Stay Public or Go Private?

A comparative analysis of water services between Quito and Guayaquil

Grupo FARO – Fundación para el Avance de las Reformas y las Oportunidades

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INTRODUCTION

Many Latin American countries face similar water problems: deteriorating systems and networks, lack of access to water and sewage for many of the populations' poorest and governments without the resources or expertise to invest in change. Unfortunately, there is little consensus on how to improve. Many countries, including Ecuador, have embarked on various forms of privatization to increase investment in infrastructure and improve service provision and water quality. However, water has not been privatized without criticism.

In hopes of clarifying the true impact of water privatization, an issue where ideology often overrides facts, researchers have implemented numerous studies. Unfortunately, results remain contradictory. On one hand, the World Bank states that the number of water connections in Latin America has increased considerably since the days of privatization, and that the venture as a whole has had "no major adverse impacts on poverty and inequality" (D. Leipziger, 2004). A number of authors have reported large gains in productivity and profitability associated with privatization in other sectors (Megginson et al, 1994; Barberis et al, 1996; Frydman et al, 1999; La Porta and Lopez-de-Silanes, 1999; inter alia). There is evidence which points to privatization's achievements in increasing investment and productivity as well as improving access to poorer communities. In addition, privatization is shown to have improved health statistics. For example, a study, which focused on the correlation between water privatization and child mortality in Argentina, found that expansion of water hook ups under privatization of water services was associated with a reduction in child mortality of 8 percent. Moreover, most of the reduction occurred in low-income areas (26 percent), where the network expansion was greatest (S. Galiani et al 2002).

On the other hand, there have been many examples across the world in both developed and developing countries where privatization of water and sewerage has faced serious challenges and led to little, if any, net improvement in the service provision. For example, IMF structural adjustment reforms lead to water prices in Cochabamba, Bolivia's third largest city, rising by as much as 200 per cent, provoking widespread protests. The average water bill was estimated to equal 22 per cent of a monthly wage of a self-employed man and 27 per cent for a woman. In addition, international reviews in

developed countries in Europe and the Unites States do not find clear cost savings with privatization (Boyne, 1998; Renzetti and Dupont, 2003; Hodge, 2000) and privatization rates among municipalities in the United States have actually fallen since 1997 according to the International City/County Management Association (Warner and Hefetz 2004). City managers cite problems with service quality and lack of cost savings; and statistical analysis of this reversal finds that problems with monitoring are key (Hefetz and Warner, 2004). Even in the United States, a region with good markets and government accountability systems, privatization has not had strong results.

In light of contradictory evidence on effects of privatization, we decided to take a closer look at water providers in two cities in Ecuador, a country that started late in privatization endeavors but has not escaped the controversy.

Guayaquil, the largest city of Ecuador (2.5 million as of 2000), struggled to provide adequate water and sewerage services to its residents in the early 1990s. At that time, the municipality ran water and sewage companies, coverage rates were dramatically low and their systems were in a state of near collapse. In 1994, the municipal government set into motion a process of restructuring the public water and sewerage companies and began to lay the groundwork for what would lead to the privatization of the sector. In 2001, the municipal water regulator signed a 30-year integrated concession with Interagua, a subsidiary of the International Water Group. This concession handed over commercial risk and responsibility for the operations, maintenance and administration of all potable water and sewerage services in Guayaquil.

In the second largest city of Ecuador, Quito, water service providers have always been run under the direct authority of the municipality. Although historically better performers than public companies in Guayaquil, municipal water and sewage companies in Quito also faced difficulties in financial management in the early 1990s. Instead of pursuing privatization, reforms to create more business-oriented practices (such as cost-savings and trainings on work ethic) were introduced.

In this study, we measure several indicators of water coverage, quality, and prices in both cities, both before and after privatization of water services in Guayaquil. We then compare changes of these indicators (before and after privatization) between the two cities to establish an association between differences and the privatization of water

services. The type of data sources that we use allow us to specifically control for income and, thus, evaluate how these indicators have changed, particularly, among the poor.

To assess how coverage levels have changed in Quito and Guayaquil, we gathered data from two national income and expenditure surveys that were administered in both cities in 1995 (before concession of water services) and in 2004 (after concession). Then, we use a binary probit model and our database to identify the conditional probability that a household has access to water services. The probit specification includes controls for several demographic variables, year and city fixed effects, and a dummy variable that takes the value of one if water services are provided by a private company. Because we seek to identify changes in the coverage level among the poor, we divide our population by per capita income quintiles, and estimate the model for each of these quintiles. Our estimates provide evidence that, in Guayaquil, households in the lowest income quintile have a smaller chance of receiving water services after concession. For instance, the likelihood that these families have access to water services decreased by approximately 7% in the last decade. Furthermore, when comparing changes in water coverage levels in Guayaquil relative to Quito, we find that, after privatization, a household in the lowest income-quintile in Guayaquil had a 13% lower probability of receiving water services than a similar household in Quito. These findings may suggest that, in Guayaquil, water coverage among the poor has decreased over the past ten years, both within the city and also relative to Quito.

To explore if there have been changes in the quality of water services in Guayaquil relative to Quito after concession, we use a detailed household employment survey that contains information on individual's perceptions about changes in various aspects of water quality over the past six years. In this survey, households were asked their opinion about changes in water services (quality, pressure, and continuity) over the last six years. The survey was representative in both cities and included detailed information about household demographics, income and employment. We analyze this data using both an ordered probit and a linear model. The dependent variable consists of the responses to our categorical variable, while the independent variables include a detailed set of controls for demographic characteristics, income, and a city dummy variable. Our results suggest that, on average, the perception about how water quality and

water continuity has changed over the last six years in Guayaquil does not statistically differ from the same perceptions in Quito. The poorest quintile households in both cities consistently think that quality has increased. This is not the case, however, with the perceptions about water pressure. In all specifications, households systematically perceive that water pressure in Guayaquil has worsened relative to the same perceptions in Quito.

To have a closer look at the current quality of water in Guayaquil, we describe the chemical composition of approximately 250 water samples in Guayaquil taken from October 2005 to January 2006 and explore if there are any systematic differences in the amount of chlorine and water clarity between poor and wealthy neighborhoods We find that, generally, wealthier areas had higher levels of chlorine and greater water clarity than poorer sectors. However, those differences are not statistically significant. Another important finding is that water quality was tested at the highest rate in the richest areas and the number of sites tested falls steadily as the poverty level increases.

Finally, we analyze the evolution of water prices in Quito and Guayaquil over a ten-year period (January 1996 to July 2005). We find that after the concession, both in nominal and real terms, the average price of water in Guayaquil is higher and has increased at a faster rate than in Quito.

If Quito and Guayaquil were identical cities and the privatization of water services was randomly assigned to this latter city, these estimates would measure the effects of privatization on water coverage, quality, and prices. This is, of course, not the case. Quito and Guayaquil are radical different cities and, this is particularly true for water provision. For example, due to geographical differences each city faces different constraints. Quito has a more complicated system to carry water from its diverse sources to the city. Guayaquil, on the other hand, only has one source but due to its flat terrain must invest a higher amount of resources to pump water to its residents. Furthermore, water sources in Quito are much cleaner that that of Guayaquil. Other differences in the idiosyncratic nature of these two cities (such as social and political culture) make water companies in both Quito and Guayaquil difficult to compare. It is important to understand these differences to make an appropriate interpretation of the above results.

We implement an institutional analysis of costs, quality and performance to explain why Quito and Guayaquil have had such drastically different experiences in water provision and to explain that there may be many other factors, other than "privatization", that explain differences in the indicators mentioned before. While it is tempting to compare water indicators between Quito and Guayaquil, it is clear that, through this exercise, the causal effects of privatization on performance cannot identified.

The rest of the document is organized as follows. The first section provides background about the history of water companies in Quito and Guayaquil. The second section describes the methodology and results of the quantitative analysis. The third section presents the institutional analysis of both companies.

I. SOME FACTS ABOUT WATER PROVISION

Guayaquil

As the largest city in Ecuador, with a population of 2.5 million, Guayaquil has long struggled to provide adequate water and sewerage services to its residents. In the early 1990s, its systems were in a state of near collapse. Financial mismanagement, inadequate maintenance and investment and a history of overstaffing and political appointees all burdened its public utilities companies. Heavily indebted and unable to provide basic services to the wave of unplanned communities that emerged with the construction of the *perimetral* (a highway that circles the city to alleviate vehicle congestion), only 64% of the population had access to water service and only 46% to sewerage (P. Constance, 2003). Poor communities in Guayaquil suffered disproportionately. With such a low coverage rate, marginal communities were almost universally excluded from the official network and left with no choice but to purchase water from *tanqueros* (private water delivery trucks) resulting in their paying 125 times more for water than those connected to the system and often having to dedicate up to 25% of their income on water alone (Ochoa and Prieto 1995).

1) The First Steps toward Privatization

Recognizing a need for change, in 1994 the municipal government set into motion a process of restructuring that fundamentally changed the face of public utilities in Guayaquil. It merged the two previously separate public water and sewerage companies into one under the auspices of ECAPAG (Empresa Cantonal de Agua Potable y

Alcantarillado de Guayaquil) and began to lay the groundwork for what would lead to the privatization of the sector.

Upon the completion of the merger in 1996, ECAPAG set out to significantly reshape the provision of water and sewerage services. By the late 1990s it had streamlined staffing, created a division to respond to customer questions and complaints and had improved efficiency in the operation of its services. The new ECAPAG began to expand distribution networks to marginalized areas of the city, rehabilitated treatment plants, purchased new, top-of-the-line equipment and completed a process of extensive administrative and operational modernization.[1]

Although these public system reforms were substantial, the level of indebtedness and the history of poor follow-through on loan obligations of the previous public utilities companies led international lenders to refuse access to credit for much-needed infrastructure construction without the significant involvement of the private sector (Santos 2005).[2] While from its inception it was understood that ECAPAG would work towards implementing the long-term goal of privatization, it was in 1995 that the ECAPAG directory officially approved the implementation process. In October of 1997, Ecuador signed a loan contract with the Interamerican Development Bank (IDB) to finance the improvement of water and sewerage services in Guayaquil; a contract that was contingent upon the opening of the sector to private concession. The loan granted by the IDB covered three principal areas: 1) the concession process; 2) the transformation of ECAPAG into a regulatory body; and 3) the rehabilitation of the potable water and sewerage systems.[3]

2) The Concession with Interagua

In 2001, ECAPAG signed a 30-year integrated concession with Interagua, a subsidiary of the International Water Group. This concession handed over commercial risk and responsibility for the operations, maintenance and administration of all potable water and sewerage services in Guayaquil, while maintaining ECAPAG as a regulator to ensure contract compliance. Key elements of the contract signed with Interagua include[4]:

[1] ECAPAG Informe de Gestion 2001-2005, 14.
[2] Interview with ECAPAG General Manager Ing. Jose Luis Santos conducted on August 16, 2005.
[3] ECAPAG Informe de Gestión 2001-2005, 15.
[4] List of contract obligations taken from the ECAPAG Informe de Gestión 2001-2005, 12.

- Operation and maintenance of potable water and sewerage systems.
    - Investment to improve quality of service.
- 5 and 10 year goals to improve minimum pressure, provision, and water quality.
    - Investment to expand the system in the first 5 years.
    - Obligation to install 55,238 new connections of potable water and 55,238 new sewerage connections in the marginalized sectors of the city.
- Obligation to invest $520 million in infrastructure, in addition to investment in rehabilitation and new connections, by the end of the 30 year contract.
- Obligation to install the number of new connections of potable water and sewerage necessary to reach 95% coverage of potable water and 90% coverage of sewerage by the end of the second fifth year period.
- Beginning in the second fifth year period, obligation to implement the new treatment plants and macro system of drainage as dictated by the Master Plan.
- Obligation to respect and apply the pricing structure established by ECAPAG for the first 5 years.
- The full inversion during the 30 years of contract should reach approximately $1000 million.

