent of households in that city. In La Paz, the 13 percentage-point expansion in the lowest quintile increased the coverage rate from 83 per cent to almost universal access among the poorest. The delivery analysis indicates that access to water increased under the private concession, while the increases were non-significant in the cities where there was no privatisation. In Cochabamba, in fact, access to water deteriorated sharply.

The expansion of access to water was greater in the areas of El Alto that initially had less provision, and efforts at expansion significantly targeted the lower quintiles. This result perhaps brings us to the achievement problem described by Kakwani (1993). It is likely that it would be easier to increase access in El Alto, given its low initial level, than to increase it in La

Paz or Santa Cruz. Table 7 analyses the expansion of access to water in the lowest quintile, showing Kakwani's Achievement Index (AI) at different levels of effort appreciation, ε.

TABLE 6

Percentage Change in Water Coverage Rate (1996–2005)

Quintile	La Paz	El Alto	Cochabamba	Santa Cruz
1	0.128 **	0.303 **	-0.374 **	0.000
2	0.168 **	0.104 **	-0.466 **	-0.007
3	0.051 **	0.111 **	-0.078 **	0.000
4	0.067 **	0.008	-0.017	-0.001
5	0.021 **	0.052 **	-0.105 **	0.012 **

Note: ** Welch t test, significant at 5 per cent level.

TABLE 7

Coverage Rate Variation and Achievement Index in the Lowest Quintile

Year/city	Initial coverage	Change (X_2-X_1)	% change	Achievement Index ε=0.1	ε=0.5	ε=1
1992–1996						
La Paz	61.1	22.3	36.5	0.057	0.054	0.046
El Alto	53.4	2.2	4.2	0.005	0.004	0.003
Cochabamba	58.2	5.1	8.7	0.013	0.010	0.007
Santa Cruz	74.3	15.9	21.4	0.043	0.048	0.052
1996–2001						
La Paz	83.4	-4.3	-5.1	-0.009	-0.010	-0.010
El Alto	55.7	22.4	40.3	0.045	0.040	0.031
Cochabamba	63.3	-4.8	-7.6	-0.009	-0.008	-0.005
Santa Cruz	90.2	2	2.3	0.005	0.007	0.010
2001–2005						
La Paz	79.2	17.1	21.6	0.048	0.065	0.093
El Alto	78.1	7.9	10.1	0.021	0.023	0.024
Cochabamba	58.5	-32.6	-55.8	-0.078	-0.054	-0.031
Santa Cruz	92.2	-2.1	-2.25	-0.006	-0.009	-0.013

Source: Authors' calculations based on INE.

Before the reform (1992–1996), water coverage was growing faster in the lowest quintile of La Paz and Santa Cruz. Both the percentage change and the achievement index points to their good performance. While their percentage changes differed, the achievements of the utilities were similar, given the cities' initial water access levels and the efforts required. In El Alto and Cochabamba, on the other hand, improvements in coverage were very slow.

In the first period of privatisation (1996–2001), access to water in El Alto increased significantly in the lowest quintile. The coverage rate fell in La Paz and Cochabamba, and increased slightly in Santa Cruz. Note, however, that small changes may stem from statistical fluctuations. In the period 2001–2005, coverage continued to expand in the cities where water had been privatised, while it fell in the other cities. The deterioration in access was most

striking in Cochabamba, mainly because the concession contract ran counter to the interests of the poor and the tariffs became exorbitant (Hailu and Hunt, 2008).

Overall, La Paz (privatised) came close to universal access, as did Santa Cruz (non-privatised). El Alto (privatised) was better off than Cochabamba, even though they had started at the same initial level of coverage (see Table 5). These findings indicate that access to piped water improved in the period of privatisation.

An interesting question remains: what would be the rates of water coverage in the "non-privatised" cities if they had performed in the same way as the "privatised" cities (and vice versa)? The exercise below estimates two counterfactual scenarios in which the performances of La Paz and Santa Cruz are applied to all four cities. Coverage rates by the end of the period are calculated considering the different initial coverage levels, and thus accounting for the degree of "difficulty" in expanding access in each individual city.

