Private sector participation in the water and sanitation sector: alternative options and measurement issues

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ABSTRACT This paper studies various aspects of the increasing role of private investment in the water services and sanitation (WSS) sector in developing countries. We start by surveying the different types of private sector participation (PSP) in the WSS sector, and the share of public and private responsibilities under each scheme. We then proceed by empirically testing the impact of PSP in the provision of water and sanitation on the average individuals' welfare with regard to water and sanitation. This paper shows that the private sector has the potential to generate a number of social and environmental benefits for a number of reasons, including its potential to increase efficiency within the sector and increase much-needed levels of investment. Poorer households gain access to affordable services from which they have long been excluded. Furthermore, adverse public health effects of inadequate service provision may be mitigated, and wastewater collection and treatment levels may be increased. The paper also illustrates actual case studies involving PSP in developing countries to present some of the actual improvements that the private sector has already generated, particularly the increased access to water and sanitation, and the rise in water use as suggested by our empirical part.

I. Introduction

In developing countries, the provision of water has traditionally been the responsibility of the public sector. The private sector was not directly involved in the water sector given the public good nature of water, its basic need characteristics, and the perception that the private sector would monopolize the service. Although technological progress has made it economically feasible to invest more in water delivery systems and increase water services and sanitation (WSS) coverage, there are still more than 1.9 billion people lacking access to safe drinking water, and more than 2.9 billion people lacking access to adequate sanitation facilities (Finger and Allouche, 2002). Consequently, millions suffer and die every year from water and sanitation related diseases. Poor management and inefficient investment in the WSS sector are often responsible for this situation, and numerous past attempts at reform have accomplished little.

More recently, however, there has been a clear move in developing countries towards accepting private service providers who compete for the right to finance, build, and operate WSS facilities in the form of Public-Private Participations (PPP's). [1] Silva, Gisele, Tynan, and Yilmaz

[1] The difference between PSP and PPP is that the former is a general term used to cover a wide range of private sector involvements. PPP, on the other hand, specifically refers to those forms of partnership in which the government establishes an arrangement with the private sector in which the private sector provides some form of investment. As such, PPP tends to exclude service contacts and management contract arrangements, but includes leases and concessions.

(1998) estimate that over 90 PPP's were adopted by 35 developing countries by the end of 1997, with total cumulative private expenditures in WSS rising from $279 million in the period 1984-1990, to $37.3 billion during the period 1990-2001.

The principal factor behind the significant rise in the number of PSP in developing nations is the desperate need for capital expenditures in the water sector. The combination of rapidly growing populations (especially in major cities), reductions in the assistance for water services by donor nations and international agencies, and decades of poor public management has rendered the public sector unable to raise the necessary funding for operation, maintenance and expansion projects. There are two arguments that are generally made for PSP in the WSS sector—one is technical and the other is an economic welfare argument.

From a technical aspect, proponents of PSP argue that the private sector is in a better position to undertake the type of investment necessary to expand, maintain, and operate water infrastructure. The cost of providing the service, especially to urban population, is expected to increase by as much as fourfold, rendering the public sector unable to keep up with demand. Many factors contribute to the anticipated increase in service cost (Briscoe, 1995). First, as the population becomes more urbanized, the existing low-cost technologies will not be able to absorb and serve dense population centers. Additional investment in the infrastructure will be needed. Second, many developing countries are categorized as either water-scarce or water-stressed countries. Even in countries where scarcity is not a problem at the national level, there are many examples of cases where scarcity at the local level, or various times of the year, does exist. Consequently, moving large quantities of water from areas where water is available to areas where it does not, requires a tremendous amount of investment. Add to this the fact that cities naturally resort to the least expensive sources of water first, and then move to more expensive sources as demand rises.

The second case for PSP in the WSS sector is that allowing for privately owned monopolies to operate, with strict government regulations, will result in an increase in economic welfare (Bhaskar, 1992; Briscoe, 1992; Caves and Christian, 1980; OECD, 1991; World Bank, 1992; Willig, 1993). The basis for this argument stems in part from the belief that involving the private sector reduces political interference in the decision-making process regarding tariffs and appointment of personnel, and provides much needed managerial autonomy. Secondly, transferring property rights from public hands to private hands minimizes cost and achieves efficiency gains. This is due to the fact that owners of factors of production in the private sector are few and easily identified, and thus they have the incentive to enhance efficiency in the production of goods and services. Thirdly, when the WSS services are in public hands, managers are tempted, and able, to prevent potential entrants from competing with them by forming a regulatory framework that would ensure maximum benefits to them. Finally, the private and public sectors differ in terms of funding sources. While the private sector raises its funding from the private financial market (which forces it to abide by the financial market's discipline), the public sector often gets its funding from the government. Even in cases where the public sector raises funds through the private capital market, these loans have to be guaranteed by the government or other lending institutions (i.e., the World Bank and the IFC). In either case, the discipline imposed by the financial market is lost.

