Efficiency effects of “privatization” in Argentina’s water and sanitation services

Antonio Estachea and Lourdes Trujillob

aCorresponding author. World Bank Institute, The World Bank, 1818 H St NW, Washington, DC 20473, USA.
(Tel: +1 202 458 1442, fax: +1 202 676 9874. E-mail: aestache@worldbank.org) and ECARES, Université Libre de Bruxelles, Brussels, Belgium

bDepartamento de Análisis Económico Aplicado, Universidad de las Palmas de Gran Canaria, 4 Saulo Torón, E-35017 Las Palmas, Canary Islands, Spain.

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Abstract

This paper provides a “back-of-the-envelope” assessment of the efficiency effects of the reforms of the water sector in Argentina. Private operators are now key players in 15 of Argentina’s provinces. While all have adopted incentive based regulatory regimes which require estimates of economic efficiency changes, none have actually issued any estimate yet. This paper provides upper bounds estimates of efficiency gains achieved for four operators. The paper concludes with a discussion of the implication of the results for regulatory accounting and data collection processes by regulators in developing countries relying on incentive based regulatory systems.

Keywords: Efficiency; Performance; Price caps; Privatization; Regulation; Regulatory accounting; Utilities

1. Introduction

The Argentina National Government and over half of its provinces initiated major reforms of its water and sanitation services during the 1990s. The main characteristic of these reforms was the promotion of an increased role for the private sector in the operation and financing of the services. Since 1991, the reforms have been implemented in the Greater Buenos Aires area under the joint jurisdiction of the national, provincial and local governments responsible for that area as well as in 12 of Argentina’s 23 provinces. The reforms typically involved awarding a 30 year concession of all or part of the service traditionally provided by the public operator, the introduction of an explicit regulatory framework building on an incentive based regulatory regime and the creation of a regulatory agency to monitor the concession and the enforcement of the contractual and other regulatory commitments.

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The main purpose of this paper is to present an assessment of the efficiency gains achieved since the reforms for a sample of provinces from the viewpoint of a regulator of the sector. The efficiency concept measured here is the ability of a firm to achieve maximum output, given its input set. The focus is chosen because it is the efficiency concept that is the most consistent with the one expected to be used by the reformers who have adopted incentive based regulatory regimes. These regimes have built-in scheduled tariff revision processes designed to allow the regulators to eventually share some of the efficiency improvements with the users. Under these regulatory regimes, regulators are expected to rely on a synthetic quantitative measure of efficiency changes used to assess the tariff changes as part of the scheduled tariff revisions. It turns out that, in Argentina, most reforms have imposed such incentive based regulatory regimes on the regulated operators.

The water and sanitation sector is, in that sense, not very different from the other reformed sectors in Argentina since all rely on price caps or hybrid regulatory regimes which combine some incentives for cost reductions with some automatic pass-through rules for specific cost categories – typically the cost of imported inputs. All have scheduled tariff revisions designed: (i) to assess the efficiency gains under private operation and (ii) to discuss a fair distribution of these gains with the users. This regulatory revision has already been done in Argentina for gas distribution and transport and for electricity transmission. It has not yet been done officially for the other regulated infrastructure sectors, including the water sector.

From the viewpoint of the water and sanitation sector, this paper is a contribution to a growing literature focusing on efficiency gains in the sector. This literature can be separated into three main groups. The literature started with a debate on the relative efficiency of public and private operators launched by Crain & Zardkoohi (1978) who estimated a cost function and found that publicly owned water utilities in the US have higher costs than their privately owned counterparts. The paper was followed by papers by Feigenbaum & Teeples (1984), Byrnes et al. (1986) and Fox & Hofler (1986), who all estimated the efficiency in the sector to question the Crain–Zardkoohi conclusion for the US.

This paper complements the many good case studies with a lot of data but focusing on partial economic or physical performance indicators only. See, for instance, Crampes & Estache (1996), Ferro (1999), FIEL (1999), Abdala & Spiller (1999) and Alcazar et al. (2000). It also complements a recent study measuring the impact of performance in terms of the health effects on the poor by Galiani et al. (2002). This study finds that child mortality fell by 5–9% with water privatization, with the strongest benefit accruing to the poorest neighborhoods.