The terms of the concession were specifically designed to avoid some of the pitfalls that arose under privatization schemes in other countries and, comparatively, can be considered relatively "poor friendly" in terms of coverage, price and quality. Recognizing that one of the greatest problems facing Guayaquil historically has been the lack of inclusion of poor communities in the water and sewerage networks, the concession contract specifically requires new connections to be provided to these communities at no cost. Emphasis in the first five years of the contract is placed on Interagua providing a minimum number of these new connections and marginal communities are identified and incorporated according to an official expansion plan (*plan de expansión).*

In order to avoid public backlash, as well as the burden of sudden price hikes, water tariffs are also strictly controlled for the initial years of the contract. The current tariff structure was designed and implemented by ECAPAG in the years prior to privatization

to both more adequately cover the real costs of the system and to disassociate the changes in tariff structure from the privatization process so as to mitigate potential public backlash. For the first five years of the contract, the concessionaire is bound to uphold the pre-established pricing structure (barring any unforeseen changes on a national level that influence operational costs).

The concession contract also controls for water quality with samples in pressure and quality taken throughout the city and submitted to a number of laboratories for testing. Samples are taken by both Interagua and ECAPAG and must fall within the guidelines stipulated in the contract or else sanctions and monetary fines can be imposed.

3) Public Response to the Concession

While in the initial years of the concession, there appeared to be very limited negative public opinion about the process, the tides have recently turned and the debate has become much more polarized. An increasing number of complaints have been coming out of marginal communities regarding poorer water quality and charges for services they do not receive. For example, complaints of poor water quality have been increasing in marginal communities in Guayaquil. Despite the standards for pressure and quality stipulated in the contract, residents of *Guasmo Sur*[5] consistently complain of turbid, foul smelling water that is not fit for consumption and residents of *Suburbio Oeste* have struggled through both a hepatitis outbreak and periodic issues of decreased chlorine content/increased fecal content in the samples from their sector (Comisión de Control Civico de la Corrupción 2005).

In early 2005, the *Observatorio Ciudadano de Servicios Públicos*, a citizen watchdog group, was formed in an attempt to monitor the conduct and compliance of the concessionaire and regulator and to ensure a basic level of public and citizen accountability in the provision of the public good. Since their establishment, this group has issued numerous reports and forums analyzing and critiquing both Interagua's compliance with the contract and ECAPAG's capacity as a regulator. In an attempt to better measure public opinion on issues related to water provision and public participation, in November 2005 the Observatorio organized a *Consulta Ciudadana* in which they polled over 40,000 citizens, primarily from marginal sectors. Although the

[5] Guasmo Sur is a low income sector located in the southern part of the city.

poll was voluntary and administered only in certain sectors of the city, the results of those that were polled overwhelming demonstrated a desire for systemic change and increased citizen participation (See table 1).

Critiques of the services rendered by Interagua have also come from recent reports issued by the governmental watchdog entities the *Defensoria del Pueblo* and the *Comisión de Control Civico de la Corrupción* (CCCC); both of which focused investigations on the issue of water quality in Suburbio Oeste. In addition, from May to October of 2005 alone over 400 articles appeared in the Guayaquil press covering the issue of water.

Quito

Water service providers in Quito have always been run under the direct authority of the municipality. EMAAP-Q, the municipal company that runs water and sewage services in Quito, was created in the mid 90s by combining the former public water and sewage companies. Although EMAAP-Q is viewed within and outside of Quito as an example of public service done right, water provision has not always been so successful. In the 80s and early 90s, it faced difficulties in financial management and was not meeting citizen needs. However, reforms to create more business oriented practices, which concentrated on cost-savings and work ethic, increased efficiency and in turn, coverage.

EMAAP-Q's has a governing board, on which the mayor sits, and a Contracting Committee to deter corruption. The departments of Engineering, Sales and Operation and Maintenance are in charge of the production and distribution of water.

II. QUANTITATIVE ANALYSIS

In this section, we analyze various indicators for water coverage, price, and quality in Quito and Guayaquil over the last ten years (1995-2005).

Coverage

To explore household water coverage, we used data from two national income and expenditure surveys. Each survey consists of one representative (cross section) sample of the urban population (about 12 cities) in Ecuador and was conducted by the

Ecuadorian Institute of Statistics (INEC).[6] The first survey took place during August 1994-August 1995, and the second one was performed in 2004. The surveys provide detailed information about household sources of income and expenditures for each respondent.[7] Descriptive statistics of this database is presented in Table 1.

Our compiled database is a representative sample of the population of Quito and Guayaquil. For example, our 1994 sample consists of 1737 respondents (households) in Quito and 1713 in Guayaquil, and the sample size of the 2004 survey is significantly higher (more than 40%) in both cities. We measure a household's real income in terms of the number of representative baskets of goods and services (BGS) that it could buy with its total earned income.[8] Our data suggests that, in the last decade, the mean household income (in real terms) decreased by about 4% in Quito and 20% in Guayaquil, respectively.

We also collected other information that describes the household's socioeconomic status, such as the share of expenses allocated towards alimentation, the number of members living in the same household, the number of children below the age of five, and the education of the head of the household. The percentage of expenditure used for alimentation is an indicator that measures household poverty – the higher the percentage, the more probable that the household is poor. Household size and number of children under the age of five are also important variables because they are generally negatively correlated to income.

We use a binary probit model and our survey data to identify the conditional probability that a household has access to water services in Quito and Guayaquil. Formally, let P_{icy} be the probability that a household i has water coverage in city c in year y,

$$(1) \qquad P_{icy} = \Phi(X_{iyc}\beta + \delta P + \lambda_y + \mu_c),$$

[6] In Spanish, INEC stands for "Instituto Nacional de Estadísticas y Censos".
[7] The INEC analyzed the structure of the households' expenditures to established a representative basket of goods and services and to compute the Ecuadorian Consumer Price Index in both 1995 and 2004.
[8] The monetary value of the set of goods and services that a representative household spends to satisfy its basic needs is computed by the INEC on monthly basis. The monetary cost of this set of goods and services was $362 and $387 in 1994 and 2004, respectively. We use the INEC's estimates to compute the real income of a household in our sample.

where X is a vector of control variables such as the household's education level and number of members; P is a dummy variable that equals one if the water service provider is managed by a private firm (that is, P equals one if an individual lives in Guayaquil in 2004); $c=\{Quito, Guayaquil\}$, and $y=\{1994\ (before\ concession), 2004\ (after\ concession)\}$; $\Phi(.)$ is the standard normal cumulative distribution function; and $\beta, \delta, \lambda,$ and u are parameter values.[9]

To identify changes in the coverage level among the poor, we divide our population by per capita income quintiles, and estimate equation (1) for each of these quintiles. These binary models are estimated with our sample data and the results are presented in Tables 2 and 3. We show both the value of the coefficients as well as the marginal effects (evaluated at the sample mean of the independent variables in each income quintile), and present two different cases: a) an analysis of Guayaquil alone before and after concession, and b) an evaluation of the "difference-in-difference" effect of the concession on water service coverage.

Guayaquil: Before and After Concession

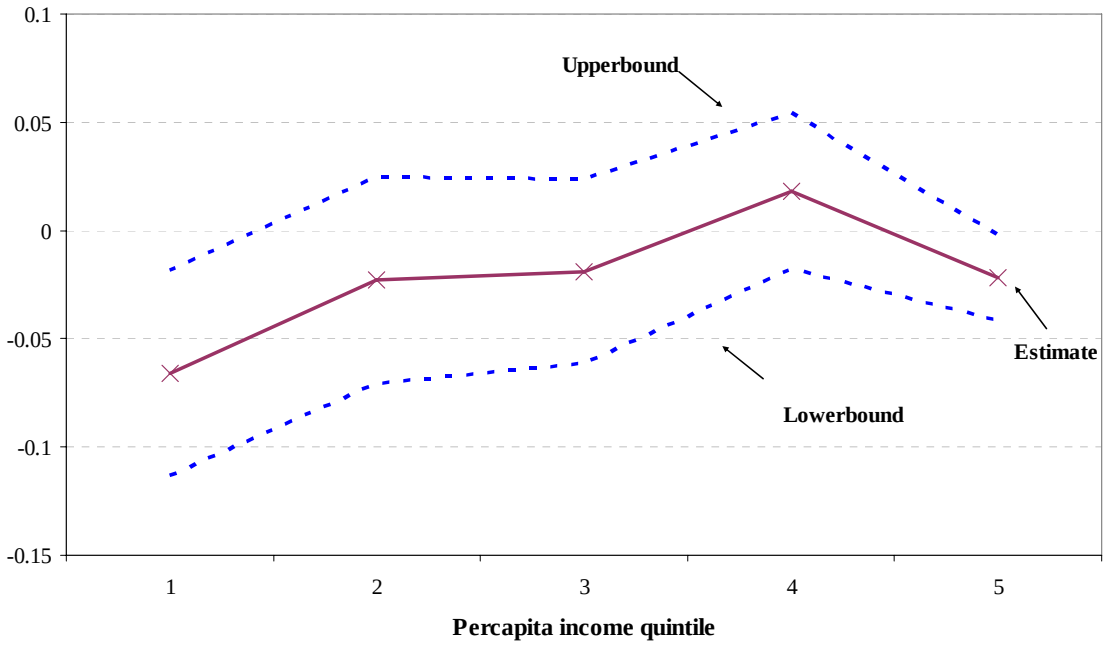
In this section, we focus only on Guayaquil and estimate equation (1) using both the 1994 and 2004 surveys. Results for our estimates are presented in Table 2. In all income groups, the education level of the head of the household has statistically significant effects on the probability of having access to water services. This variable is most likely capturing the unobserved location of the housing unit, since higher educated households tend to live in neighborhoods that have better public services. Our results also provide evidence that, with the exception of the richest quintile of the population, families that have children under five years old have less chance of having water in Guayaquil. This result is disturbing considering that the health of young children is jeopardized by the lack of service.

The coefficients on the variable "privatization fixed effect" suggest that, on average, there are not significant changes in the probability of having access to water

[9] Although the actual concession occurred in 2001, we refer to 1994 as "before concession" because it was the year before ECAPAG started making drastic public sector reforms in preparation for the hand-over to a private company.

services before and after concession in Guayaquil. There is evidence, however, that households in the lowest income quintile have a smaller chance of receiving water services after concession. For example, the likelihood of these families obtaining water services decreased by approximately 7% in the last decade (Graph 1).