It is important to note that shifting the management of water and sanitation to the private sector does not come without much criticism. One of the most commonly used arguments against PSP in the WSS sector is that involving the private sector in the provision of water and sanitation is detrimental to the welfare of the poor. The basis of this argument is that with privatization, the poor lose government subsidy, which they are eligible for under public provision of the service. Proponents of PSP provide a counter-argument by showing that since the poor are not linked to the water infrastructure, they end up paying between 5 to 100 times more for water than the rich, and, thus, it is the rich who benefit more from water and sanitation subsidies (Briscoe, 1995).

This paper aims at discussing various empirical and conceptual issues related to PSP in the WSS sector. More specifically, the objectives of this paper are:

- Provide a survey of the different types of PSP available for policymakers in developing countries;
- Empirically test the social benefit of PSP using an aggregated measure of an average individual's welfare derived from water and sanitation;
- Conduct a comparative analysis of actual case studies from developing countries where PSP has improved the provision of water and sanitation. The case studies presented are from Argentina, Gaza, Mexico, and the Philippines.

II. What are the Different Forms of PSP?

A wide range of options is available for PSP in the WSS sector. For a long time, France and the United States were the only countries with extensive private participation in the sector. More recently, however, developing countries have adopted such an approach, particularly in urban areas (see Table 1), and have started to accept bidding by private companies to reform their ailing water and sanitation infrastructures.

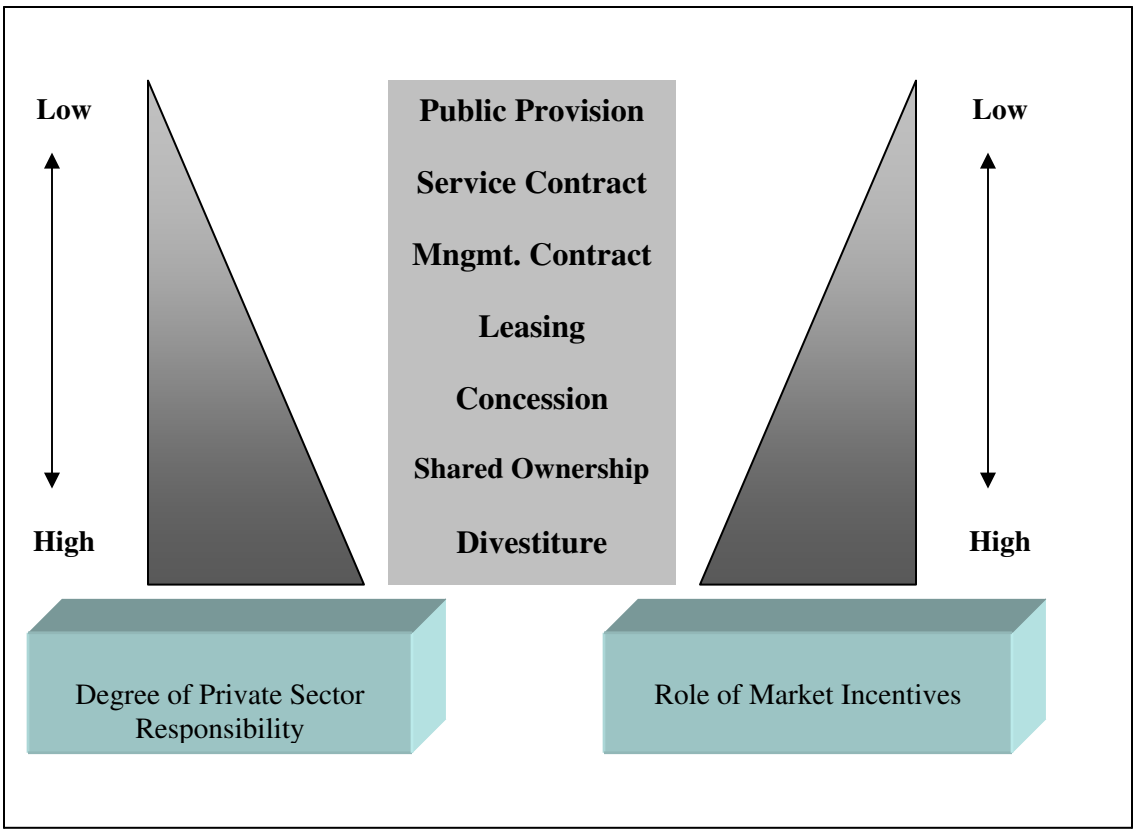
Table 1. Private Sector Projects in WSS Sector in Developing Countries, 1990-2001

Type	Number of Project	Dollar Amount (in $US)
Concessions	85	$25.1 billion
BOT/BOOT	71	$6.4 billion
Management Contracts	44	$0.18 billion
Divestitures	19	$5.6 billion
Total	*219*	*$37.3 billion*

Source: World Bank, PPI Project Database

There are many institutional options for PSP in the water sector. With each option come various degrees of responsibility assumed by the public and private sectors. These options range from almost completely public sector responsibility (i.e., management and services contracts), to joint responsibility (i.e., concessions, leases, and PPP's), to completely private responsibility (i.e., divestitures). (see Figure 1).