TABLE 8

Counterfactual Performance according to Kakwani's Performance Index at Different Effort Intensities

City	Actual coverage by end of the period	Counterfactual 1: Performance of La Paz			Counterfactual 2: Performance of Santa Cruz		
		0.1	0.5	1	0.1	0.5	1
	1996–2001						
La Paz	**88.6**	**88.6**	**88.6**	**88.6**	88.2	88.4	88.7
El Alto	69.4	76.9	77.2	77.5	76.6	76.9	77.8
Cochabamba	78.6	77.2	77.4	77.8	76.8	77.2	78.0
Santa Cruz	**95.8**	96.1	95.9	95.7	**95.8**	**95.8**	**95.8**
	2001–2005						
La Paz	**96.6**	**96.6**	**96.6**	**96.6**	88.3	88.2	88.0
El Alto	87.8	78.6	84.1	91.0	69.2	68.9	67.9
Cochabamba	61.9	87.4	90.5	93.7	78.3	78.1	77.5
Santa Cruz	**95.6**	100.0	99.7	98.8	**95.6**	**95.6**	**95.6**
	1996–2005						
La Paz	**96.6**	**96.6**	**96.6**	**96.6**	88.0	88.0	88.1
El Alto	87.8	85.8	89.6	93.4	76.3	76.4	76.7
Cochabamba	61.9	86.1	89.7	93.5	76.6	76.7	77.0
Santa Cruz	**95.6**	100.0	100.0	98.7	**95.6**	**95.6**	**95.6**

Source: Authors' calculations.

Counterfactual 1 shows all cities performing at the La Paz performance index in each period. Comparing the actual figures (Table 8, second column) with the estimated ones, we observe that in both the second stage (2001–2005) and in the overall period (1996–2005), the cities where water was not privatised—Cochabamba and Santa Cruz—would have achieved higher water coverage rates if they had performed as did La Paz. On the other hand, counterfactual 2 shows that if the "privatised" cities had performed as did "non-privatised" Santa Cruz, coverage rates would have been lower than they actually were by the end of each period. The exception is El Alto in the period 1996–2001, where coverage would have been slightly higher.

4.2 DISTRIBUTING ACCESS TO WATER

Just before privatisation, El Alto and Cochabamba clearly had the most unequal societies in terms of water provision (Table 9). Five years after privatisation, El Alto and La Paz (where provision was privatised) were the most equal cities in terms of water access. Between 1996 and 2005, the concentration indices declined from 0.044 to 0.01 in La Paz, lower than the initial level of concentration in the other "non-privatised" cities. El Alto also moved towards equitable water access. Its negative concentration index shows that, in 2001, the poor had proportionally better access to water than richer households. Moreover, El Alto and La Paz had the same low concentration index in 2005, despite the high and very different indices in 1996.

TABLE 9

Concentration Index

Year	La Paz	El Alto	Cochabamba	Santa Cruz
1992	0.076	0.056	0.078	0.040
1996	0.044	0.077	0.061	0.020
2001	0.040	-0.018	0.095	0.015
2005	0.010	0.011	0.159	0.026

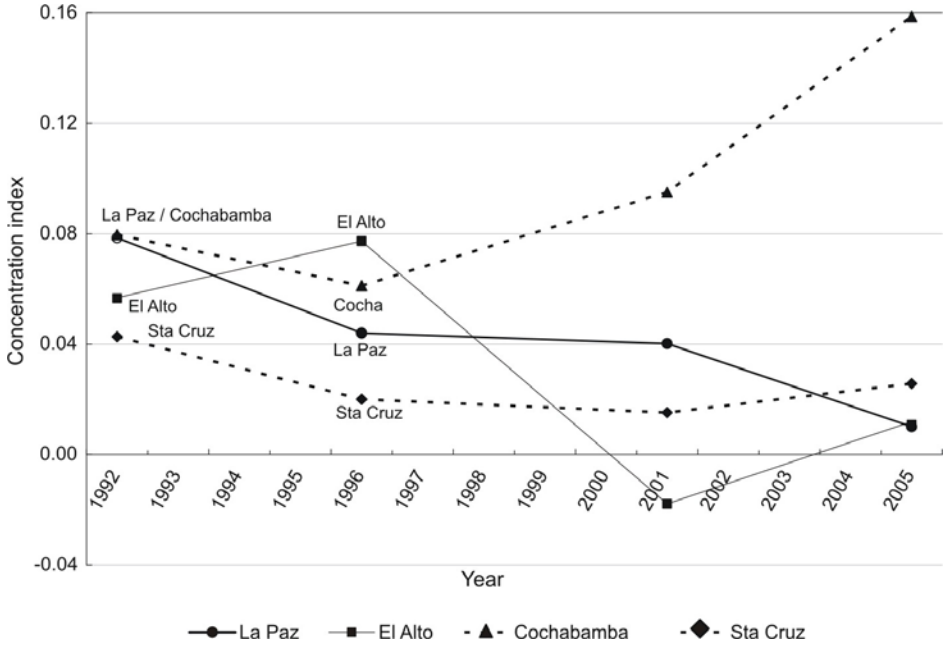
Source: Authors' calculations based on INE.