A major drawback of the approach followed by the regulators of privatized utilities is that they do not measure the environmental and other social costs associated with the production activity in the context of their regulatory decisions. This is also the case in Argentina, where environmental issues are addressed by a provincial environmental regulator with varying degrees of consultation with the economic regulator of the operators, depending on the province. Although conceptually it is possible to build in quality variables to obtain quality adjusted efficiency measures, we have not done so at this stage of our research on Argentina’s reform experience but it is clearly an important concern, as pointed out by one of the reviewers of the paper. The impact on the measure proposed here could be positive if the operators improve the treatment of sewage, or negative if they generate a larger volume of untreated sewage production.

Incentive based regulatory regimes are designed to promote sustained reductions in costs over time. The cost savings need to be measured as a single figure which must be comparable across operators and hence recognize that operators may have different technological preferences and/or constraints and which are used to assess future tariff reductions imposed on the operators.

The main purpose of these tariff revisions is to ensure a fair distribution of these efficiency gains. An easy, although weak, test of the effectiveness of regulatory decisions is to check on the correlation between efficiency and average tariff changes. For more on this, see Estache (2002).

There are, however, academic estimates for energy (e.g. Rossi, 2001) or railways (e.g. Estache et al., 2002).
the process, they made important methodological contributions which have generated their own follow-up papers, including, for example, Bhattacharyya et al. (1994, 1995). The next wave of papers came in preparation for a tariff revision in the UK and started with a series of working papers financed by OFWAT, the British water regulator (Stewart, 1993; Price, 1993). These papers were followed by a series of paper on the UK experience, including other papers commissioned by OFWAT, such as Cubbin & Tzanidakis (1998), with an interesting methodological discussion, and recently summarized in Ashton (2000). While these various waves of papers focused on specific developed countries, the US first and then the UK more recently, these methods are now also being tested with international developing country databases. Estache & Rossi (2002) for Asia could not find significant differences in efficiency levels achieved by public and private service providers while Estache & Kouassi (2002) found a clear advantage for private operators in Africa.

The methodological contribution of this paper is certainly not as ambitious as the first generations of papers were. It is essentially a contribution to the efforts made in preparation for tariff revisions in Argentina as an illustration of what can be achieved in developing countries with nascent regulatory capacity and limited data availability. It takes a very pragmatic view of what can be done in this context and discusses and documents some of the regulatory consequences of the failures by regulators, common in developing countries, to collect proper data needed for ordinary tariff revisions or extraordinary contract reviews.

The specific measure of economic efficiency adopted here is the change in total factor productivity (TFP). The choice of this approach is driven by the fairly modest database put together with the help of the regulators of four of the Argentinean provinces as part of a diagnostic of the quality of the data available for regulatory purposes in Argentina. It is an improvement over partial productivity indicators often used in the sector because it provides a figure which can be used as part of any incentive based regime. Indeed, it accounts for the joint effect of all technological changes and improvements in the use of all inputs as well as any improvement in economies of scale. Efficiency changes do not generally come only from reductions in employment; they may come from changes in the use of any input or even technological changes. It is, therefore, important to be able to account for all sources of gains or losses in efficiency that may result from a reform.

The paper is organized as follows. Section 2 summarizes Argentina’s water and sanitation sector reform experience. Section 3 spells out the efficiency measure used here. Section 4 discusses the data available and the assumptions we had to make. Section 5 presents the results. Section 6 provides a few simulations, showing the payoffs from investing in better regulatory databases on inputs. Section 7 shows how a recognition of the multi-output nature of the business influences the results. Section 8 provides some conclusions.

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6 Note also that, as an increasing number of studies focus on these technically complex measures, there is strong progress being made on the partial productivity measures. For best practice in this respect see the World Bank web site on partial performance indicators for the water sector.

7 The data are processed with the program TFPIP version 1.0 developed by Tim Coelli and available for free on the web. For more details, see Coelli et al. (2003).