Figure 1. Types of Institutional Forms by Degrees of Public and Private Sector Participation



Source: Adapted from Kessides, 1993

The choice of participation is determined by the government, and is dependent on the state of the WSS sector, as well as the institutional and regulatory weaknesses, or strengths, in each country. The different options can be defined as follows.

- **Service contracts**. They are the simplest form of PSP. They involve a transfer, by means of a fixed-term contract, of responsibility for a specific service or infrastructure operation and maintenance. Service contracts are usually fairly limited in scope and cover specific activities, i.e., metering, billing, or equipment maintenance. The potential benefit of such arrangements are cost saving and efficiency improvement. Countries that have awarded such contracts include Chile, India, Jordan, Mexico, and Paraguay.

- **Management contracts**. The private sector assumes greater responsibility in this case. The public sector passes management and operational control of an enterprise to the private operator for an agreed upon period. These contracts transfer full managerial control to the private sector, with the freedom to make day-to-day decisions. The public sector retains full ownership and the responsibility of capital expenditures and maintenance, while the private company supplies only management and technical skills. Various compensation packages are used, which include annual fixed fee, a fixed fee plus cost, fee as a percentage of profit,

incentive payment based on increased production and profitability, etc. The incentive for the manager to increase efficiency is, therefore, dependent on the compensation package. Countries that have awarded these types of contracts include Dominica, Gaza, Mexico, Poland, and Trinidad and Tobago.

- **Lease contracts**. In this case, the government awards the private company an exclusive right (known as franchise or license) to use its facilities to conduct business for a stipulated period of time at a specified amount of rent. The ownership of resources remains with the public, but the private operator receives full operational and financial control of assets. Expenditures on fixed investment, such as system expansion, remains with the public sector. The private firm is responsible for financing working capital, maintaining and repairing assets in use, and finance capital with short production life. Under a lease contract, commercial risk arising from day-to-day operations can be transferred to the private company. Such arrangements provide the contractor with strong incentives to improve efficiency. The performance of the private sector is evaluated using monitoring and regulatory benchmarks outlined in the contract. Examples of lease contracts are found in France, Guinea, Poland, Senegal, and Spain.

- **BOT contracts**. Under these contracts, the government awards the private firm a long-term concession to build, operate, and transfer a water project, such as a water treatment plant or groundwater extraction and delivery. During the time of the concession, the government retains all regulatory and monitoring roles. The contract is sufficiently long to allow the private company to recover its capital expenditures. At the end of the contract, the private company transfers the system to the public sector often at no charge. The advantages of a BOT contract include the ability to attract private capital, improvements in system efficiency, and cost reductions. There are many variations to BOT concessions. Examples are BOOT (build, own, operate, and transfer), BBO (buy, build, and operate), BOMT (build, operate, maintain, and transfer), and BROT (build, rent, operate, and transfer). Argentina, China, Jordan, Malaysia, and Mexico are only a few examples of countries with major BOT-type projects.

- **Concessions**. These long-term contracts grant private firms an exclusive right to operate and maintain the entire system, as well as the responsibility for investment and system expansion. All financial and commercial risks are transferred to the private sector, but the duration of the contract is long enough to allow the concessionaire to recuperate all capital expenditures. The role of the government in this case is to maintain control over service provision through monitoring investment plans and their implementation, monitoring service quality, and regulating tariffs that the company collects directly from customers. To ensure compliance, the government can impose penalties if specific targets or standards established in the contract are not met. Examples of countries with long-term concessions include Argentina, Brazil, Ivory Coast, Morocco, and Philippines.

- **Joint Public-Private Ventures**. These arrangements entail the construction of a separate corporate entity in which the responsibility of service provision is shared by the public and private sectors. These agreements provide greater cooperation between the public and private sectors, which, very often, leads to efficiency enhancement through the use of private

managerial skills, the ability to raise funding from private sources, and through the application of risk management and market feasibility analysis. Furthermore, joint ventures allow the government to play a role that otherwise would not have been possible (i.e., seek profit, raise funds, avoid caps on public borrowing limits, etc.). Examples include Chile, Dominica, and Brazil.