Graph 1
Likelihood of having access to water services in Guayaquil in 2004 relative to 1994 (before and after privatization)
(90% Confidence interval)



Quito vs. Guayaquil, Before and After Privatization

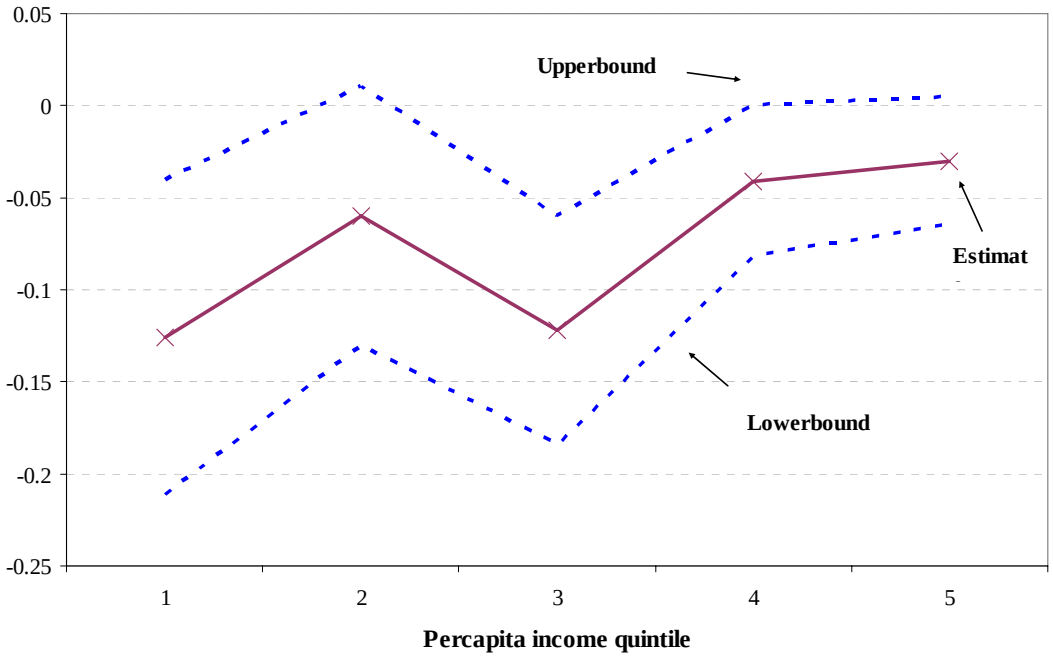
We may also compare the evolution of coverage levels in Guayaquil relative to Quito. That is, we may use a "difference-in-difference" approach to explore the effects of privatization on water coverage. We use "*time*", "*city*", and "*private-owner*" dummy variables with our set of explanatory variables and estimate equation (1) using our full database. The results are shown in Graph 2.

We find two important results. First, there is strong evidence that, on average, the chance of being covered by water services decreased after concession in households in every income level. For example, our estimates suggest that after concession, the

probability of a median-income household having water in Guayaquil was reduced by approximately 0.12 points relative to a similar household in Quito.

Secondly, our results also suggest that poorer homes decreased their likelihood of obtaining this service in Guayaquil relative to Quito. For instance, after privatization, a household in the first quintile in Guayaquil had a 0.13 lower probability of receiving water services than a similar household in Quito, while a family in the fifth income quintile had only a 0.03 smaller probability of receiving this service. This result may suggests that in Guayaquil the concession of water among the poor has diminished the access to water of the poor in relation to Quito.

Graph 2
Likelihood of having access to water services in Guayaquil relative to Quito, Before and After privatization
(90% Confidence interval)



Migration trends

The previous analysis is incomplete without looking at the migration trends of the two cities. If Quito and Guayaquil experienced different migration rates (rural to urban)

during the last decade, our "difference in difference" estimates could not provide evidence that the concession has had some type of effect on water service. For example, higher rates of migration to Guayaquil may explain why water coverage decreased relative to Quito.

To identify migration rates, we use data from the 2004 Demographic Survey on Mother and Infant Health Survey (ENDEMAIN).[10] In this survey, heads of households in Quito and Guayaquil were asked if they resided in the same city in the year 1999.[11] Furthermore, a large amount of information on a household's consumption is available and, therefore, we are able to rank households by their per capita consumption level. This information is displayed in Table 6 of the Annexes.

Clearly, migration rates to Quito are higher than migration rates to Guayaquil for all consumption level quintiles, and these differences are higher for poorer families. Whereas only 8% of the poorest families in Guayaquil lived in another city five years earlier, 22% of the poorest families in Quito had recently migrated.

These results refute a common belief that Guayaquil faces a higher influx of poor populations than Quito, leading to chaotic urban planning and difficulties in providing water for all. The decrease in coverage in Guayaquil after concession relative to Quito cannot be explained by migration trends to these cities. If anything, the observed migration trends provide us with evidence that the shrinking coverage levels in Guayaquil after concession are underestimated. This is true for every income level.

Changes in Price

To assess price changes of the last ten years, we graphed the price of water in each city, Guayaquil and Quito, during the 10-year period. We looked at the price of water as a

[10] Since 1987, the Center for Population Studies and Social Development in Ecuador (CEPAR, for its initials in Spanish) has periodically published its "Demographic Survey on Mother and Infant Health," the ENDEMAIN. The last survey was taken in 2004. Through the compilation of numerous statistics related to health care, infant and child mortality, reproductive health, fertility, domestic violence, sexually-transmitted diseases, household demography, migration, and other topics, CEPAR attempts not only to provide description, but also to identify any patterns or problems in themes of access to and usage of health services. Socioeconomic status (based on consumption), for example, is one of the household statistics collected to ascertain if persons of lower socioeconomic status have less access to health care or have to spend more to obtain it than persons of greater socioeconomic status. The information is collected through household and individual surveys, with responses solicited from 17 different sections of the country. Of the 10,966 observations in the 2004 ENDEMAIN, 1,151 come from Quito and 957 come from Guayaquil. For more details on the ENDEMAIN see Lastra (2004).

[11] Optimally, we would like to observe migration trends over the last 10 years to make our previous results comparable with our migration trends. However, we were not able to find such information.

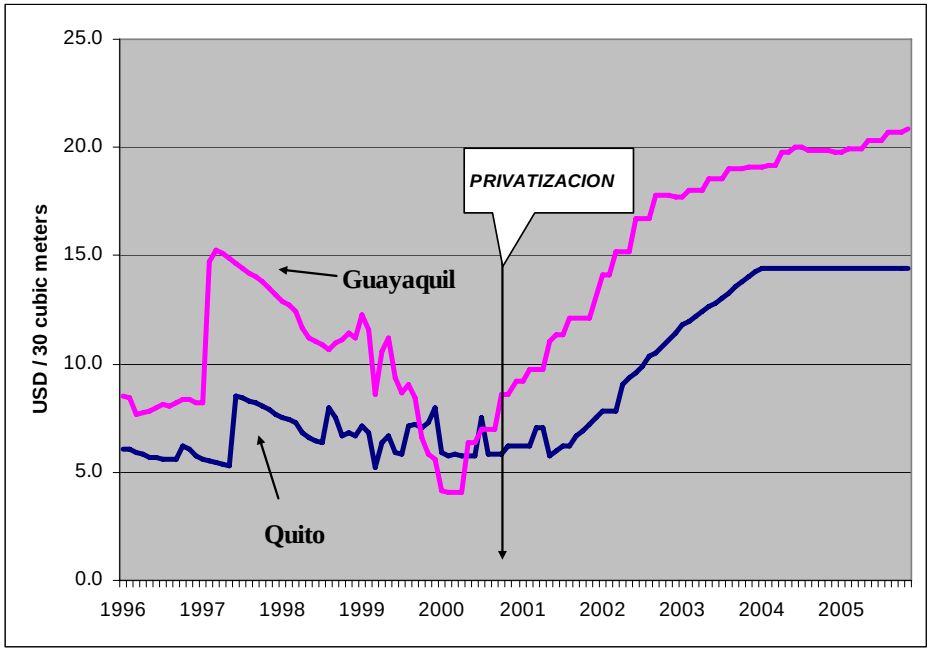
percentage of the cost of a basket of household goods to control for the change in currency from *sucres* to dollars in 2000 and the slightly different cost of living of each city. These statistics were available through the Consumer Price Index collected by INEC.

To analyze price of water in Guayaquil before and after the concession, we compare the monthly average prices of water in Guayaquil and Quito over a ten-year period (January 1996 to July 2005). First, we collected information about the price paid by consumers for the use of water services. This information comes from monthly surveys realized by INEC with the objective of calculating the Consumer Price Index. This information is highly reliable.[12]

Through these surveys, we plot the evolution of the average cost of 30 cubic meters of water in Quito and Guayaquil. In Graph 4, we present the amounts in current US dollars. From the beginning of 1996 until October of 1999, the price of water was on average 66% more expensive in Guayaquil than in Quito. On the other hand, after November of 1999 until May of 2000, the price of this product was 25% more expensive in Quito than in Guayaquil. However, a few months after the concession this tendency reverses, and the price of water in Guayaquil surpasses the price of water in Quito. Thus, there exists evidence that after the concession the average price of water in Guayaquil has increased in comparison to Quito. From the graph it looks like the Guayaquil price is about $2 higher than Quito pre privatization, and then jumps to $3 immediately after and climbs steadily to more than a $4 differential by 2005.

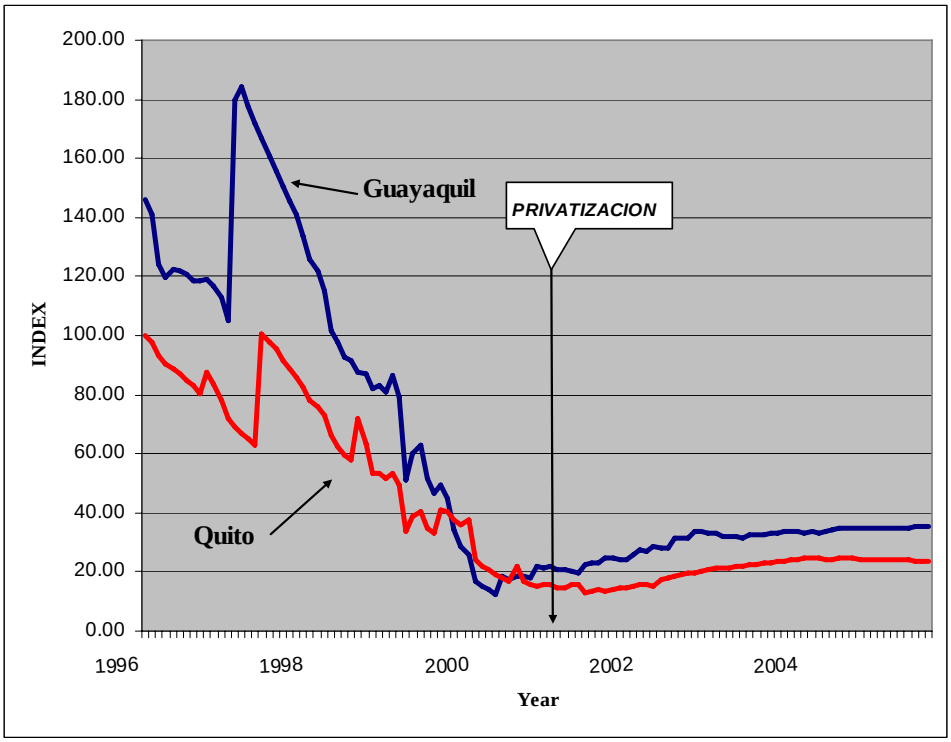
[12] The fact that the information comes from INEC and not private companies means that there should be no bias.

Graph 3
The Price of Water Services in Quito and Guayaquil
(US dollars)



It is important to also analyze the evolution of the price of water in relation to the cost of living in each city. To calculate the evolution of the price of water in real terms, we divided the nominal price of water in Quito and Guayaquil by the Price Index in each city. Then, we standardized the index in a way that the price of water in Quito in January 1996 is equal to 100. The corrected evolution of prices is represented in Graph 5. As in the last graph, the difference between the relative price of water in Guayaquil and the price in Quito is positive at the beginning of 1996 and decreases until a few months before privatization. Approximately, six months before the concession, the difference becomes positive again and remains higher than Quito for the following years.