In the period 1992–1996, before privatisation, there was already a trend towards the deconcentration of water provision in all cities except El Alto. Projecting this trend to future years, one could expect that, *ceteris paribus*, deconcentration would continue, though at decreasing rates. After the reform, however, we observe different deconcentration trends. El Alto underwent sharp deconcentration, while in La Paz and Santa Cruz there was less intense tendency towards deconcentration. The period 1996–2001 was turbulent for Cochabamba, and a steep concentration path is evident from 1996 onwards. Figure 3 shows the concentration tendencies between 1992 and 2005.

After privatisation, La Paz and El Alto converged to a lower level of concentration and eventually had the lowest index among the four cities. It is also interesting to focus on La Paz. Initially the city had the same concentration level as Cochabamba, but it ended up at the opposite extreme. La Paz followed the same pace of deconcentration as Santa Cruz from 1992 to 2001, though later their paths diverged: there was steep deconcentration in La Paz, while in Santa Cruz there was a slight concentration in access to water.

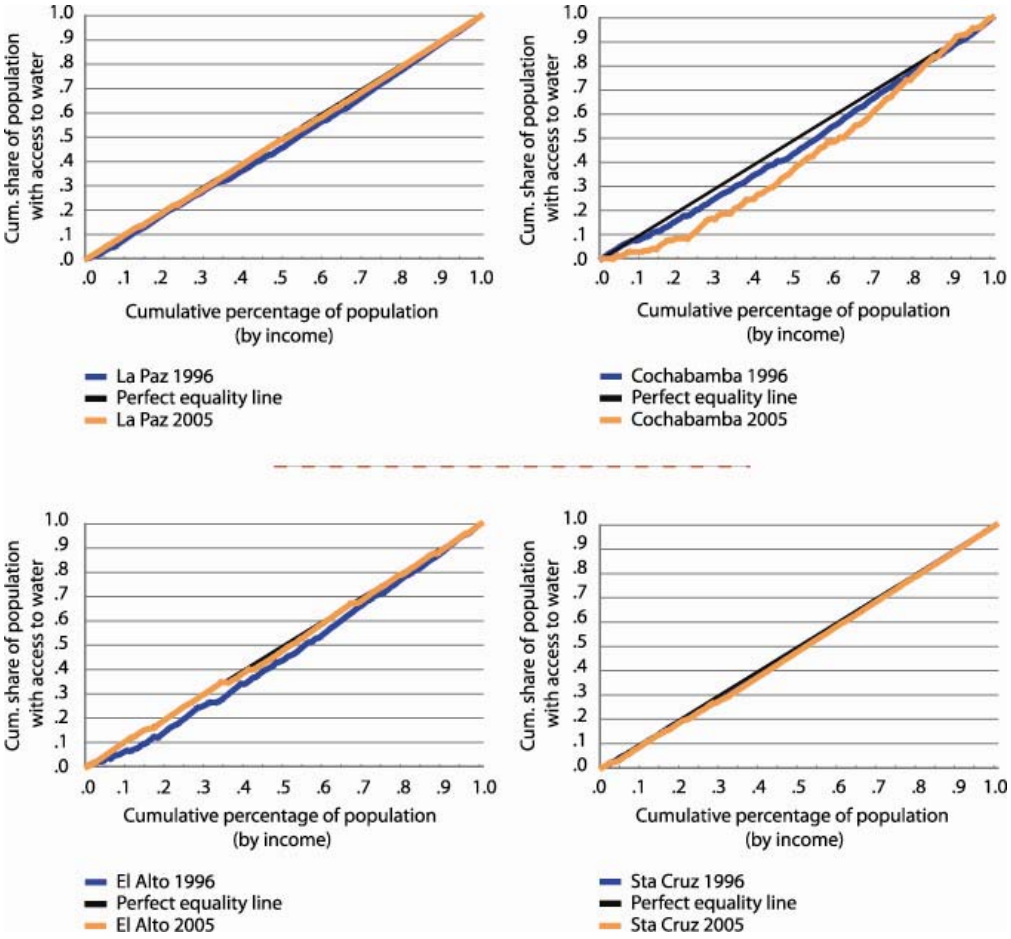
The concentration curves in Figure 4 depict the distribution of access to water in each city. The curves have moved inwards (towards the equality line) across the years in both La Paz and El Alto, denoting a more equal distribution of access to water. Once the curves do not cross each other over time, the interpretation is straightforward: concentration has decreased over time. The lowest quintile (the poorer 20 per cent) of the population in El Alto, which in 1996 had 14.6 per cent of all water connections before privatisation, saw its share increase to 19.5 per cent at the end of the concession period. In a world of perfect equality, the bottom 20 per cent of the population should have 20 per cent of the total water access.