- **Divestitures**. This means that the ownership and responsibilities are transferred to the private sector, with the government maintaining its regulatory control over the industry. The process can be achieved via the sale of shares, the sale of physical assets, opening a state-owned company to new private investment, and a management or employee buy-out [Vuylsteke, 1988]. There are many arguments highlighting the potential gains from divestitures both from theoretical (e.g., Vickers and Yarrow, 1991) and empirical (Galal and Shirley, 1994) perspectives. Examples of countries that have experimented with this option include Chile, England, Thailand, and Wales. Table 2 summarizes the responsibilities, scope, and usual duration of each type of PSP.

Table 2. Responsibilities of Different PSP Options

Option	Asset Ownership	Operation & Maintenance	Capital Investment	Commercial Risk	Usual Duration	Scope of Contract
Service Contract	Public	Public & Private	Public	Public	1-2 years	Meter reading, collection of bills, leak repairs, etc.
Management Contract	Public	Private	Public	Public	3-5 years	Full System
Lease	Public	Private	Public	Shared	8-15 years	Full System
BOT/BOOT	Private	Private	Private	Private	20-30 years	Bulk supply, wastewater treatment plant
Concession	Public & Private	Private	Private	Private	25-30 years	Full system
Joint Venture	Public & Private	Public & Private	Public & Private	Public & Private	Indefinite	Full system
Divestiture	Private	Private	Private	Private	Indefinite	Full system

Source: Adapted from Kessides (1993) and Saghir, Schiffler, and Woldu (1999).

III. Empirical Analysis of the Benefits of PSP

A question that would then arise is whether the privatization of the water and sanitation sector would be beneficial to current and future generations. Fortunately, a new measure of the 'utility' of an agent with regard to water, known as the Water Poverty Index (WPI), has been developed by Lawrence, Meigh, and Sullivan (2003) on which we can measure the effect of private investment in the water and sanitation sector. This index ranges between 0 and 100, covering 147 nations, and is composed of 5 categories. Each category is then composed of several sub-groupings ('water poverty' lessens as the index increases). As stated by the authors of the WPI, the purpose of the WPI is to ". . . express an interdisciplinary measure which links household welfare with water availability and indicates the degree to which water scarcity impacts on human populations. Such an index makes it possible to rank countries and communities within countries taking into account both physical and socio-economic factors associated with water scarcity." Table 3 illustrates the components of the WPI.

Table 3. The Make-up of the WPI

RESOURCES	• Internal freshwater flows • External inflows • Population
ACCESS	• % of population with access to clean water • % of population with access to sanitation • % of population with access to irrigation adjusted by per capita water resources
CAPACITY	• Income per capita • Under five mortality rates • Education Enrolment rates • Gini coefficient
USE	• Domestic water use in liters per day • Share of use by industry and agriculture adjusted by the sector's share of GDP.
ENVIRONMENT	• Water quality • Water pollution • Environmental regulation and management • Informational Capacity • Biodiversity based on threatened species
Note: The particular makeup of the sub-groupings will not be explained here, however, these details are fully explained and justified in the Lawrence, et al., paper (2003).	

The model we use is a very simple one primarily because of the size of the data set. Furthermore, we help to normalize our data by taking the natural logs of each variable. We run 6 regressions of the form:

$$\ln(WPI_i) = \alpha_{0r} + \alpha_1 \ln(PrivateInvestment_i) + e_i \quad (1)$$

$$\ln(Resources_i) = \beta_{0r} + \beta_1 \ln(PrivateInvestment_i) + u_i \quad (2)$$

$$\ln(Access_i) = \chi_{0r} + \chi_1 \ln(PrivateInvestment_i) + v_i \quad (3)$$

$$\ln(Capacity_i) = \delta_{0r} + \delta_1 \ln(PrivateInvestment_i) + r_i \quad (4)$$

$$\ln(\text{Use}_i) = \varepsilon_{0r} + \varepsilon_1 \ln(\text{PrivateInvestment}_i) + t_i \quad (5)$$

$$\ln(\text{Environment}_i) = \phi_{0r} + \phi_1 \ln(\text{PrivateInvestment}_i) + q_i \quad (6)$$

The variables above are the variables explained earlier, and e, u, v, r, t, and q, are normal, independent, and identically distributed errors. We assure ourselves of these probabilistic assumptions by first correcting for any mean heterogeneity through regionally-specific constants as defined by the Penn World Tables (PWT) 6.1. Fortunately, we were able to combine the effects of many regions, which greatly increased our degrees of freedom. We also test for omitted variables through the Respecification Error Test (RESET) developed by Ramsey (1969), for heteroskedasticity using the Cook-Weisburg (1983) test which has been shown to have relatively high power in small samples (Lyon and Tsai, 1996), and for normality using the Shapiro-Wilk (1965) test which has also been shown to have relatively high power in small samples (Shapiro, Wilk, and Chen, 1968). Table 4 summarizes the empirical results of regressions 1 through 6.