Graph 4
The Real Price of Water Services in Quito and Guayaquil
(Consumer Price Index Adjusted)



A possible explanation for higher prices in Guayaquil, despite the fact that Interagua has had to follow ECAPAG's pricing restrictions, is the gradual reduction of subsidies. Before reforms, large consumers of water (industries) subsidized small consumers of water (households). Interagua's goal is for consumers to eventually pay the cost of water production. As the first five years of the concession are ending, Interagua is free to change tariffs without ECAPAG's restrictions. Therefore, it is essential to continue monitoring prices.

EMAAP-Q continues to subsidize consumers, using the telecommunications tax as its principal source of funding. This practice is often criticized because it jeopardizes the long term sustainability of the company.

Water quality

To measure if the quality of water in Guayaquil has improved or worsened since the concession, one should analyze the chemical and biological makeup of samples of water

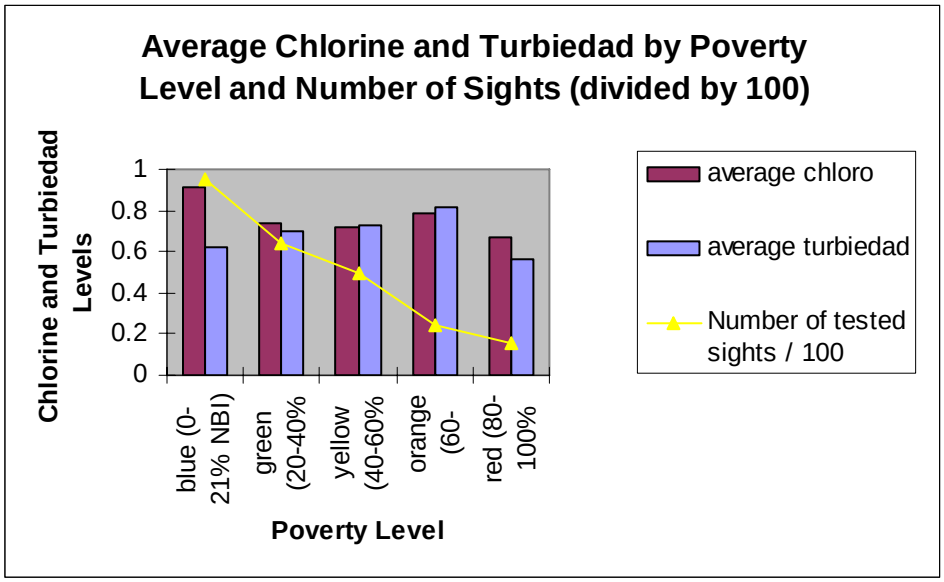
taken before and after 2001. Unfortunately, such data, is not available (at least, to the researchers).

Information on water quality samples in Guayaquil has been publicly available starting in October 2005, and we have collected this data until January 2006. The data includes details about the chemical composition of the water samples and the detailed address of the properties where the samples were taken. We use the individual addresses to match the water samples database with poverty data from the Ecuadorian 2000 Census. Finally, we use this information to determine if poor neighborhoods have lower quality of water. While this analysis does not assess if there have been any changes in water quality over the last ten years, it will help us understand whether there are systematic differences in quality in the water provided to the poor.

We found 291 water quality test records in the ECAPAG web page. Ten of those files would not open. Thirty-seven files were missing, and 44 locations could not be matched with a specific address. Using the Ecuadorian 2000 Census, we then constructed a map of Guayaquil that divides the city into census zones and quintiles of poverty level as determined by a national poverty index (NBI "Necesidades Basicas Insatisfechas"). Finally, the water records were matched with the Census Poverty levels. Not surprisingly, water quality was tested by far at the highest rate in the richest areas, and the number of sites tested falls steadily as the poverty level of the location increases (Table xx).

The water sample tests contained information on many variables (for example, chlorine, turbidity, fecal residuals, bacterial analysis, and ph-levels). We focus on chlorine and water clarity indicators, because these are the only two available for most of the tested sites. Higher chlorine levels indicate larger amounts of disinfectant in the water. Lower turbidity indicates greater water clarity. As shown in the graph below, wealthier areas of town generally had higher levels of chlorine and greater water clarity than poorer sectors. For example, poorer areas have an average of 20% less chlorine than all the other samples. However, those differences are not statistically significant.

Graph 5
Average Chlorine and Turbidity by Poverty Level and Number of Sites



In the remaining part of this section, we explore if there have been changes in the quality of water services in Guayaquil relative to Quito after concession. For this, we use a detailed household survey that contains information on individual's perceptions about changes in various aspects of water quality over the past six years.

We focus on three measures of water services that are available in the Monthly Employment Survey: overall water quality (purity, odor), water pressure, and water continuity. In April's 2006 survey, households were asked their opinion about changes in water services over the last six years. In particular, the following questions were asked: "In your housing unit, has the quality/pressure/continuity of water improved, remained constant, or decreased over the past six years?" We use the responses to these questions and a simple regression analysis to identify if there are any systematic differences in these variables in Guayaquil relative to Quito.

We use two types of regression models. The first is a traditional linear model while the second is an ordered probit model. The dependent variable is an integer that represents five different categories: 1) notably decreased, 2) decreased, 3) remained the same, 4) improved, and 5) notably improved. We also include several independent variables that may explain the way individuals express their opinions about water issues.

For example, it is possible that less educated people are more optimistic about the future and perceive that water quality changes have been higher than in reality. For this reason, we include several independent variables such as the number of children (age 5 and younger) in the housing unit, head of household's age, gender, education, marital status, and employment status. Because we are interested in identifying effects among the poor, we also control for income by adding a set of dummy variables that describe the percapita income quintile in which the household belongs.

For both the linear and the ordered probit models we estimate three different specifications. In the first and second specification, we control for income and city effects only; the third one adds several other independent variables to control for household demographics. Results are presented in Tables 10, 11 and 12.

Our results suggest that, on average, perception about how water quality and water continuity has changed over the last six years in Guayaquil does not statistically differ from the same perceptions in Quito. However, the poorest quintile households consistently think quality has increased. This is not the case, however, with the perceptions about water pressure. In all specifications, there is evidence that household's think that water pressure in Guayaquil is worse relative to what people in Quito think. In particular, this effect seems to be stronger among those households in the second income quintile. These results make sense considering that Interagua has made an effort to increase number of water connections. Without increasing the production of water, water pressure inevitably worsens.

Limitations of our results

If Quito and Guayaquil were identical cities and the privatization of water services was randomly assigned to this latter city, these estimates would measure the effects of privatization on water coverage, quality, and prices. This is, of course, not the case. Quito and Guayaquil are radical different cities and, this is particularly true for water provision. Thus, to perform an adequate interpretation of the previous findings, one has to incorporate a detailed institutional analysis.

VI. INSTITUTIONAL ANALYSIS

We interviewed employees of EMAAP-Q, ECAPAG, Interagua, the University of San Francisco at Quito, the IDB and the *Observatorio Ciudadano de Servicios Publicos* to understand the institutional contexts of both entities and determine why Quito has continually outperformed Guayaquil in water provision. In addition, we conducted focus groups with residents of various marginal communities throughout Guayaquil to get first hand accounts of their experiences with the water services.

1) Why do an institutional analysis between Quito and Guayaquil?

Private companies are traditionally seen as more efficient and innovative than public agencies. The fact that economic profit motivates performance gives private companies incentives to push for more efficient ways to provide goods and services. However, absent contestable markets, the incentives for efficiency and quality depend more on the institutional and regulatory environment. While public agencies are stereotypically slower to respond to market needs and more susceptible to corruption, this does not have to be the case. Results from the quantitative analysis of this study and key interviews demonstrate that EMAAP-Q has been a well performing public company for years, and Interagua has shown limited benefit.

Unfortunately, in Guayaquil, the public entities that preceded ECAPAG were not as successful as EMAAP-Q. In fact, many proponents of the concession felt that changing management from public to private hands was the only viable option to improve water service. Nonetheless while pre-concession ECAPAG and post-concession Interagua have made improvements to the water delivery system in Guayaquil, they have not yet been able to catch up to EMAAP-Q standards in terms of coverage, cost and quality. Is this because conditions in Guayaquil were so far behind those in Quito to begin with or does EMAAP-Q have institutional strengths that should be replicated? Given that higher levels of efficiency and institutional capacity in water companies facilitate their ability to increase the provision of services to poor communities, it is important to explore these questions to both determine importance of management and regulatory environments and to develop viable policy recommendations.

Our institutional analysis has three primary goals: 1) to understand the internal workings of each water company that the quantitative analysis alone cannot reflect, 2) to understand *why* Quito and Guayaquil have had such drastically different experiences in water provision and 3) to analyze the impacts that these factors have on the provision of services for poor communities and thereby develop policy recommendations for general water company good performance. To achieve this we analyze external factors that contribute to performance; the institutional and political culture of each water provision entity and region; and various measures of current efficiency and performance.

Challenges and Approach

Throughout the course of the investigation, various interviewees in both cities told us that it would be difficult to justly compare the water system of Guayaquil with that of Quito; that there are numerous qualitative factors that would have to be taken into account. For example, the very fact that one system is public and the other private affects the analysis in a variety of ways. In addition, the two companies are not operating from the same starting point. As an established public company, EMAAP-Q is relatively free to decide its investment levels, number of new connections as well as how to spend its income generated from the telecommunications tax. Interagua, on the other hand, has its investment decisions and income sources, for better or for worse, bound by its contract obligations; which in this case in particular require all tax income to be dedicated to the installation of new connections and *not* infrastructure or operational investment (Suardi Interview 2005).

Other external factors that have contributed to the varying performances of the water provision entities over time, which will be addressed in this section, include the particular challenges that each city faces in water source, geographic characteristics and rates of poverty and immigration. We also take into account the different social, economic and political cultures of Quito and Guayaquil that have directly affected the quality of their water services.

2) External factors that contribute to performance

2.a) Geographic characteristics

Both cities have geographic advantages and disadvantages to capture, clean and distribute water. The question is – *who* is worse off? Quito for example has a more complicated

system to carry water from its sources to the city and its suburbs. There are hundreds of kilometers of piping used to transport water from seven water capture sites to 22 treatment plants. Guayaquil, on the other hand, has only one source, the River Daule, and three treatment plants, which are relatively close in proximity. One could argue that the high number of Quito's capture and treatment sites complicates coordination and raises cost of water production.

However, the mountains surrounding Quito provide it with an advantage in terms of water pressure. The majority of the 172 water tanks are located above the valley that the city of Quito occupies, and therefore, EMAAP-Q has to put effort into restraining water pressure, not creating it. On the other hand, the relatively flat topography of Guayaquil, combined with the fact that its treatment plants are located above the river, means that money has to be invested not only into pumping water to the plant, but also in distributing it out into the system.

Probably the most important geographic characteristic that contributes to water entity performance is the quality of the water *before* it arrives to the treatment plants. Quito is proud to be well below the water turbidity requirement of 5 units. However, it is important to highlight that water reaches the treatment plants at around 1 or 2 units. The water consumed by *Quiteños* comes from melted snow and glaciers from the various volcanoes surrounding the municipality, which is a great advantage that *Guayaquileños* do not share. In fact, a biologist from the University of San Francisco Quito, Dr. Sonia Zapata, who has tested water throughout the years with her students, claims that water in Quito is better than some bottled water, primarily due to its pure sources. When we mentioned that Guayaquil receives water from a river, she remarked, "poor Guayaquil." Guayaquil's treatment plants have to pass its water through fairly extensive processes of sedimentation and filtration in order to reduce the organic material and contamination caused by nearby factories, boats and communities and to get the water to a point at which it is potable.