FIGURE 3
Concentration Index: Tendency (1992–2005)



Source: Prepared by the authors on the basis of INE.

FIGURE 4
Evolution of Concentration of Access to Water



Source: Prepared by the authors on the basis of INE.

4.3 AFFORDING WATER

A given level of water expenditure can be achieved through a combination of different price levels and consumption patterns. Thus, if tariffs are set in a block scheme, it is not possible to construe household consumption by reversing the expenditure data.[16] With some caveats, household income is usually used as a proxy for consumption level: households with a higher per capita income are expected on average to have a higher consumption pattern. This includes water consumption. But water expenditure may vary widely across cities because of prices, even though households have similar income and consumption levels. In a temporal analysis, however, assuming that water is an inelastic good, the quantity demanded should remain constant for households with the same income level over the years.[17] If income increases, it is expected that water expenditure will also increase, though less than proportionally given the decreasing marginal utility at high levels of consumption. Thus, if households' water expenditure—within a given city and already connected to the utility—increases more than proportionally to their increase in income, then prices may have risen. It is also true that a sharp increase in prices may force consumption down despite an increase in income (see Yepes, 1999), but one is unlikely to find households reducing their overall water expenditure in such a case: they would reduce consumption while maintaining the same expenditure level.

Table 10 shows that water expenditure has been persistently higher over time in Santa Cruz and Cochabamba among both the richest and poorest households. Though the poorest in Santa Cruz have an average lower income than those in La Paz (US$89.5 against US$101.8 in 2001), the former spent more on water than the latter. The burden of water expenditure seems to fall hardest on the poor households of Santa Cruz, which spent on average 8.8 per cent of their income on water in 2001, and 5.9 per cent in 2005. The poor in La Paz and Cochabamba also bear a high burden, respectively spending an average of 4.7 and 4.6 per cent of their income on water in 2001, higher than the accepted affordability measure of 3 per cent of income.

TABLE 10

Average Per Capita Water Expenditure of Households Connected to the Utility: Lower and Upper Quintiles

		Water expenditure		Y per capita		Share of income (%)		Change in expenditure (%)	Change in Y per capita (%)
		2001	2005*	2001	2005*	2001	2005		
La Paz	QI	2.8	3.4	101.8	127.2	4.7	2.6	23.2	25.0
	QV	12.0	13.6	1621.1	2437.1	0.9	0.7	14.1	50.3
El Alto	QI	1.4	2.6	83.4	104.7	1.9	2.6	79.5	25.5
	QV	2.5	4.8	609.0	833.8	0.5	0.6	93.1	36.9
Cochabamba	QI	4.7	5.3	123.2	129.9	4.6	4.0	12.6	5.4
	QV	22.8	18.7	2215.9	1827.8	1.3	1.5	-18.2	-17.5
Santa Cruz	QI	6.7	9.4	89.3	150.0	8.8	5.9	39.6	68.0
	QV	19.9	23.0	1395.5	2295.3	1.6	1.4	15.5	64.5

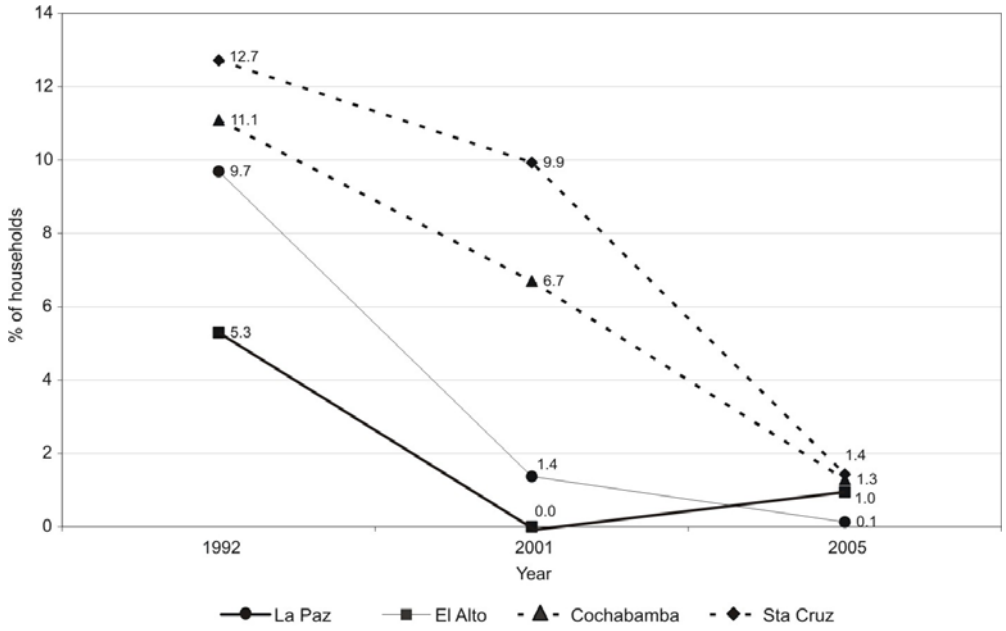
Source: Authors' calculations based on INE. * Deflated to 2001 values.