Table 4. Results from Regressing Models 1-6

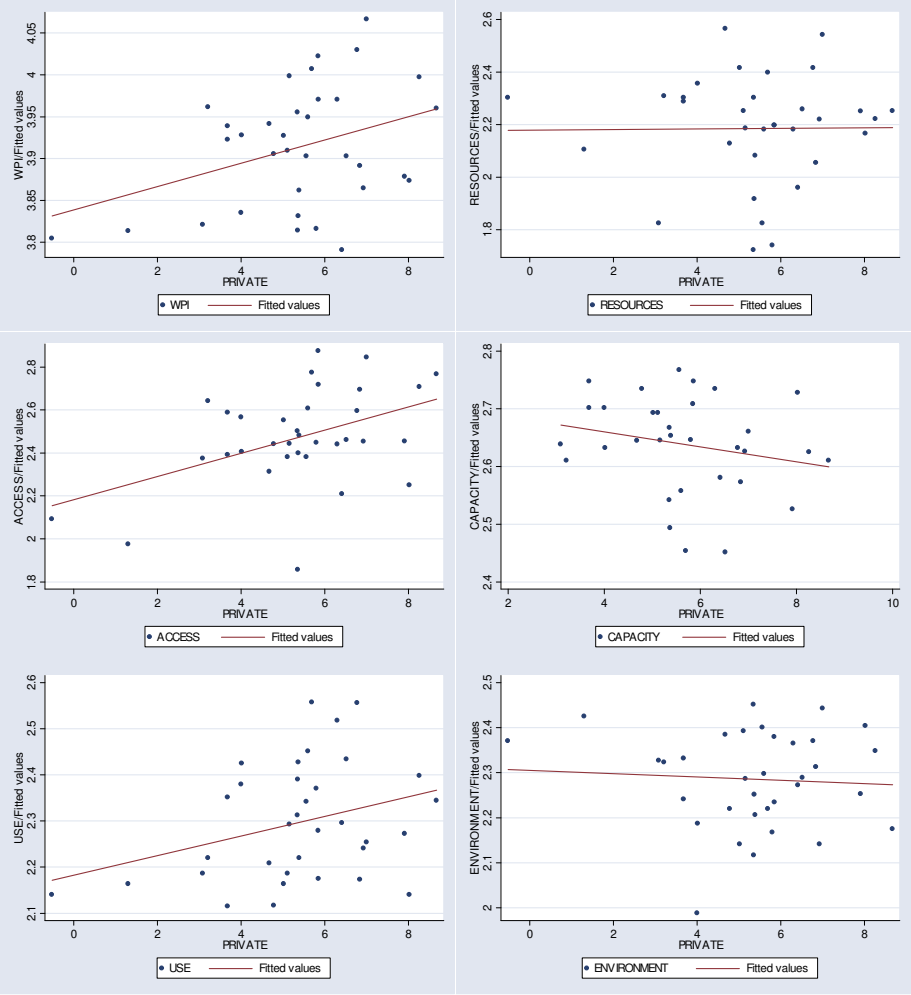
Model	WPI	Resources	Access	Capacity	Use	Environment
Private Inv	0.014 * (0.100)	0.001 (0.954)	0.054 ** (0.013)	-0.129 (0.250)	0.021 * (0.088)	-0.003 (0.731)
Constant	3.838 ** (0.000)	2.178 ** (0.000)	2.181 ** (0.000)	2.711 ** (0.000)	2.182 ** (0.000)	2.305 ** (0.000)
RESET	0.307	0.779	0.407	0.913	0.908	0.865
Cook-Weisburg	0.988	0.100	0.191	0.494	0.501	0.351
Shapiro-Wilk	0.593	0.087	0.168	0.212	0.428	0.318
Adjusted R^2	0.600	0.409	0.323	0.479	0.443	0.304
# observations	34	33	34	32	34	34
# Regions	4	2	3	2	2	3

Note: The estimate of the constant includes the control region of Africa. P-values are both displayed in the parentheses below each estimate, and in the rows containing the testing statistics. '# Regions' are the number of regions needed in the regression to mop up the mean heterogeneity, not including the control group which is in the constant term. Because of outlier complications in attaining our NIID assumptions, the country of Jordan was dropped from the Resources model, while Senegal and Mozambique were dropped from the Capacity model.