8 The assessment was actually initially intended to cover the 12 provinces with regulatory agencies. Only 4 of them, however, have so far put together some of the data sets needed for scheduled regulatory revisions.

9 It is, however, true that employment reduction was the norm in the reforms. For instance, it declined from 7800 to about 3800 after 7 years of private operation for Aguas Argentina, from 560 to 304 for Corrientes after 9 years of the concession, from 245 to 39 in Formosa after 5 years of the concession, or from 609 to 452 in Salta after 4 years of the concession.
2. The context

Until 1982, the sector was centralized and controlled by a national operator. Since then, the sector has been decentralized and is controlled autonomously by each of Argentina’s 23 provinces. The capital city, Buenos Aires, enjoys a quasi-provincial status and roughly equivalent jurisdiction in the sector. This 1982 reform did not do much for the sector. It was unable to generate enough revenue to cover the sector’s operational and capital costs, so coverage was limited and certainly not consistent with the demand. This situation led to the next major reform wave about a decade later with the attempt to increase the role of the private sector as part of a wider state reform agenda introduced by the Menem administration.

The first concession was awarded to the Province of Corrientes in September 1990 (but effectively transferred a year later), while the next one was for the Greater Buenos Aires region and was the largest concession in the world at that time. It was transferred in May 1993. Since then, eleven provinces have followed: Tucumán (5/1995), Santa Fe (12/1995), Formosa (12/1995), Córdoba (5/1997), Santiago del Estero (1996?), Mendoza (1997), Salta (7/1998), Misiones (7/1999), La Rioja (12/1999), Catamarca (9/2000) and the province of Buenos Aires (7/1999). A total of 20 million users are now served by private operators. In addition, in various provinces, such as Chubut, Neuquen and Entre Ríos, the services are contracted to cooperatives under rules similar to those relied on in concession with private operators. This means that, by the end of the 1990s, 70% of the urban population was taken care of by private operators or cooperative. Only 30% were still under the responsibility of public providers. Almost all the large cities and a majority of medium-sized cities are now serviced by private concessionaires.

The smallest cities and rural areas have, however, been left out of most coverage obligations of concession contracts. In many cases, the financial viability of these services has not been perceived as being sufficient to attract the private operators and have been unbundled from otherwise commercially viable services. The government continues to be responsible for these non-commercially viable water and sanitation services. They may present some of the toughest policy challenges since they are expected to meet the needs of many of the rural poor.

Accounting for this difficulty in dealing with the needs of the rural poor, in general terms, partial indicators seem to suggest that many of the expected payoffs of the reforms have materialized. For instance, information provided by the National Agency for Water Works and Sanitation (Ente Nacional de Obras Hídricas y Saneamiento (ENOHSA)) on its web site shows that coverage rates increased from around 70% in water and 38% in sanitation in 1991 to 78% and 48%, respectively. Once more, these indicators are useful but do not provide the synthetic indicator needed for implementation of the incentive based regulatory regimes adopted by the provinces. There are also other ongoing regulatory issues. For instance, the measurement of improvements in consumption continues to be a problem. ENOHSA estimate that about 40% of the 400 liters/person/day produced is not accounted for. The introduction of a more effective metering system is one of the major challenges ahead if regulators are going to try to get a better handle on costs and incentives in their regulatory decisions. Another important outstanding regulatory issue is the fact that coordination with the environmental regulatory agencies continues to face implementation problems – but this goes beyond the scope of this paper.

10 The concession granted by the province of Buenos Aires has since been cancelled in 2002.
3. The methodology

The main problem faced by the regulators is that there are many ways of defining efficiency. The idea is quite general and covers multiple concepts. As mentioned earlier, partial performance indicators are particularly limited in terms of generating a synthetic performance indicator which accounts for all outputs and all inputs simultaneously. This is one of the reasons why they cannot be used in the implementation of incentive based regulatory regimes. Moreover, they can lead to the wrong ranking of firms’ performances when yardstick competition is considered by a regulator, as is increasingly the case.