Unfortunately, as has been witnessed in several recent water quality controversies in Guayaquil, heavily treated water does not always guarantee lasting quality because the effects of the chlorine used in the treatment dissipate over time and as it moves through

the water mains. This is reflected in our analysis of water quality in the quantitative component (Section 5.c), which demonstrates that poorer communities have lower levels of chlorine. Even if water leaves the plant with adequate levels, by the time it is distributed throughout the city, chlorine levels can fall below the levels required by INEN (*el Instituto Ecuatoriano de Normalización*) quality standards. The fact that poorer neighborhoods reside in the south of the city and the treatment plant in the north could contribute to this problem. In addition, many marginal sectors of Guayaquil do not have continuous water service or adequate pressure, which means that the stagnant water in the tanks or pipes, or even the empty pipes themselves, when combined with heat can lead to the growth of organic materials. Although this material is not as dangerous as feces or metals, it does heighten water turbidity and affects quality.

2.b Poverty and migration

Poverty and immigration rates have historically played significant roles in each city's ability to provide adequate coverage of water services – especially to their poorest communities. In comparison to Quito, Guayaquil traditionally has had higher levels of overall poverty. According to the World Bank's Ecuador poverty assessment of 2001, 34% of the Guayaquil population lives on less than a dollar day, as compared to 18% of the population in Quito. The level of severe poverty is more than double in Guayaquil than in Quito - 5% verses 2%. However, poverty rates are growing at a faster rate in Quito than in Guayaquil. In 1990, 14.5% of poor people in the country resided in Guayaquil whereas 4.4% resided in Quito. In 2001, 14.6% resided in Guayaquil and 6.5% resided in Quito. This could be due to the higher migration rates from rural areas to Quito as demonstrated in section 2.d of the quantitative analysis.

Although Guayaquil's poverty rates are high, it is not clear that this has signified a greater inability or unwillingness to pay on the part of its poorer residents or that the lack of investment in Guayaquil's water system is due to a lack of payment from these users. In fact, quite the contrary seems to be true. As demonstrated in the quantitative analysis (section 1.b), poor communities in Guayaquil actually pay significantly more for water than those connected to the network. Families who are not connected to the system are forced to purchase their water from *tanqueros* at a price that often increases during

times of water scarcity*, not to mention the additional cost of time and energy that these families must dedicate to the process of obtaining the water. Since the concession, this expenditure difference has likely begun to close as more poor families become connected to the network, however, those families still awaiting a connection continue to pay disproportionately – with those who purchase from *tanqueros* paying an average of $3.20 per m3 (or $0.80 per 55 gallon tank) compared to the approximately $0.27 per m3 of water (for the first 15 m3) paid by those connected to the system.

Guayaquil's levels of poverty and immigration, when combined with the severe lack of municipal urban planning, resulted in the emergence of extensive, invasion communities in areas without access to basic public services. Unfortunately as the years have passed and many of these communities have begun to gain formal legal recognition, water and sewage infrastructure investment and expansion has not kept up at the same pace. Clientelistic political practices combined with the previous public water companies' poor efficiency levels and policies that aimed at increasing water delivery levels to those already in the network rather than increasing coverage to new users all have contributed to the current inadequate provision of water services in poor communities in Guayaquil and to the challenges that Interagua continues to face (Swyngedouw 2004).

Despite the decades of poor expansion policies and inadequate infrastructure investment, the concession agreement signed with Interagua attempts to rectify some of the misdeeds of the past. Recognizing the current crisis in basic service provision, emphasis is placed on getting Guayaquil's marginal sectors connected to the water network. The contract specifically states that 55,238 new water connections must be made by the end of the first 5 contract years, all of which are to be made free of charge to residents of marginal communities identified in the official expansion plan. The contract also binds Interagua to meeting the greater goal of providing 95% of the population with potable water coverage within the first 10 years. As of August of 2005, Interagua had made 37,966 connections, 2% more than their goal for that time period. Continual water

* The average price charged by tanqueros to fill a 55 gallon tank of water is $0.80, however community members living in Guasmo Sur reported that they have had to pay up to $2.00 to fill the same tank during periods of water scarcity such as when water service was cut in neighboring communities for repairs.

service has been established for the first time in Isla Trinitaria, a marginal community that skirts the *perimetral*.

Despite lower levels of poverty, Quito experiences greater rates of immigration, which puts it at a disadvantage. However, Quito has managed to stay ahead of the game due to adequate practices in urban planning and infrastructure investment. For example, the population *Quiteña* is growing at an amazing rate toward the valleys of Cumbaya and Los Chillos. The construction of a new international airport in one of these valleys means that EMAAP-Q must start planning now. It has developed the project, *Parroquiales Orientales*, which will provide water for this area through new connections for 600,000 people. The fact that this project costs over 200 million dollars means that EMAAP-Q is considering concession to a private company. A second program, *Rios Orientales*, aims to provide water to Quito until 2050. Concession is also a possibility to fund this venture.

EMAAP-Q also appears to be addressing the rising *Quiteño* poverty rates head on. This is possibly the reason for EMAAP-Q's creation, in 2001, of the Department for Public Works for Social Development with the objective of serving marginalized communities. According to the director of the department, of the 2,000 neighborhoods served by EMAAP-Q, 400 are poor. Of these, 100 do not have water services due to the fact that communities do not have legal title to the land. There are various reasons for the illegality; residents are squatters, the land should not be inhabited due to geographic dangers, or residents were tricked into believing that the land had legal title. EMAAP-Q has adamantly stated that it will not provide water services to illegal communities. However, the Department for Public Works for Social Development has a program to help poor communities obtain water. Citizens avoid paying the $75 connection fee by contributing manual labor to the implementation of the system. The department works directly with the municipality to detect these neighborhoods in need.

3) Institutional and Political Culture

3.a) Water companies and political influence

Various interviewees remarked that the general political environment of Guayaquil has been one of the primary causes of the poor historical performance of its public water providers. This could be a result of the paternalistic culture of Coastal political parties and their traditional methods to gain political support. The fact that past (pre-

privatization) water service providers in Guayaquil did not operate as independent and technical entities, but as mechanisms to mobilize political power, hurt their institutional capacity and provision of services and is one of the leading causes of the infrastructure problems facing the system today.

Prior to the creation of ECAPAG, whose structure and mandate were designed with the specific purpose of removing water provision from local political dynamics, public water providing entities functioned as pawns in the political struggles between the more central powers and the municipal government – resulting in their periodic dissolution and re-creation in attempts to fix failures and inefficiencies. Although the pre-ECAPAG public water companies ballooned with over-staffing, as jobs were exchanged for political favors, all restructuring attempts turned out to be changes in name alone, as each new company reorganized with the same personnel as the previous and reinitiated the same inefficiencies and failed policies of the last. In an industry as technical as water service provision, these political dynamics were fatal to both long-term growth and infrastructure investment – outcomes that Guayaquil's poor communities have disproportionately had to bear.

It was not until the establishment of ECAPAG, in 1995, that the issues of over-staffing and political influence began to come under control. The national law establishing ECAPAG's creation removed it from the influence of the local political scene and gave it the autonomy to carry out the provision of water and sewerage services in an apolitical, technical manner. In preparation for the privatization process, ECAPAG began to streamline staffing as well as implement numerous administrative and organizational reforms. To this day the municipality plays a very limited official role in water provision; the mayor simply has a representative that sits on the ECAPAG *directorio*.

In contrast, interviewees in Quito emphasized the technical, not political nature, of the institution, and were proud to have worked for decades in EMAAP-Q. Although low turn over rates are positive, Quito is suffering from over-bloating (See Table 14), indicating that it is not as efficient and apolitical as it would like to appear.

Although EMAAP-Q has not been heavily politicized, the Mayor plays an active role. According to the Director of Finance, employees talk to the mayor and his staff weekly about current and future activities. In fact, the Mayor has been a supporter of the concession of the two programs, *Parroquias Orientales* and *Rio Orientales*, because of the positive results stemming from private-public partnerships to modernize the airport, reconstruct the historical district and construct the *teleferico*. This suggests that management and regulatory framework are more important than ownership in ensuring quality public service provision.

4) Measures of efficiency and current performance

As has been shown above, both municipalities have dealt with challenges relating to geographic characteristics, poverty and internal immigration. However, Guayaquil has possibly suffered more from external factors due to the inferior quality of its water source and its higher levels of poverty and unplanned urban development. Furthermore, the distinct political environments have led to different historical performance of the water providing entities. The fact that Guayaquil has generally been more clientelistic means that water companies have been managed for political ends. This form of corruption has hindered both institutional development and much needed investment in infrastructure.

As important as it is to take external and historical factors into account, it is also critical to measure institutional performance today. As discussed above, ECAPAG and Interagua have implemented many reforms pre and post privatization with the objective of providing water more efficiently and effectively. In addition, the independent structure of ECAPAG, combined with the fact that the water company is now is private hands, seems to have reduced the direct political influence that was prevalent under the municipality's previous water entities. It is worth mentioning that since the early '90s, Quito's EMAAP-Q began to implement serious administrative reforms to ensure that it would remain in public hands. It is thus useful to now look at how Quito and Guayaquil compare under current measures of performance.

We have chosen several indicators to measure current institutional efficiency and performance: 1) response to consumer complaints, 2) payment rate, 3) ratio of employees per 1,000 connections, 4) percentage of water lost, 5) general finances and 6) management and technical innovations. It is important to note that while none of these

indicators are perfect, together they can give us a better sense of how efficiently and effectively the public and private institutions are working.

Table: 1
Management indicators from Guayaquil and EMAAP-Q

Indicator	**Guayaquil**		**Quito**	
	Before concession	**Actual**	**1996**	**Actual**
Number of employees per 1000 connection	9.4	3	7.1	6.1
Percent of water lost due to leaks in the system or non-payment	79%	68%	?%	30%
Payment rate	50% (1996) 76% (2001)	84%	62%	79%
Percent connections with meters	24%	49%	67%	97%

Source: PowerPoint presentations: EMAAP-Q and Interagua

4.a) Response to consumer complaints

A key indicator that demonstrates how well an institution meets customer needs is consumer response rate. Not only should institutions have effective methods for receiving citizen complaints, either through a 1-800 number or client service windows, but also strategies to turn complaints into action and results.

Water providing entities in both Quito and Guayaquil have mechanisms for receiving, processing and addressing consumer complaints, but Quito's appear to be more responsive and user friendly. In a recent interview with a member of the Consumer's Tribune, EMAAP-Q was stated as responding well to complaints.

In Quito, there are two main systems to make a complaint – via telephone or via an EMAAP-Q office. There are 12 client services centers throughout the municipality, where 83 % of the complaints are made. These offices are only open during business days from 7 am to 7 pm. A call center also takes complaints 24 hours a day. Both methods are connected to the system AS400, which processes and distributes the complaints to the

appropriate areas. According to the Director of Client Services, there has never been a complaint related to the quality of water. The grand majority deal with billing problems, which are addressed by a home visit on the next working day. New connections are addressed within 20 days and reconnections within 48 hours after payment. Pipe breaks and technical complaints within the city of Quito have a response rate of 24 hours and within the parishes, 48 hours. In 2002, EMAAP-Q set a goal to maintain complaints per year below 1% of the number of consumers – and in 2005 this goal was surpassed at 0.35%.