The first thing that should be noticed is that all models pass statistical testing of the normal, independent, and identically distributed assumptions even though the number of observations is small and the smallest and largest degrees of freedom for any model is 28 and 30 respectively. We find that private investment does increase access to water and sanitation and its use in a statistically significant fashion. On the other hand, private investment does not impact the environment, the extraction of resources, or the capacity as measured by accessibility through wealth.

In particular, our results show that doubling the amount of private investment on average will increase the WPI by 1.4%. This may not sound like much, however, being that the WPI essentially measures the utility of a typical economic agent with regard to water and sanitation--an ordinal measurement--this constitutes an overall improvement in utility. The increase in utility is dominated by the fact that doubling private investment returns a 5.4% increase in access and a 2.1% increase in use. Ordinary Least Squares fitted plots of these results are shown in Figure 2 for ease of interpretation. The natural log of each of the dependent variables, less the estimated regionally-specific fixed effects, are graphed on the vertical axis while the natural log of private investment is graphed on the horizontal axis.

Figure 2: Estimated Plots of WPI, Resources, Access, Capacity, Use, and Environment.



By using a broad index of individuals' utility with regard to water and sanitation, our empirical investigation finds that private investment in water and sanitation does not hurt the utility of a typical economic agent with respect to water, and actually increases accessibility to water and sanitation and its use. The next step, of course, would be to assess the impact of

private investment on each of the sub-groups that make up the WPI, however, this simple assessment does lend credence to the argument for more private sector involvement in water and sanitation resource management.

IV. Comparative Analysis of Case Studies

IV.1 Buenos Aires-Argentina

In an effort to stabilize its economy, the Argentinean government embarked upon a comprehensive privatization program during the early 1990s, including sectors such as the telecommunication, oil and gas, water and sanitation, and electricity sectors. One of the most prominent of these projects occurred in 1993, when an international consortium (Aguas Argentina) won a 30-year concession to provide potable water and sanitation services for the City of Buenos Aires and 13 other municipalities. The contract was awarded on the basis of lowest tariff bid, with the winning contract bidding 27.4% reduction from existing tariff.

Before 1993, the provision of WSS services was the responsibility of a public enterprise, which, just a year before, spent more than 80% of its budget on operations and less than 5% on new investment. This slowed expansion of services and system maintenance, and resulted in four major social and environmental problems (Mazzucchelli, Pardinas, and Tossi, 2001). First, an estimated 2.2 million m^3/day of untreated household wastewater and 1.9 million m^3/day of industrial effluent flowed across the city's main source of potable water, hence polluting surface water and groundwater sources. Second, service coverage was only 70% of the population for water and 58% for sewerage services, with an unevenly distributed coverage (only 55% and 36% of the poor population had access to clean water and sanitation, respectively). Third, even those who were connected to the service had to experience the inconvenience of the varying quality of services due to insufficient pressure and contamination. Finally, due to high levels of waste by users, unmetered services, and water loss from the distribution system, unaccounted-for-water (UFW) was around 45%.

The improvements in the WSS sector brought by the concession are summarized in the following points:[2]

- Increases in investment ($1.2 billion in new capital investment) allowed for system expansion and for rehabilitation and maintenance of the existing infrastructure.
- Improvements in the quality of potable water and sewerage systems.
- Increased water connections by 30% and sewerage connections by 20%.
- Constructed 3,200 kilometer (km) of new water network and rehabilitated 1,100 km more.
- Constructed 1,500 km of new sewerage network.
- Raised enough capital to construct a wastewater treatment plant to treat domestic and industrial effluents.
- Increased access to services for 110,000 people living in poor neighborhoods.

[2] See Mazzucchelli, Pardinas, and Tossi, (2001), and Saghir and Taylor (1999) for additional information on the impact of the concession.

- Water and sewerage rates remained below their pre-privatization levels.
- Achieved significant reductions of UFW (from 45% to 35% only after five years into the concession).
- Promoted and supported significant technical research, including environmental studies on groundwater, environmental evaluations, etc.

The concessionaire and the government are still dealing with a number of problems, which arise from the fact that the expansion process has been slower than anticipated due to the great deal of rehabilitation work that was required initially, and to the high levels of non-payments. These problems are summarized in the following points.

- Many poor neighborhoods are in zones that will receive service in 10 to 20 years.
- Water and sewage services are provided separately, and the latter are not as prevalent as the former.
- The tariff structure is equitable, however it provides no incentives for greater expansion to disadvantaged areas or for efficient water use.
- There are no clear provisions in the contract for education about public health and hygiene issues.
- The concessionaire has the right to report illegal industrial dumping into the watercourse, but it does not have the power or incentives to exercise its rights over the service area.