A concept that seems to be agreeable to a wide range of regulatory experts in the sector focuses on technical efficiency. It measures the ability of the operator to produce the largest possible volume of service with the minimum level of inputs. Expanding the idea somewhat, cost efficiency adds the concern that the operator also relies on the combination of inputs that minimizes production costs. These concepts can be measured in absolute terms and can track the evolution of a firm over time or relative to the performance achieved by similar operators.

The easiest such indicator is a Total Factor Productivity (or TFP) Index. This index measures the changes in total output relative to this in total inputs. In growth rates, it can be expressed as follows:

\[
\ln TFP_{st} = \ln \frac{\text{Index for product}_{st}}{\text{Index for input}_{st}}
\]  

(1)

where the indices \( s \) and \( t \) refer to the beginning and end of a time period, respectively, and where the product is, e.g., the volume of water produced or sewage handled and the input is, e.g., employment, capital, energy consumption or use of chemicals.

The indexes are estimated as Tornqvist which, in log form, takes the following form:

\[
\ln \text{Index for product}_{st} = \frac{1}{2} \sum_{i=1}^{N} (w_{is} + w_{it})(\ln y_{it} - \ln y_{is})
\]  

(2)

\[
\ln \text{Index for input}_{st} = \frac{1}{2} \sum_{j=1}^{K} (v_{js} + v_{jt})(\ln x_{jt} - \ln x_{js})
\]  

(3)

where:

- \( y_i \) represents the quantity of the \( i \)th product,
- \( x_j \) represents the quantity of the \( j \)th input,
- \( w_i \) is the share of the value of the \( i \)th product,
- \( w_j \) is the share of the value of the \( j \)th input.

The main challenge is clearly to identify, among the indicators typically produced by operators, variables that are reliable and relevant enough to get an approximation of the components of the TFP measure. With respect to the measurement of output, the practice is as follows. Even if many studies recognize that the services provided by water and sanitation companies are multi-product in nature (water and sanitation are indeed two separate business lines), most actually focus on a single output, principally because of the poverty of data available in the sector.

Moreover, the computation of the TFP requires information on the value shares appearing in equations (2) and (3). This can be approximated by the price of the output in equation (2) and of the inputs in equation (3). The price of the inputs is estimated as follows. The price of labor (wages) is the ratio of the wage bill to the number of workers. The price of capital is approximated by the ratio of
the depreciation expenses and the length of the network. The price of energy is estimated by the ratio of the energy bill to the volume of energy consumed. The price of the other inputs is approximated by the expenses on these inputs divided by the volume of water produced.

Table 1 provides a summary of the minimum set of variables needed to assess TFP. Ideally, a regulator would also want to have access to information that may influence the results, such as quality of service and business environment factors (typology, rain, income levels of the clients, etc, are the most common ones). But more subtle factors, such as the extent to which the operator subcontracts and what it subcontracts, will clearly influence the firm’s specific TFP. Unless these factors are clearly understood, inter-operator comparisons can be difficult.

For a fuller methodological discussion see Coelli et al. (1998).

4. The data

The data used in this paper were collected by sending a questionnaire to all of Argentina’s water and sanitation regulators. While 14 of the provinces were kind enough to send the questionnaire back, only 4 of them provided enough information to allow us to compute the TFP: ETOSS, the regulator for the concession covering the Greater Buenos Aires (Aguas Argentinas) and the regulators of the provinces of Mendoza, Salta and Tucuman. The sample is quite interesting: it includes one of the largest concessions in the world (Aguas Argentina) as well as the province with the first contracts to be revoked, Tucuman, where a public operator has now taken over the operation from the private operator after a highly publicized conflict. Table 2 summarizes the coverage of the data collected.