In Guayaquil, both Interagua and ECAPAG have established fairly thorough mechanisms for accepting and processing complaints and the absolute number of complaints has actually gone down since the concession. Under ECAPAG, prior to privatization, the total number of complaints received per month averaged approximately 2000, while Interagua now averages roughly 800. Complaints related specifically to billing have also decreased. In 2001-2002 there were approximately 0.6 complaints related to billing per account, this number has now decreased to 0.4. (Interview with Ing Espinoza 3/17/2006)

Processes for receiving and attending to customer complaints have also expanded since the concession. Similar to EMAAP-Q, Interagua accepts complaints either through its call center, open 7am to 8pm Monday to Friday and with limited hours on Saturday, or through its two customer service centers that are located in the north and south of the city (open 8:30am to 4pm). Unfortunately, neither the Interagua nor ECAPAG call centers offer a 1 800 number (Interagua has a regular phone number and ECAPAG a 1 700 number), in both instances users must personally assume the cost of the calls.

First instance billing complaints are responded to by Interagua within 30 days and second instance complaints within 10 days. Technical complaints have a much faster response time that varies according to their gravity. Reconnections for cut services are made within 48 hours of payment. According to the Director of Economic Regulation at ECAPAG, the vast majority of complaints that Interagua receives are related to over-billing. These complaints are addressed by a home visit to investigate if a billing discrepancy does in fact exist and what its cause may be. Complaints regarding water

quality have a separate process; ECAPAG is notified immediately and sends its own team of specialists to take counter samples.

As the operator and provider of water services, Interagua has the primary responsibility to address consumer complaints and concerns, however, as the regulating entity, ECAPAG both monitors the database of complaints received and responded to by Interagua as well as acts as a third instance appeal. When a user makes a complaint the first two instances go through Interagua. However, if the consumer remains unsatisfied with the decision, they may file an appeal with ECAPAG which then conducts its own investigation, reviews the prior decisions and comes to its own determination. Like Interagua, ECAPAG has initiated a call center to receive customer complaints and concerns and responds to such complaints within 30 days.

While the mechanisms to accept and respond to complaints exist, focus groups conducted in marginal areas of the city reported high levels of frustration with Interagua's responses to user complaints and requests. Participants reported poor treatment by Interagua employees working in both the customer service centers as well as in the field. Others felt that they were given the run-around when they attempted to get a response to the complaints they had filed. One resident of *Suburbio-Oeste* recounted his personal experiences of submitting complaints to address both a sudden lack of water in his sector as well as Interagua's policy of average billing. In one attempt to get resolution to the lack of water service in his area, he reported that Interagua's response to his written complaint stated that water was present in the sector, although no on-site inspection was ever made. Having gained no resolution to the problem, this resident continued to visit the Interagua offices making personal appeals for the issue to be corrected. After numerous visits he was finally informed by Interagua staff that they had "good news" for him, that his water service was to be re-established, but that he should not share this with his neighbors because only *his* service would be reinitiated. After receiving this news, water service did resume but with very low pressure and only in the late nights and early mornings.

This same resident has also been embattled in an appeals process with ECAPAG for apparent over-billing by Interagua in their interim policy of average billing for those who do not yet have water meters installed. While ECAPAG reviewed his case and as of

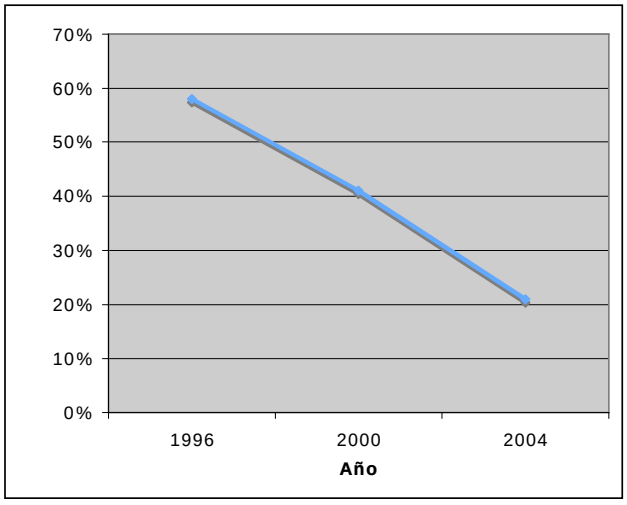
September 27, 2005 ruled in his favor, deciding that Interagua must cancel his outstanding debt and reimburse the money that he has paid, as of December 2005 Interagua had yet to refund the money and had simply issued a statement that the matter was under study.

4.b) Payment rates

As mentioned above, payment rate can indicate either *ability* or *willingness* of citizens to pay, or *ability* of the water providers to timely and accurately charge consumers. Either way, high payment rates are positive because they reflect that the institution not only provides a service for a cost worth paying, but also continues investing in water services.

In Quito, payment rate has increased substantially over the last ten years.

Graph 6: Percent of money owed to EMAAP-Q, 1996-2004



Source: Gerencia Comercial, 2006

Although the 20% still outstanding is high, it only represents what is owed by 3% of total customers. According to the Director of Client Services, the increase in payment rate is due to more options for payment. Although 82% of consumers still pay in EMAAP-Q

agencies, others now pay online, through the municipal electric company[13], in banks or cooperatives and in agencies of *pago facíl* and *servipago*.

In Guayaquil, payment rates have also increased substantially – both since ECAPAG assumed control of water provision operations and in the four years of Interagua's control. When ECAPAG was created, one of the primary reforms it implemented was to systematize its collection of payments and collect directly through banks. Prior to this reform, payment was handled by public utility staff directly and large amounts went missing – never making it into water company accounts. In the years prior to the creation of ECAPAG payment rates averaged at just 50% and did not provide enough to cover even the basic costs of water provision. However, under the new direction of ECAPAG, employees were prohibited from handling money directly and all money collected went straight into the ECAPAG account. By the years immediately prior to the concession, ECAPAG had reached a payment rate of approximately 76%.

Since the concession was granted to Interagua, payment rates have continued to rise to 84% with additional increases each year. (Espinoza Interview 2006). In addition to accepting payments in Interagua offices, the company has worked to expand the methods through which monthly bills can be paid. They have recently initiated arrangements with additional banks throughout Guayaquil as well as through the agency *servipago*.

4.c) Ratio of employees per 1000 connections

An indicator commonly used to determine efficiency and management performance is the number of employees per 1,000 connections. This indicator is important because many municipalities provide jobs in water companies as political favors. To reduce large, expensive and less effective water companies, experts typically recommend a ratio of approximately 2 to 3 employees per 1,000 connections. This number is based on technical, not political, criteria.

Quito has approximately 6 employees per connection, down from 7.1 in 1996. This could indicate that Quito is over-staffed and less efficient. However, it is possible that extra staff is helping EMAAP-Q maintain its good performance. Interagua, is right

[13] EMAAP-Q and EEQ have an alliance for on-stop payment. Customers can pay both bills in either agency. According to officials, the majority pay through EMAAP-Q.

on the efficiency target with a ratio of 3 to 1,000. This ratio, however, does not include these employes by ECAPAG. In this area, privatization has definitely made an impact on efficiency. The pre-privatization water providers in Guayaquil had extremely high ratios: in 1982, EMAP-G (one of the previous municipal water providers) had a ratio of 15 to 1,000 and at the end of 1994, before control was turned over to ECAPAG, EPAP-G (the provincial water company that followed EMAP-G) had a ratio of 9.4 to 1,000. (Swyngedouw 2004)

4.d) Physical and commercial losses

Another common measure of efficiency in water providing companies is their level of physical and commercial losses, or the amount of water unaccounted for either due to illegal connections, breaks in the system or non-payment. En 2005, EMAAP-Q lost about 30% of water produced. Heavy losses in both of these areas have been one of the most serious problems in Guayaquil's water provision system. Under the provincial water provision entity EPAP-G, that existed prior to ECAPAG, water losses reached up to 75% - one of the highest indices in Latin America (IDB Ecuador Perfil 1996). Since Interagua has assumed operations and begun to invest more heavily in system infrastructure and new connections, the level of loss, although still high, has begun to decline. They are now at approximately 67%.

While there have definitely been improvements in this area since privatization, the high levels of losses still present challenges to the system. For instance, according to technical experts in ECAPAG, one of the primary reasons why such large sections of Southern Guayaquil have such low levels of water pressure and continuity is because of the high levels of physical water loss throughout the system. Because this sector lies at the end of the network, there is very little water left by the time it reaches these communities – thus forcing residents to collect whatever water they can in the early morning or late at night when there are fewer users connected to the system. Unfortunately, it tends to be the poorer sectors that suffer most from such system failures as it is primarily those communities that lie on the outskirts of the network and have little financial recourse to personally resolve such continuity and pressure problems.

Losses also originate from unaccounted for clandestine connections to the official water network. At this point in time there is no real accurate estimate for how many clandestine connections exist in Guayaquil. However, many of such hook-ups stem from low-income residents that have water mains run near their house, but who have never been provided formal connections to the system. Interagua currently has a program to regularize such users once their connections are discovered. As Interagua expands the number of new connections to the more marginal sectors of the city, the number of clandestine connections and concomitant losses should decrease.

4.e) General finances

"General finances" encapsulates various themes. The first is the overall budget per year of the water companies as compared to their number of connections. In theory, if a company has a higher cost per connection, it is less efficient. However, the infrastructure required for each system is different, therefore this comparison is impossible. Nonetheless we feel that it is important to understand the current costs of each institution. Secondly, we look at source of income. Finally, we analyze the loan history of each institution to determine sources and if there have been problems of default.

As of 2005, EMAAP-Q has an annual budget of 200 million dollars. The budget has grown approximately 80 million dollars in the last five years. Expenditures are divided in the following areas: 60% project investment, 10% debt repayment, 20% operations and maintenance and 10% administrative costs. EMAAP-Q earns its income from various sources: 60% service sales, 25% telecommunications taxes, 10 % international loans and 5 % sales of electricity. The last item is perhaps the most interesting and innovative. Due to the fact that EMAAP-Q works with rushing water sources, it developed a system to generate electricity, earning almost 5 million dollars in 2004. Originally, the electricity created was used within EMAAP-Q. However, with increased production, it is now sold for additional income.

In terms of loan history, EMAAP-Q has worked with the IDB for 15 years. Although it is unclear to us how much the loans total, currently EMAAP-Q owes 180 million dollars. There are five projects currently being implemented that have been funded by the IDB with an average of a 5 % interest rate. EMAAP-Q is proud to have a direct loan relationship with the IDB, a status not common in Ecuadorian public agencies.

Most must work through the Central government. Furthermore, EMAAP-Q has recently signed an agreement with the Corporación Andina de Fomento (CAF) for a loan of 50 million.

Unfortunately, information on the general finances of Interagua is hard to acquire. When a request was made to Interagua staff for general financial information, the response was that it was confidential company information not subject to the national transparency laws. The Interagua annual report contains no concrete annual budget statistics and the website link that is labeled "annual budget" only lists dollar amounts invested, it provides no other line item categories or even a general operating budget total.

According to ECAPAG (which provided limited budget information when requested), Interagua's annual budget totals $80 million – with approximately $40 million going to general operating expenses and $25 million to investments. Further details as to how Interagua allocates funds within these general categories, or for the $15 million unaccounted for in this equation, remains unexplained.

One possible explanation for performance differences between EMAAP-Q and Interagua is budget. Over the last 10 years EMAAP-Q has had a substantially higher budget than that of ECAPAG and Interagua. The telecommunications tax is said to give EMAAP-Q extra resources that allow it to be less efficient, accounting for its high employment level.