IV.2 Gaza Strip

In 1995, as the Palestinians and Israelis were negotiating an interim peace agreement, WSS services were reaching crisis levels. The population in the narrow strip was 900,000 people, with a population density of 2,500 people/km^2. A shallow aquifer is the region's only source of water, which was mined at a rate twice as big as its natural recharge rate, causing the quality of the remaining groundwater to deteriorate. Prior to 1995, 4 different municipal departments and a 12-village council were in charge of water services in this relatively small area—a rather fragmented system. Data on water production and consumption was non-existing, but estimates put average daily per capita water supply at 70 liters—an average far below the levels of other countries in the region. It was also estimated that as a result of distribution inefficiencies, illegal connections, nonfunctioning meters, and high non-payment rates, UFW reached as high as 50% of total delivered water supply (Saghir, Sherwood, and Macoun, 1998). Only about 25% of the population had proper sewerage coverage.

All parties involved recognized that only the private sector can provide an immediate fix to the rapidly deteriorating water situation. More specifically, a short-term management contract was the only feasible option because (i) long-term investment in the region was seen as a risky venture, (ii) limited information on water consumption and production made it difficult to form any kind of long-term expectations regarding financial returns, and (iii) water tariffs were too low for a long-term concession contract based on revenues to succeed. Consequently, in 1996, a consortium led by Lyonnaise des Eaux was awarded a 4 year service management contract to improve water service. The contract fee is split between a fixed annual payment of $6 million

and an additional performance payment (up to $3 million over the 4 years) based on the achievement of performance indicators.[3]

The service contract was awarded to achieve the following specific objectives:

- Increase the quantity of available water by improving distribution efficiency.
- Improve the quality of water and wastewater effluent.
- Improve the management of WSS services through better operations, revenue collections, and customer services.
- Strengthen WSS institutions through long-term planning and training.

In 1997, only 2 years after awarding the service contract, the private sector was credited for a significant amount of improvement in the WSS sector (Saghir and Taylor, 1999). The following is a summary of improvements:

- UFW dropped from 50% to 31%.
- Water consumption increased by 50%.
- Total revenue collected in 1997 was $30.7 million, compared to only $1.1 million before the contract was awarded.
- Authorities identified 11,000 illegal connections (although little action was taken to rectify the situation).
- Contract operators replaced 10,000 connections, repaired and/or replaced 15,000 meters, and mapped 80% of the network infrastructure.

IV.3 Manila-Philippines

In 1997, Metro Manila Water and Sewerage System (MWSS), was successfully privatized. The MWSS service area serves 11 million people living in 8 different cities and 29 municipalities. During that time, the public corporation pumped 3 million m^3 of water per day to 850,000 water connections, raising around $150 million of annual revenue per year (Saghir and Taylor, 1999).

Prior to privatization, the delivery system was poorly managed due to lack of adequate investments. As a result, only 67% of people were properly connected to the water network, and only 8% had sewerage connections. Those without water supply connections relied on private groundwater wells to satisfy their basic needs—a fact that caused depletion of groundwater aquifers in the service area. As for those who were connected, they had to endure a service that was characterized by low water pressure and intermittent supply, averaging only 16 hours/day. Moreover, the MWSS area had the highest UFW among all other main cities in Asia, reaching a staggering 60% of water production. Prior to 1997, there were 9 employees per 1,000 connections, making the service area also among the highest in Asia[4] (McIntosh and Yniguez, 1997).

[3] Operating investment funds were made available by the International Finance Corporation (IFC) and the World Bank.
[4] The ratio in Bangkok is 4.6, Jakarta 7.7, Singapore 2.0, Kuala Lumpur 1.1.

The form of private sector participation chosen was a 25-year concession agreement, which transferred overall responsibility for operation, maintenance, and investment to a private contractor. The objectives of the concession are to improve the standard of services, expand coverage, increase WSS system efficiency, and eliminate fiscal burden on the government. The MWSS area was divided into two zones (West and East Zones) to promote competition and to establish effective regulations. Two separate contracts were awarded, each covering a zone. They were awarded to companies with the lowest submitted tariffs in a competitive fashion. The West Zone contract was awarded to a company with a tariff bid of 5 pesos,[5] and the East Zone's winning contract was for a tariff bid of 2.32 pesos (compared to a pre 1997 tariff of 8.78 pesos in both zones). Both agreements required the private companies to initially charge the bidding water tariff in the first year, but allowed them to charge an increasing-block tariff thereafter, with industrial and commercial use tariffs considerably higher than those for domestic water uses (McIntosh and Yniguez, 1997). The Regulatory Office, which is a governmental entity, must approve any future adjustments to water tariffs.

As of 1998 (just one year after the inception of the concession), results show significant improvements in the WSS sector in the MWSS service area (Saghir and Taylor, 1999).