Table 1. Summary of the indicators needed

<table>
<thead>
<tr>
<th>Output 1 (water)</th>
<th>Physical units</th>
<th>Prices (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of water production</td>
<td>Average water tariff per cubic meter and tariff structure</td>
<td></td>
</tr>
<tr>
<td>Output 2 (sanitation)</td>
<td>Volume of sewerage collected</td>
<td>Average sanitation tariff per cubic meter and tariff structure</td>
</tr>
<tr>
<td>Input 1 (labor)</td>
<td>Number of workers (in equivalent full time employment)</td>
<td>Average annual salary, with and without all additional labor charges</td>
</tr>
<tr>
<td>Input 2 (energy)</td>
<td>Volume of energy and fuel consumption in whatever unit of fuel is available</td>
<td>Average energy and fuel prices per whatever unit of fuel is available</td>
</tr>
<tr>
<td>Input 3 (capital)</td>
<td>Length of network in km</td>
<td>Cost of capital (or depreciation) expressed in %</td>
</tr>
<tr>
<td>Input 4 (intermediary inputs)</td>
<td>Annual expenses in items others than labor, energy or capital</td>
<td>Annual expenses in items other than labor, energy or capital divided by the volume of water</td>
</tr>
</tbody>
</table>

* We gave the option to the regulators to provide us with two of the three following indicators: volume, prices or revenue, since the third one can be derived from the other two.

11 The Tucuman concession contract with the consortium Aguas de Aconquija was awarded in 1994 and signed in May 1995. There was a very negative reaction from the community to the reform, mainly because of the dramatic increase in tariffs. Indeed, in addition to the initial 68% increase in charges allowed from the bid, a further 6% was added as a levy to fund the regulatory body. Moreover, there were various provincial and municipal taxes that previously did not apply to the public company, but which the private concessionaire would have to pay. As a result, the final tariff impact was an immediate increase of 103%. After a major drought and many social conflicts, as of the end of 1997, both the concessionaire and the provincial government agreed that the concession contract was no longer valid. The contract is now in international arbitration.
None of the provinces provided all the data. All had problems in providing information on the chemicals or on other intermediate inputs. Only the province of Salta provided all the other information requested in Table 1 for both water and sanitation. The main problem for the other provinces was to collect data on the cost of capital or on depreciation. We also had to estimate some of the price data for Aguas Argentina. Across the board, we deflated the nominal series by the wholesale price index.

5. A first look at the changes in TFP since privatization

The initial estimation we present focuses on the efficiency in the delivery of the water service approximated by the production of water. We first consider the changes in the efficiency of two factors only, labor and energy. Table 3 summarizes our estimates of TFP changes since the private operator took over obtained for Aguas Argentina, Aguas de Salta and Mendoza and since the public operator took over from the private operator after the contractual dispute in the case of Tucumán.

The annual changes in TFP estimated under the assumptions discussed so far vary between 2.3% (for Aguas Argentinas) and 13.5% (for Mendoza). The shock from the transfer in ownership seems to be

Table 2. Variables available for the four operators covered and related assumptions.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Aguas Argentinas</th>
<th>Mendoza</th>
<th>Tucumán (4)</th>
<th>Salta (Latin Aguas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of transfer of operation</td>
<td>To private operator</td>
<td>To private operator</td>
<td>To public operator</td>
<td>To private operator</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network depreciation</td>
<td>1994–2001</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>Expenditures on intermediary inputs</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>Information on degree of subcontracting</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>

(×) The data was not provided.
(1) The number of employees for 1994 was calculated as the ratio of the labor and social charges costs to the average salary of the price of factors in 1995
(2) The consumption for all years was derived from the cost and the price data. The price of energy was approximated from the average energy price for the other provinces.
(3) The network length for 1994–1998 is approximated by assuming that the ratio of length to water for 1999–2001 also applied during that period.

12 Salta had been collected the data in preparation for an operation with a multilateral agency.
working for all provinces. To be fair, it should be pointed out that the initial conditions are not quite comparable: the dispute in Tucumán was quite sour and, during the dispute, the private operator did the strict minimum. It was thus relatively easy to improve. The fact is that so far the public operator has managed to sustain its modest efficiency gain.

A second result that emerges from Table 3 is that there is not only a wide margin of changes across operators but there is also a wide margin in terms of sources of changes in efficiency. The largest concession (Aguas Argentina) and Salta are the only ones to achieve overall efficiency gains from both improvements in output and input. While the annual gains in terms of inputs are similar for the two operators, the output gains are stronger for Salta. Of course, this may reflect a strong start up since the reform was only implemented in 1999 in Salta while it started in 1993 for Aguas Argentinas in Buenos Aires.