A cross-period analysis shows that the average share of income spent by the poor on water has declined for all cities except El Alto. In that city, households connected to the utility spent an average of 2.6 per cent of their income on water in 2005, compared to 1.9 per cent in 2001.

Household per capita spending on water in El Alto has grown by an average of about 80 per cent for the poorest, whereas their income has risen by only about 26 per cent. Possible explanations for this are the expansion of metered connections in the region and the improvement in bill collection by the private supplier, which began charging for water that previously was freely available (see Figure 5). It is worth noting that the tariff structure was the same for La Paz and El Alto.

FIGURE 5

Share of Households Connected to the Utility That Did Not Pay for Water



Source: Authors' calculations based on INE.

The most relevant information extracted from our expenditure data is the affordability measure. Table 10 presented the average share of household per capita income spent on water; Table 11 analyses the share of households in the lower and upper income quintiles that spend more than the accepted water affordability measure. As expected, the lowest quintiles in each city contain the highest incidences of households for which water is non-affordable. A cross-city comparison shows that, even though El Alto is the poorest in terms of both per capita income and water expenditure, it has the best affordability indicators in both years. Cochabamba and Santa Cruz have the highest incidence of non-affordability. Respectively, about 63.9 per cent and 78.4 per cent of the population in the bottom quintile of these cities spent more than 3 per cent of their income on water in 2001.

TABLE 11

Share of the Non-Affording among the Population Connected to the Utility: Lower and Upper Quintiles

Year	2001		2005	
	QI	QV	QI	QV
La Paz	34.8	6.1	42.1	0.6
El Alto	25.6	0.0	15.1	1.8
Cochabamba	63.9	5.3	23.2	10.4
Santa Cruz	78.4	9.6	73.1	7.1

Source: Authors' calculations based on INE.

A comparison of affordability across years reveals no common pattern within the two groups (privatised versus non-privatised). In the "privatised" cities, the non-affordability rate has increased La Paz among the lowest quintile (from 34.8 per cent to 42.1 per cent of the population); in El Alto it has decreased to 15.1 per cent. In the "non-privatised" group, Santa Cruz still has a very high level of non-affordability (73.1 per cent), while in Cochabamba there is a significant improvement in affordability for the poorest quintile (the share of the population unable to afford water fell from 63.9 per cent to 23.2 per cent). This latter result may stem partially from a fall in water tariffs after 2000, when the public utility reassumed water provision after a brief period of privatisation. But the result must not be interpreted as purely positive because there was a contraction in the city's coverage rate during the period. It is likely that the poorest households were disconnected (remember that the affordability measure is calculated among the connected households only), which may be why the affordability indicator has improved partially.[18]

A final issue to be mentioned concerns connection fees. The initial costs that households incur to gain access to the utility are frequently barriers that exclude the poor from access to water. Before the concession in La Paz and El Alto, the public utility used to charge different fees according to a household's location and the exact cost of each specific connection (consisting of extending the secondary network and installing the household connection). The concessionaire imposed a uniform connection fee, limited only by the concession contract's maximum fee. Households, however, were given the option of buying the building material and carrying out the work themselves instead of paying the full connection fee (Komives, 1999). In La Paz and El Alto, costs ranged from US$105 to US$155 for water connections, and from US$130 to US$180 for sewerage (August 1998 figures). Other incentives from the concessionaire included three- to five-year financing plans for the connection fees and different interest rates according to the households' geographic location. Despite the incentives, Israel (2007: 61) highlights that "increases in connection fees were a key part of the protests against Aguas del Illimani".

As an overall conclusion, the delivery analysis so far has shown that the post-privatisation period is associated with expanded access to water in the cities where privatisation took place, especially among the low-income population. The distribution analysis found that targeting the poor clearly helped create a more equitable society in terms of access to water. The results of the affordability analysis, however, were mixed. Trends in spending between 2001 and 2005 show both an increase and a decline in the number of people who could not afford water in the two groups (privatised and non-privatised cities). But no inference can be drawn about the effect of water prices on each city's affordability, given the shortage of data. What is evident

from the expenditure data is that non-affordability is also a common problem among households in cities where the utility was not privatised.