- Average water rates decreased from $\$0.23/m^3$ to $\$0.061/m^3$ in the East Zone and \$0.131 in the West Zone.
- Water users pay about \$64 million less per year.
- Population served increased from 7.15 million to 7.51 million.
- UFW declined from 60% to 36% and 59% in the East and West Zones, respectively.
- Productivity of leak repair, connection and meter installation staff increased significantly.
- Significant advances made in apprehending and regulating illegal connections.
- About 25% reduction in the number of personnel per 1,000 connections.

IV.4 Mexico City-Mexico

The Mexico City Metropolitan Area (MCMA) comprises two political administrative entities—the Federal District and the peripheral urban municipalities of the State of Mexico. Approximately 98% and 94% of the population are connected to water sources and sewerage, respectively. The Daily per capita rate of water supplied dropped from 400 liters during the period 1984-1990 to 360 liters during 1995-2000. This is attributed to the significant rate of UFW (37%) and to the tariff structure in the area which gave users no incentives to conserve the resource. In the MCMA, two-thirds of the water supply comes from the aquifer underlying the city. The rest comes from external sources located about 130 km away from the city center and at a lower altitude (making pumping water rather a costly option). As a result of over-pumping the aquifer, the city center has sunk by several meters in the last decade (Hazin, 2001).

In 1993, the government awarded 4 service contracts to 4 different consortia that were required, by law, to maintain majority Mexican ownership. The service contracts were designed to overcome some significant deficiencies in the WSS sector, including an inadequate customer database, poor tariff structure, and deteriorating water and sanitation infrastructures. Each contract was designed to serve a particular zone in the MCMA. The rationale for dividing the

[5] On March 15, 2004, the exchange rate was \$1 to 56 Philippine pesos (PHP).

total area into zones is to foster a certain degree of competition, and to ensure that each private operator would use the best technologies available (Saade, 1997). Furthermore, a phased approach was implemented in all 4 contracts. Phase 1, which started in 1994, required companies to install meters, create a customer database, and to draw up network plans. Phase 2 followed Phase 1 and included meter reading, meter maintenance, assessment and distribution of bills, and added new connections. Phase 3 began in 1997 and consisted of operating, maintaining, and rehabilitating the water distribution and drainage networks. The government paid companies for each activity during each phase.

Preliminary results indicate modest benefits generated by the service contracts (Diaz, 1997). The following is a summary of benefits:

- Before awarding the service contracts, water tariffs were fixed and highly subsidized. After that, authorities adopted a new tariff structure, whereby customers pay more for each additional quantity of water used (increasing-block price structure).
- The percentage of UFW declined from 37% in 1993 to 30% in 1997.
- Metering efficiency (water metered/water distributed), which was only 68% before 1993, has increased.
- Average daily per capita water supply remained at 360 liters.
- Following the establishment of billing and metering, domestic water consumption has decreased by an average of 15% in all 4 zones.
- Due to the availability of more up-to-date information, the number of paying customers for the services increased by 30%.
- In 1994, the poorest segment of the city's population spent 4.5% of its budget on water services. In 1996, the same population segment spent only 3% of its budget on water. This is seen as an equity enhancement result.

There are, however, various shortcomings that are due to flaws in the contract design and lack of proper institutional and regulatory arrangements. Some problems are summarized below:

- Even with rising water tariffs, water revenues still do not cover even 50% of the cost of pumping water into the city, let along the opportunity cost of water.
- The groundwater aquifer below the city is still being exploited at alarming rates.
- In theory, splitting the contract intro 4 sub-contracts was done to provide the regulator the freedom to set benchmarking performance indicator. In practice, however, this was a regulatory nightmare, especially when authorities attempted to compare the performance of the contract across zones.

V. Conclusion

This paper studies various aspects of private sector participation in the water services and sanitation sector in developing countries. The wide range of private sector involvement in the WSS sector is discussed thoroughly to show the different options available to governments who seek to improve the provision of these services. These options vary in terms of the amount of shared responsibility, capital ownership, duration, scope, etc.

Regardless, assuming that a country adopts at least one of the PSP forms, the empirical part of this paper confirms that there is a positive impact of PSP on the average individual's utility with regard to water and sanitation. Specifically, our empirical investigation finds that private investment in water and sanitation increases the accessibility and use of water and sanitation services, without harming the environment.

The last part of the paper is an attempt to show four case studies on PSP in four different countries. This section shows that each case of PSP is unique, depending on countries' specific attributes and the WSS sector situation. Results from all case studies show an overall improvement in the provision of water and sanitation, and the ability of the private sector to attain the specific contractual objectives agreed upon with the government. These case specific results reaffirm our empirical results.

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