The strong performance achieved by Mendoza in terms of TFP results completely from its improvements in input efficiency. In fact, output efficiency declined slightly since its privatization in 1998. It would be important for the regulators to come up with better data on the other inputs since the current results may simply reflect a rebalancing across inputs, including some not used here such as capital increases resulting from the investment or coverage obligations specified in the concession contracts. It may also reflect an increase in the level of subcontracting not accounted for here but which would emerge from a better accounting structure than the one available. It may also simply reflect a short term decline in maintenance expenditure.

In Tucumán, under new public operation, input use is increasing somewhat. This was expected since for almost three years the private operator, while in conflict with a new provincial government elected after the privatization was implemented, did not do much in terms of investment or maintenance. Input use had to increase. The question is whether it will have to increase more to ensure reasonable amounts of maintenance. Output increased also for the same reason, but it improved significantly more, with a new public sector management eager to show it can deliver as well as any private operator would.

Overall, this first look at the results based on two inputs seems to raise more questions than it provides firm evidence on the effect of reform of the sector. Total Factor Productivity seems to have increased. The main problem is that this ignores the very significant role of increases in the use of capital required (implicitly) by the concession contracts. This implies that, in most cases, TFP measured based only on labor and energy inputs are likely to overestimate efficiency gains. Using these measures as the X in tariff revisions of these provinces would penalize operators. These measures are upper bounds but they are the best available considering the database available for these four provinces.

Table 3. Average TFP annual growth rate and its sources (1).

<table>
<thead>
<tr>
<th>Operator</th>
<th>Period</th>
<th>Output</th>
<th>Input</th>
<th>TFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aguas Argentinas (2)</td>
<td>1994–2001</td>
<td>1.151</td>
<td>–1.157</td>
<td>2.334</td>
</tr>
<tr>
<td>Mendoza (2)</td>
<td>1998–2001</td>
<td>–0.267</td>
<td>–12.115</td>
<td>13.484</td>
</tr>
<tr>
<td>Tucumán (3)</td>
<td>1999–2001</td>
<td>4.580</td>
<td>0.020</td>
<td>4.561</td>
</tr>
<tr>
<td>Aguas de Salta (2)</td>
<td>1999–2001</td>
<td>2.869</td>
<td>–1.243</td>
<td>4.211</td>
</tr>
</tbody>
</table>

(1) The TFP is computed with 1 output (water production) and 2 inputs (labor and energy)
(2) From the first full year after “privatization” until end of 2001
(3) Tucumán is under public operation since 1998.
6. How much is TFP overestimated by lack of data on inputs?

It is interesting to get a feeling for the importance of the overestimation of the efficiency gains that result from ignoring the capital expenditures realized by the private operators. To do so, we use the data available on investment (increases in network length) and depreciation for Aguas Argentina and show the comparison of efficiency changes estimated with two inputs with the efficiency changes estimated with three inputs for that operator. The results are summarized in Table 4.

The inclusion of a third factor known to increase inputs in the estimation reduces the TFP by about 15%. We now have a much lower upper bound to work with. The regulator would, of course, penalize the operator if the future tariffs were to be readjusted to reflect efficiency changes ignoring the importance of this third factor. The point is that in this case the operator would have a strong incentive to reveal more information than it has in the past. The example also illustrates what a shift in the burden of proof from the regulator to the operator could achieve in reducing the information asymmetry that typically penalizes regulators in this industry. By arguing that efficiency gains will be those assessed from the information published unless the operator is able to prove the regulator wrong is likely to increase the incentive of the operator to cooperate, at least when it stands to gain from cooperation. If there is no cooperation, it means either that the regulator’s estimate was perfect or that the operator is better off not complaining. This is turn means that the regulator knows that its upper bound estimate was, in fact, a lower bound!