4.f) Management innovations

Another important indicator is management innovation. Private companies are lauded for using more cutting edge technologies and efficient management systems. However, the comparison between Quito and Guayaquil indicates that this is not necessarily true. Quito has a history of pushing for high standards. In Guayaquil, pressure to find an international buyer triggered major reforms and innovations. This section is a brief description of what each entity has been doing to improve service over the last 10 years.

An example of an important technical innovation in Quito is the digital mapping system implemented in 1998. Now, 100% of the commercial area of Quito is mapped, which allowed technicians to identify breaks or problems in the system. Furthermore, with *telematría*, technicians in charge of water production can measure the amount of

water being produced at each capture site to divert it more effectively to processing plants. As mentioned before, the sale of electricity is also an important innovation. According to a functionary within the Department of Planning, Quito is the only city in Latin America that generates and sells electricity. Finally, treatment plants are equipped with a system to automatically and constantly test the amount of chlorine needed and treat water.

As far as administrative innovations, EMAAP-Q had to develop an effective system of communications to allow all 22 water plants to coordinate activities. Interestingly enough, employees of EMAAP-Q are proud that they have a private, not public, sector system of accounting, which allows them to more effectively calculate income and expenditures. Furthermore, the EMAAP-Q uses its long-term strategic plan to calculate tariffs. Instead of basing the price of water on current costs, EMAAP-Q includes costs of future projects. Furthermore, EMAAP-Q is aware of the advantages of using private companies to implement some activities. For example, the recording of meters and printing of bills are in the hands of private companies. Finally, 97% of customers have meters, which allows EMAAP-Q to more fairly charge consumers. The meters are changed every five years to avoid mistakes.

While Interagua has implemented numerous reforms and innovations since assuming control of operations in 2001, the modernization of Guayaquil's water services first began under the direction of ECAPAG in the late 1990s in preparation for opening the sector to private concession. In the years leading up to the concession ECAPAG expanded the network – incorporating 43,000 new users from marginal areas in Guayaquil, conducted numerous projects to rehabilitate and optimize the functioning of the water and sewerage system and designed a plan for providing potable water to Isla Trinitaria. ECAPAG also implemented various reforms to modernize their administrative and operational systems with the latest technology; among many other things this included the automation of their billing system and significant improvements in the area of customer service.

As a subsidiary of a multinational company, with access to the latest technological developments and innovations, Interagua has continued to build upon the modernization project first begun under ECAPAG. The number of innovations

implemented by Interagua since 2001 is substantial, yet without the ability to directly interview Interagua employees it is difficult to determine which have had the greatest impact on water provision in Guayaquil.

5) Factors contributing to institutional strength

5.a) Civil Society Participation

Recent events in Guayaquil have taught us that citizen participation is crucial. When consumers feel that they are excluded from important decisions and processes that affect their daily lives, protest is inevitable. Citizen participation is even more essential when a private company manages a public good as important as water. When a public company oversees a public good in a democratic system, citizens have indirect participation and recourse through their elected representatives. These elected politicians appoint key functionaries within the company and set general policies; if citizens are unhappy with the provision of their services or the policies they set, they can take action through the electoral system. The fact that private companies do not inherently have these same systems of accountability presents a challenge when it comes to ensuring that civil society's interests and needs are adequately addressed.

There are various indicators that can be used to measure civil society participation in water provision: 1) newspaper articles critiquing or exposing water company performance, 2) civil society movements or organizations that diffuse information to citizens and pressure for reforms, 3) spaces provided by the water companies to "*rendir cuentas*" and receive feedback from citizens and 4) programs promoted by water companies to involve citizens in project activities.

In Quito, general participation is low in the first three areas, primarily due to the fact that there have been no serious scandals of water shortages or poor quality. The only incident that brought attention to water in Quito was in 2003, when an oil pipe near the River Papallacta broke and contaminated a prime water source for Quito. This, however, was the fault of the oil industry and not EMAAP-Q. In terms of citizen participation in program activities, the Department for Public Works for Social Development of EMAAP-Q provides the materials and technical support to make connections to water and sewage systems without cost if the community provides the manual labor. According to the Director of the Department, this process helps generate a sense of ownership for

the system, which raises payment rates and the monitoring of illegal connections. Furthermore, such community-based contributions have saved the company over 5 million dollars. Although the amount of direct citizen involvement in Quito water planning and provision activities has been limited, the fact that EMAAP-Q is a public entity ensures that if a major scandal or concern were to arise, the democratic channels exist through which pressure could be placed on elected officials to address and resolve the issue.

Over the course of 2005, the issue of citizen participation in the provision of Guayaquil's water services began to gain attention. In part due to a number of scandals regarding water quality, as well as the media attention generated by a newly formed watchdog group, the number of newspaper articles focusing on water company performance skyrocketed. From just May to October of 2005 over 400 articles were printed in the local press covering water related issues.[14] In addition to this increased media attention, and perhaps responsible for some of it, a citizen watchdog group, *el Observatorio Ciudadano de Servicios Publicos*, was formed under the mandate of publicly monitoring Interagua and ECAPAG and holding them accountable to the residents of Guayaquil for the services they provide.

The *Observatorio* holds that it is not necessarily against the privatization of public services, but that it believes that when such processes are implemented adequate citizen oversight and accountability need to go hand in hand. Although the *Observatorio* is a relatively new organization, and a fairly unique one in Ecuador, it got off the ground running, publishing numerous reports analyzing and critiquing the terms of the concession contract, the structure of ECAPAG, as well as the Plan Maestro (master plan for water and sewerage development) that was recently presented by Interagua. In late 2005, they held a *Consulta Ciudadana* (citizen referendum) that garnered over 40,000 respondents and evaluated the current level of satisfaction with the Interagua and ECAPAG, whether the municipality should assume responsibility for the concession's regulation and whether citizens groups should have increased representation and participation in regulation and control organisms of public services.

[14] Articles compiled by the Observatorio Ciudadano de Servicios Publicos.

While the *Observatorio's* efforts have definitely created a public dialogue around the quality of services being provided by Interagua and the responsibilities that ECAPAG holds as a regulator, official channels for citizen participation within both Interagua and ECAPAG remain severely limited. There is no formal way in which citizen concerns are integrated or represented within either entity. While the ECAPAG *directorio* includes delegates representing both the President of the Republic as well as the mayor of Guayaquil, it is unlikely that these delegates regularly voice the needs and concerns of Guayaquil's poorest residents

While Interagua does maintain a department dedicated to community development and communication, there appear to be no formal mechanisms within this division to incorporate the community and citizen concerns that arise into the decision-making processes of the company. Focus groups with participants who had attended such community meetings held by Interagua reported that the meetings were used as a time to inform their community of upcoming repairs and work that would be done in their area. They stated that it was unclear how community groups were selected to participate because many were not invited. Focus group participants complained that the meeting was run on a tight schedule and that the facilitators were not interested in taking any questions. When neighborhood residents began to try to question the plan that was presented, their questions were left unanswered and the meeting was abruptly brought to a close.

5.b) Regulatory Bodies

Regulatory bodies are essential to ensure not only that funds are being managed free of corrupt or clientelistic practices, but also that citizen rights are being realized. Unfortunately, there are few regulatory mechanisms in Ecuador, and municipal water agencies are no exception. For example, a new code of water quality norms, which raised national standards, was passed in October of 2005 by the INEN. However, there is no body to hold municipalities accountable on a national level. The Association of Municipal Water Companies is not very active; and the law that involved the Ministry of Urban Planning and Living in regulation was never implemented. The Board of Directors of water companies should play an important role in regulation. However, it is difficult

without a profound analysis to determine if the members are independent and representative of interested sectors of society.

Various members of EMAAP-Q mentioned that the entity is "self-regulated." Most recognized the deficiencies with this model and agreed upon the dangers of not having official or un-official watchdog groups. EMAAP-Q's process to test the quality of water is a good example of how "self-regulation" works. Its prime laboratory, Bellavista, works independently from the Department of Water Production. However, it is located on the same site, if not in the same building, and the laboratory receives almost 100% of its funding from EMAAP-Q (although it does sell some of its services to private companies). Nonetheless, according to the director, the independence of his laboratory is respected and he has never felt pressure to modify results. EMAAP-Q does have a board of directors; the Board is made up of the Mayor, Council Members and Directors of different Departments. At this point, we are unsure of the role of the board as an effective oversight mechanism.

Guayaquil, on the other hand, has a much more elaborate and established regulatory system as is essential under privatization. As part of the initial loan granted by the IDB to assist with the concession process, ECAPAG was provided the funds for training and capacity building to prepare itself for its new role as a regulatory body. The new ECAPAG was streamlined down to core team of approximately 40 highly technical staff and was charged with the mandate of continual monitoring and auditing to ensure that Interagua stays on task in meeting its contract obligations. Specific areas of regulation include the following:

a) *Client Attention* – ECAPAG monitors billing, consumer complaints and Interagua's response to said complaints. Monthly reports as well as Interagua's databases are submitted to ECAPAG for review. Goals in this area are focused on follow-through and response time in addressing complaints, not on the total number of complaints made.

b) *Water Quality* – ECAPAG conducts monthly/weekly regulation of water quality throughout the city by subcontracting a number of laboratories to do four counter

samples in various sectors. In addition, ECAPAG is immediately informed of any complaint made to Interagua regarding water quality and sends its own team out to take counter samples.

c) *Investments* – ECAPAG specifically regulates Interagua's completion of the required number of water/sewerage connections stipulated in the concession contract. Additional infrastructure investments are not required to go through any specific regulation or approval process, Interagua's follow-through in this area is indirectly regulated through their ability to meet service goals (such as pressure and continuity).

d) *Finances* – ECAPAG conducts regular reviews of Interagua's financial statements to ensure that they are in good financial standing for the projects they seek to undertake. The contract does not stipulate any further regulatory influence over company finances.

ECAPAG also defines its objectives as including: ensuring good service delivery; promoting the expansion of the system and broadening access; and redistributing the weight of payments to alleviate the poorest population.[15]

As mentioned previously, ECAPAG's current structure is composed of a relatively small, technical staff that has been trained in the key elements of regulation. The entity itself is supervised by its *directorio*, or board of directors, that is composed of 6 fairly stable members: 1) a delegate of the President of the Republic, 2) a delegate of the mayor of Guayaquil, 3) a delegate of the Camaras de Produccion of Guayaquil, 4) the president of the Association of Civil Engineers of Guayas, 5) a delegate of the President of ESPOL and 6) the General Manager of ECAPAG. There are no minimum or maximum term limits for members of the Board of Directors and there has been fairly limited turn-over since it was first established.

[15] *ECAPAG Proceso de Modernizacion de los Servicios Publicos de Agua Potable y Saneamiento de Guayaquil al Sector Privado*: *ECAPAG 1994-2001*.

ECAPAG's role in both setting the terms of the initial concession contract, as well as in monitoring the contract once established, have definitely had a positive impact on ensuring the expansion of services and the stabilization of prices for the poorer sectors of Guayaquil. Although the concession contract itself determines much of Interagua's operations, there is no doubt that without regulatory oversight, the challenges coming from civil society groups would be even more prevalent.