4.4 ECONOMETRIC RESULTS

Can we really be certain that privatisation brought about greater access? A regression exercise points out the relationship between having access to water and living in cities where the water utility was privatised. The positive coefficient for effect (see Equation 2 and Table 12) suggests that there was a more than proportional variation in the expansion of access to water for households in cities where the utility was privatised, relative to households in cities where it was not. This was found in an analysis of the entire privatisation period (1996–2005). In other words, controlling for household wealth and for region-specific characteristics, living in a "privatised" city is associated with a greater probability of having access to water in the longer run (analysed up to nine years after privatisation). It is interesting that the short-run result (1996–2001) does not show a statistically significant effect. In the first five years of privatisation, living in a city where the utility was privatised did not entail a greater probability of having access to water. This takes us back to an issue raised in the literature about the time lag between basic infrastructure investments and an effective supply response. Since investments in heavy infrastructure (such as building treatment plants and extending water grids) need a certain amount of time to affect coverage, analysis of privatisation should consider evaluation at different points in time.

TABLE 12

Regression Results

Water	Coeff.	Std. error	Coeff.	Std. error	Water	Coeff.	Std. error	Coeff.	Std. error
1996 and 2001					**1996 and 2005**				
Post	0.021	(0.016)	0.038**	(0.017)	Post	-0.030*	(0.016)	-0.010	(0.015)
Privatised	0.080***	(0.016)	-0.099***	(0.020)	Privatised	-0.103***	(0.022)	-0.123***	(0.023)
Effect	**-0.025**	(0.025)	**-0.025**	(0.025)	**Effect**	**0.077****	(0.016)	**0.075****	(0.015)
lnY/capita	0.054***	(0.006)	-	-	lnY/capita	0.046***	(0.008)	-	-
Rooms	-	-	0.027***	(0.004)	Rooms	-	-	0.023***	(0.004)
Electricity	-	-	0.508***	(0.061)	Electricity	-	-	0.231***	(0.046)
Wall	-	-	0.030	0.019	Wall	-	-	0.111	0.076
Number of obs.: 3240			Number of obs: 3277		Number of obs.: 2917			Number of obs: 2945	
Population size: 1385919			Pop. size: 1401111		Population size: 1476802			Pop. size: 1487615	
Design df: 3239			Design df: 3276		Design df: 2916			Design df: 2944	
F(6, 3234)= 30.41			F(8, 3269)= 32.84		F(6, 2911)= 35.44			F(8, 2937)= 31.23	
Prob > F=0			Prob > F=0		Prob > F=0			Prob > F= 0	

Source: Authors' calculations.

Note: Marginal values reported. Regional dummies included in the regression.

5 CONCLUDING REMARKS

We found that access to water by the poor improved during the period of privatisation. Nonetheless, the concession contract was terminated in 2005 and the water sector in La Paz and El Alto was renationalised in 2006. Why?

a. *Meeting the targets.* The coverage rate is often used in arguments about the success or failure of private concession contracts. Coverage expanded significantly more in La Paz and El Alto than in the cities where water was not privatised. The concessionaire, however, failed to meet the targets stipulated in the contract (universal access in La Paz and 82 per cent coverage in El Alto).

b. *Water prices*. In this regard we were constrained by a lack of data. It is widely known, however, that the bidding process for the La Paz/El Alto concession did not take the lowest water price as a criterion; it focused instead on the offer of the widest network expansion. Additionally, the water authority raised tariffs just before privatisation, which may have led households to associate the price increases with the utility reform. Israel (2007, p. 62) notes that:

> "Burdens may be examined either in absolute or relative terms. With absolute progressivity, the burden is greater in monetary terms for high-income groups than for low-income groups, whereas with relative progressivity, the burden as a proportion of income is increasing with income. If price increases are the same for all income groups, then if low-income households spend a larger percentage of income on water than do high-income households, these across-the-board water price increases would be regressive."

c. *Unpopularity of the company Aguas del Illimani.* The concession contract required that communal standpipes be eliminated and that dwellings be provided with in-house connections (Komives, 1999). The underlying reason was to help the government achieve the political target of providing universal in-house water access, as stated in a national water plan. Standpipes, however, were inexpensive alternatives to in-house connection for some households, especially those that were unable to afford the high initial costs of connection to the utility network. This was a potential cause for discontent on the part of the low-income households, which would have to search for alternative (and usually more expensive) sources of water.