7. What happens to TFP estimates when multiproducts are accounted for?

The database for Salta is detailed enough to allow us to test a multiproduct TFP estimate. We compare here the estimate we did for one output and two inputs for the sake of comparison purposes with an estimate that uses all the information available for Salta. That is, we assess the efficiency changes looking at two outputs (water and sanitation) and three inputs (labor, energy and capital) for the same period 1999–2001. Table 5 summarizes the results.

Table 4. Comparing annual changes in TFP with 2 and 3 inputs.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Period</th>
<th>Output</th>
<th>Input</th>
<th>TFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aguas Argentinas</td>
<td>1994–2001</td>
<td>1.151</td>
<td>–0.811</td>
<td>1.977</td>
</tr>
</tbody>
</table>

(1) TFP calculated with 1 output (water production) and 2 inputs (labor and energy).
(2) TFP calculated with 1 output (water production) and 3 inputs (labor, energy and capital).

Table 5. Impact of an explicit modeling of the multi-output responsibilities on the measure of TFP.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Period</th>
<th>Output</th>
<th>Input</th>
<th>TFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aguas de Salta</td>
<td>1999–2001</td>
<td>1.277</td>
<td>–1.293</td>
<td>2.601</td>
</tr>
</tbody>
</table>

(1) The annual TFP change is based on 1 output and 2 inputs (labor and energy).
(2) The annual TFP change is based on 2 output (water production and sewerage collection) and 3 inputs (labor, energy and capital).
Once more, the new computations suggest that we had overestimated efficiency gains by ignoring the information on all outputs and inputs. The estimate of annual efficiency gains drops from 4.2% to 2.6%. A 1.6% annual overestimation of the efficiency gains achieved is quite significant and could have dramatic effects for the financial viability of the firm.

8. Conclusions

This paper shows that it is possible to come up with a reasonable upper bound for the estimates of the technical efficiency gains achieved by the operators of various water companies in Argentina. For the two provinces for which reasonable data are available, the gains are roughly 2% per year. If these gains can be sustained, they represent quite significant contributions from the reforms of the sector in these provinces.

It is important to note, however, that the results must be used with caution because we found that the data collected were generally quite insufficient to allow a fully satisfactory assessment. In particular, regulators would need much more detailed information on all inputs if they were to be able to come up with a fairer assessment of the size of the efficiency gains that will eventually have to be shared with the users. Moreover, the results do not account for environmental issues, reflecting to a large extent the unfortunate practice in the economic regulation of this sector in developing countries where the coordination between the economic and environmental regulators continues to be weak and seldom leads to pricing systems in the sector which addresses the concerns of both regulators simultaneously.

The results are, however, sufficiently robust to allow a number of general observations. First, the gains come not only from the input side (and not only from employment reductions) but also from the output side. Second, as long as operators continue to increase investment as scheduled in their concession contracts, major input increases, and hence efficiency gains estimates, continue to be low since output gains are related to this specific increase in inputs. But this is a win–win situation in which operators get to keep some of the rent and users gain access, although it means users may not see their tariff drop as fast as they would wish for when efficiency gains are passed back through tariff reductions. Third, with the data available there is not much scope for an inter-company comparison which could result in some form of yardstick competition. Much more data are needed to get a good appreciation of the underlying policy and institutional factors.

Ultimately, the most policy relevant lesson learned from this paper may be that the reform processes seem to largely ignore the importance of regulatory accounting for the monitoring of the performance of these privatized or commercialized monopolies in the sector. Argentina’s experience is not very different from the one observed in any developing country in which the private sector has started to contribute more significantly in the delivery of water services. The lack of information implies that neither the firms nor the regulators can be held accountable for their ability to deliver on the promises made to the users through reforms in the sector.

More information would make it easier to scrutinize regulatory decisions and assessments because it would make it easier to understand who gains and who loses from regulatory decisions. Ideally, a more transparent consultative process at an early stage of the reforms, including at the auction and contracting stage, would yield the necessary accountability from the start. This in turn would make it easier to understand the politics underlying decisions and the incentives the various players have to pull strings. In summary, more transparent decisions are not only possible – i.e. the tools exist – but also desirable because they will mean fairer and more often efficient decisions.
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References