d. *Contract design and enforcement of expansion goals*. A mix of well-designed contracts and stringent regulation (periodic revision of expansion targets) is advocated as essential for successful private provision. A successful pro-poor water concession requires that the contracts clearly specify the output standards (type of services to be provided), quality and reliability (high quality service in low-income areas). In the case of La Paz/El Alto the concession contract seemed clear on the penalties for non-compliance with the contract goals,[19] but the company failed to meet the targets for new connections in El Alto. Households complained about low water pressure in the city, the increase in tariffs after the first period, and high connection fees. The company was also accused of polluting Lake Titicaca. All of these factors contributed to the emergence of popular movements that brought about the termination of the concession contract.

The lesson is that when privatisation contracts stipulate clear targets, concessionaires do attempt to reach them—though this did not fully happen in Bolivia. Nonetheless, we are aware that the distributional impacts of privatisation go beyond coverage and affordability. Privatisation may also affect the concentration of assets, returns to labour and employment rates (mostly in the low- and middle-income classes), returns to capital, and public tax structures. Future research that explores these other matters in the context of privatisation reforms will be useful.

APPENDIX

Percentage-Point Change in Access to Water before and after Privatisation, by Income Quintile

	1992-1996	1996-2001	2001-2005	1996-2005	ai -1992-1996			ai - 1996-2001			ai - 2001-2005		
Quintile	Change	Change	Change	Change	0.1	0.5	1	0.1	0.5	1	0.1	0.5	1
La Paz													
1	0.223 **	-0.043 **	0.171 **	0.128 **	0.06	0.05	0.05	-0.01	-0.01	-0.01	0.05	0.07	0.09
2	0.045 **	0.088 **	0.081 **	0.168 **	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.05
3	0.168 **	0.013	0.037	0.051 **	0.04	0.05	0.05	0.00	0.00	0.01	0.01	0.02	0.02
4	0.099 **	-0.027	0.094 **	0.067 **	0.03	0.04	0.04	-0.01	-0.01	-0.01	0.03	0.06	0.12
5	0.088 **	0.003	0.018 **	0.021 **	0.03	0.05	0.09	0.00	0.00	0.01	0.01	0.03	0.53
Total					0.03	0.04	0.04	0.00	0.00	0.00	0.02	0.04	0.07
El Alto													
1	0.022	0.224 **	0.079	0.303 **	0.01	0.00	0.00	0.05	0.04	0.03	0.02	0.02	0.02
2	0.092 **	0.174 **	-0.070	0.104 **	0.02	0.02	0.02	0.04	0.04	0.05	-0.02	-0.03	-0.03
3	0.242 **	-0.368 **	0.479 **	0.111 **	0.06	0.05	0.04	-0.07	-0.06	-0.04	0.12	0.11	0.09
4	0.277 **	-0.403 **	0.411 **	0.008	0.07	0.07	0.06	-0.08	-0.07	-0.06	0.10	0.10	0.08
5	0.078 **	0.018	0.035	0.052 **	0.02	0.02	0.02	0.00	0.00	0.01	0.01	0.01	0.02
Total					0.04	0.03	0.03	-0.01	-0.01	-0.01	0.05	0.05	0.05
Cochabamba													
1	0.051 **	-0.048	-0.326 **	-0.374 **	0.01	0.01	0.01	-0.01	-0.01	-0.01	-0.08	-0.05	-0.03
2	0.124 **	-0.044	-0.421 **	-0.466 **	0.03	0.03	0.02	-0.01	-0.01	-0.01	-0.10	-0.07	-0.05
3	0.167 **	0.058 **	-0.136 **	-0.078 **	0.04	0.04	0.03	0.01	0.01	0.01	-0.04	-0.04	-0.03
4	0.109 **	0.055 **	-0.072 **	-0.017	0.03	0.03	0.03	0.01	0.02	0.02	-0.02	-0.02	-0.03
5	0.027	0.084 **	-0.189 **	-0.105 **	0.01	0.01	0.01	0.02	0.03	0.03	-0.05	-0.06	-0.07
Total					0.02	0.02	0.02	0.00	0.00	0.00	-0.04	-0.04	-0.03
Santa Cruz													
1	0.159 **	0.020	-0.021	0.000	0.04	0.05	0.05	0.00	0.01	0.01	-0.01	-0.01	-0.01
2	0.125 **	0.022	-0.030	-0.007	0.03	0.04	0.05	0.01	0.01	0.01	-0.01	-0.01	-0.02
3	0.187 **	-0.024 **	0.024 **	0.000	0.06	0.11	0.66	-0.01	-0.03	-0.44	0.01	0.04	0.55
4	0.134 **	-0.015	0.014	-0.001	0.04	0.06	0.11	0.00	-0.01	-0.02	0.00	0.01	0.03
5	0.079 **	0.012 **	0.000	0.012 **	0.02	0.05	0.11	0.00	0.02	0.41	0.00	0.00	0.00
Total					0.04	0.05	0.08	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculations based on INE.

Note: ** Significant at 5% level.

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NOTES

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2. At the UN Water Conference at Mar del Plata in 1977, governments agreed to include the target of providing safe drinking water and basic sanitation to all by 1990. At the World Summit for Children in 1990, 2000 was set as the target year for universal access.

3. In this paper, the term "privatisation" refers to any private sector involvement in the provision of basic utilities.

4. Urban water provision is regarded as a natural monopoly: it has significant infrastructure sunk costs, high fixed costs and large economies of scale. The utility supply chain comprises several activities, where only infrastructure building and plumbing services are competitive—that is, activities for which there can be a market, and where many companies can participate in grid construction and maintenance.

5. Or households may not meet the legal requirements for having piped water installed, such as proof of land ownership and legal property rights over the dwelling (Dagdeviren and Robertson, 2009).

6. Geographic cross-subsidies based on broader regions, such as inter-cities, are very sensitive to privatisation processes. Private companies are mostly interested in profitable areas, and thus the cities—which are the source of revenue surpluses—are more likely to be privatised. Consequently, the amount devoted to subsidies declines, with a negative impact on the tariff structure of all other connected cities.

7. Yepes (1999) supports cost-sharing and criticises cross-subsidies on the grounds that welfare losses may be caused by different elasticities of high- and low-income consumers. He argues that prices should be uniform across consumers, except when provision costs vary. Still, he admits that full cost recovery could exclude provision to the poor and discusses alternative subsidy schemes, not through tariffs.

8. The water utility in Bolivia has traditionally been state-provided. The 1906 legislation (Ley de Aguas) established water as a property of the state. Water provision was the responsibility of the central government until 1966, when the system began to be decentralised and a municipal water company was created in La Paz. The semiautonomous public company Servicio Autónomo Municipal de Agua Potable y Acantarillado (SAMAPA) became responsible for providing water and sewerage to La Paz and El Alto. The 1994 law (Ley 1600) introduced a national regulatory reform in several infrastructure sectors and created a sectoral system of regulation, the Sistema de Regulación Sectorial (SIRESE).

9. The Bolivian law on water-sector regulation stipulates that any public provision of water must operate under concession (either public or private), according to Article 14 of the 1997 Regulation of Concessions (Reglamento de la Organizacion Institucional y de las Concessiones del Sector Aguas).

10. The regulatory body, the Superintendencia de Saneamiento Basico (SISAB), was created in 1999, together with the legal framework for water and sewerage provision, according to Law 2029 (Ley de Servicios de Agua Potable y Acantarillado Sanitário) and Law 2066 (Ley Modificadora a la Ley 2029).

11. On the contract targets, see Komives (1999) and IDB (1998).

12. An early attempt to privatise water provision in Cochabamba occurred in 1997. For legal reasons the bid was suspended. A new bid to explore another aquifer was launched, but no proposals were received. In 1999, Aguas de Tunari (from the multinationals Biwater and Bechtel) submitted an unsolicited bid and was granted the concession.

13. It is worth noting that prices were adjusted in La Paz and El Alto just before privatisation (Israel, 2007). This effect is not captured in our analyses.

14. The regressions were run in separate pairs before/after privatisation (1996/2001 and 1996/2005 or four and eight years after privatisation).

15. We also use the household per capita income for robustness checks, though this could be subject to criticism as to whether endogeneity might be introduced into the model.

16 Although tariffs are available (Barja and Urquiola, 2001; Komives, 1999), the block schemes do not allow us to rebuild individual household demand.

17. Unless the overall consumption pattern changed substantially because of behavioural adjustments.

18. One should be careful about interpreting the affordability results. Expenditure data show that household per capita expenditure on water is lower in the "privatised" cities than in the "non-privatised" ones. The proportion of the non-affording population in the privatised cities is also smaller than in the others. Despite this positive result, we do not know the level of consumption (quantity of water) of the households in each group. Additionally, households that used to benefit from free water (illegal or unmetered connections) became subject to the billing system after privatisation. Any inference about households' welfare is therefore incomplete.

19. See Komives (1999) and the concession contract, Appendix 5 and clause 27.

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