Despite the very necessary role that ECAPAG plays, there are nonetheless several areas for concern in its structure and operations. The fact that the primary portion of ECAPAG's annual operating budget comes from Interagua, raises the question of a potential conflict of interest. Can or will ECAPAG hold Interagua fully accountable to its contract obligations if it financially depends on it for its own basic operations? Another issue that arises with ECAPAG's structure is the question of to whom it is ultimately accountable. As it is now, ECAPAG is said to be accountable to its board of directors; however, this board is made up of a mixture of delegates none of whom directly represent the population at large. The question must then be asked; if problems were to arise with ECAPAG's functioning as a regulator, who would claim responsibility? What checks and balances exist to ensure that ECAPAG does its job well? Although its creation as an apolitical entity was necessary for its role as a provider of services, now that ECAPAG has become a regulator it is not so clear that this structure continues to work.

5.c) Transparency and Access to Information

Transparency and the ability for the public to access key information are also indicators that can be used to measure the institutional strength and healthy operations of companies managing public goods. As demonstrated in Table 15, EMAAP-Q and Interagua are publishing important information on their web pages. Although ECAPAG only complies with 46% of Article 7 of LOTAIP,[16] EMAAP-Q and Interagua comply with 88% of the law.

[16] Article 7 of LOTAIP required agencies that receive public funds to publish key information on their web pages.

Table 2: Level of compliance with Article 7 of LOTAIP, August 2006

	Internal Organization				Salaries and Benefits		Services		Financial Situation			Contracts	Accountability		Web master	Total Compliance
	Structure	Legal Base	Objetives	Directory	Salaries	Employee distribution	Services	Forms	2005 Budget	Programs	Audits	Contract processes	Performance indicators	Travel expenses	Contact information	
EMAAP-Q	1	1	1	1	1	1	2	2	2	2	2	4	3	0	0	**88%**
ECAPAG	1	1	0	0	1	1	0	0	2	0	2	0	0	0	4	**46%**
Interagua	1	1	1	0	1	0	2	0	2	2	2	4	3	0	4	**88%**
Total Items	1	1	1	1	1	1	2	2	2	2	2	4	3	1	4	

However, this research team's experience in collecting the data to conduct study has unfortunately demonstrated that agencies are less likely to deliver more detailed information. Furthermore, we found a difference in our ability to access the needed information for this study from the public utility company EMAAP-Q in Quito and the private operator and public regulator Interagua/ECAPAG in Guayaquil.

We ran into numerous challenges securing even the most basic of data for this study from both Interagua and ECAPAG. In our assessment, this appears to stem both from how private companies approach the "transparency" issue as well as from the more conflictive political environment of Guayaquil itself.

While Interagua initially expressed interest in cooperating fully and providing us with access to both their databases and key staff members, after an unfortunate and wholly inaccurate comment made by a local activist critical of the company (stating that our research team was working with his NGO to prove that the concession had not benefited Guayaquil), the company decided to withdraw all support and collaboration. Since the political environment and tensions surrounding the water issue have intensified significantly in the past year, it is understandable that Interagua might be concerned with opening access to their internal databases to a group they felt might be hostile to their work. While we immediately issued statements to the contrary and met with Interagua staff in an attempt to rectify the situation, once the suspicion was cast all channels of assistance were cut off. Interagua as a private company that it receives public resources it is under the legal obligation to share information with our team. Without the

implementation of general principles of transparency and access to information how can the general public fairly evaluate the services that the company is entrusted to deliver?

While ultimately Interagua refused to grant us any access to information, the same was not the case for ECAPAG, which made both staff and some internal documents available. However, with the exception of a couple of staff members who were thorough and timely in their collaboration, our interactions with ECAPAG proved to be challenging as well. Despite the official approval of collaboration with our study, requests for information averaged months for a response (despite frequent attempts at follow-up made by our team) and in many cases went unanswered.

On the surface both Interagua and ECAPAG seem to attempt to recognize the need for transparency and public access to information – as is apparent in their inclusion of these areas on their websites. In fact some information, especially the text of the concession and water quality test results, are openly available. However, given that both entities are charged with efficiently and safely administering a public good, this is not enough. The public effectively has no recourse if they cannot access basic information to evaluate how their services are being delivered and regulated.

V. POLICY RECOMMENDATIONS

Water providers in both Guayaquil and Quito have implemented innovative and important public policies over the last 10 years. However, as Ecuador's population is becoming increasingly more urban, Interagua and EMAAP-Q continue to face both unique and similar challenges. We have outlined a series of policy recommendations on how *both* EMAAP-Q and Interagua can improve public relations, efficiency and service provision.

Text box 1: Reforming Water Companies

When Elsa de Mena became the financial advisor of Quito's water company in 1989, the system was in desperate need for reform. The General Manager, Patricio Ribadeneira, like many of his colleagues, was an engineer; highly skilled in the construction and management of water systems, but unable to design and implement a financial structure that responded to dynamic costs and citizen demands. When the Inter-American Development Bank (IDB) threatened to retract a loan due to financial mismanagement, the new EMAP-Q administration leaped into action. The first step was to create a budget and organize balance sheets – both essential components to a company's financial health. With the IDB's agreement to sustain the loan, the new administration had the necessary cash to start reforming.

Despite resistance from the State Controller's Office, Mrs. de Mena and her newly formed, business-minded team began to create an accounting system that operated on business administration principles. They then went through the stacks of unpaid water bills to identify big debtors. Surprisingly enough, on top of the list were prominent public agencies such as the Municipality of Quito. Debts were negotiated and paid off.

It was not easy incorporating a business attitude into a public agency that was accustomed to routine visits to the Ministry of Economics and Finance in order to obtain funds to pay salaries. The attitude toward inventory was, "We should have enough of everything so nothing runs out." Monthly conferences on good business practices taught storage operators to plan for the future and solicit materials when *needed*. Furthermore, the new system treated each of the 56 water systems as a separate economic entity that generated individual costs and income. That made it easy to identify high cost zones. Systems managers were then approached to detect the causes of inefficiencies and make changes. One obvious problem was high staffing, which exists in EMAAP-Q today. During this time, the number of employees decreased from 3,000 to 1,400, which greatly reduced operations costs.

To generate more income and create a more just pricing system, the administration changed tariffs for the first time in 11 years. The plan decreased exorbitant rates for business and communities that used *tanqueros*. The new system was based on financial auto-sustainability, charging citizens for cost of production and only giving subsidies to the elderly. The theory was that if people were not willing to pay, then it was the company's responsibility to implement even more mechanisms of efficiency to lower prices further.

Interestingly enough in 1992, Quito faced the challenge of combining its water and sewage companies. Whereas, this was a long struggle for Guayaquil, it only took the administration in Quito six months. According to Mrs. de Mena this, and other reforms, were due to the political willingness for change. Although she attempted to support Guayaquil in its merger, lack of leadership from above hindered the project.

Finally, employees had to change their attitudes about public resources and citizen rights. When Mrs. de Mena asked employees, "Who is the owner of Quito's water company?" she only received confused mumbles. According to her, a key strategy to ensure that public officials operate with honesty and efficiency is to instill in them a sense of obligation to citizens and taxpayers. Although reforms utilized private sector practices, no one could lose site of the fact that the *citizens of Quito* were the owners of the water company.

Source: Interview with Elsa de Mena

1) Improve transparency and access to information:

Unlike most agencies that receive public resources EMAAP-Q, Interagua and ECAPAG generally comply with Article 7 of LOTAIP by posting key information on their web pages. However, LOTAIP also requires agencies to receive, process and respond to formal petitions for information. This is especially key considering most of the Ecuador's population does not have access to Internet. With all three entities, we have found that our petitions get lost between departments, and numerous phones calls are not sufficient to motivate public employees to hand over requested information. A person or department within each agency should be responsible for receiving, documenting and distributing the citizen petitions to the appropriate areas. As LOTAIP's ten-day response deadline approaches, the designated person should follow through with the department to ensure that the citizen has received a response. If not, management should send a memo to the department requesting action and emphasizing the repercussions for non-compliance, as stated in the law.

1.a) Interagua/ECAPAG

Now that Interagua is entering its sixth year and has more room to make its own decisions related to price structures, it should implement mechanisms to communicate new policies to citizens.

Furthermore, the infamous database on water quality, pressure and continuity should be made public. These indicators should be constantly monitored and published on the Interagua web page to demonstrate to citizens that policies are having a positive impact. If a particular area of the city continues to have poor numbers, Interagua should describe the mechanisms it is implementing to solve the problems.

Due to the fact that many people do not have Internet to access the database, Iteragua should explore the idea of posting indicators on billboards in the more marginalized neighborhoods of the city. Numbers can be replaced as indicators improve. If this information is made available to citizens, they can develop more informed opinions about Interagua's performance and participate more actively in community projects.

1.b) EMAAP-Q

Although EMAAP-Q has avoided citizen criticism in the past, its current plan to privatize several new and costly projects has triggered citizen protest. A survey implemented by the Central Bank in 2006 demonstrates that 98% of *Quiteños* are against privatization. Furthermore, many people are ill informed and believe that the entire system and not just individual projects will be handed over to a private company. A demonstration in the town of Tumbaco and more media coverage on the topic are the initial signs of a larger citizen movement. Due to the current controversy in Guayaquil and general sentiment in Quito about privatization, EMAAP-Q should think twice about its plan. However, if it has evidence that the concession will be more beneficial for the citizens of Quito because of project costs, it should disseminate this information. However, as opposed to many governmental campaigns that only highlight positive aspects of a reform, EMAAP-Q should be clear about potential negative results.

2) Encourage citizen participation

2.a) Interagua

Citizen groups complain that it makes valid recommendations to Interagua, which are then ignored. For example, in a recent letter to Jose Luis Santos, the General Manager of Interagua, the *Observatorio* requests the following mechanisms to improve citizen participation in Interagua decision-making processes:

- The establishment of a toll free telephone number in Interagua for citizen comments and complaints.
- The establishment of local customer service offices, especially in marginalized areas.
- Inclusion of a member of the *Observatorio* on the ECAPAG board.
- An analysis of water quality with participation of citizen groups to ensure that results are not manipulated.

These recommendations demonstrate that the *Observatorio* and the organizations it represents have little faith in Interagua and want to participate more actively in policy design. Although it is unlikely that Interagua accepts a member of the *Observatorio* on

the ECAPAG board, it is possible to incorporate actors trusted by both Interagua and the *Observatorio* in activities such as water analysis.

Furthermore, Interagua could have public hearings when it plans to start a new project in an area. Officials should explain the cost, technical aspects and beneficiaries of the project and receive input from citizens. Furthermore, a toll free number and local offices are feasible and common strategies used by water companies to receive and process citizen requests.

2.b) EMAAP-Q

If EMAAP-Q proceeds with the concession, it should set up mechanisms for citizen participation in the process. Before it's too late, EMAAP-Q must first identify the organizations and media outlets strongly opposed to privatization and analyze their concerns. Citizen watchdog groups, formed by opponents as well as more neutral and pro-privatization organizations, should receive information relating to the companies vying for the contact and participate in the contract negotiation process.

3) Improve regulation

3.a) Interagua

To improve regulation, one interviewee suggested dismantling ECAPAG and forming a regulatory body within the municipality. This municipal commission would be in charge of monitoring contract compliance, receiving citizen complaints, analyzing water samples and enforcing fines. More governmental participation would encourage the governmental accountability lacking in the current structure. Although this option might have been impossible at the point of privatization, the heightened legitimacy of the current municipal administration means that citizens may be more willing to accept increased government regulation.

However, the members of ECAPAG are highly trained on the regulation process and loosing their institutional and technical knowledge could be detrimental. A less drastic measure would be integrating citizen and governmental representatives into the ECAPAG

board or creating a citizen commission with members from neighborhoods throughout the city. Interagua would be responsible for presenting results to these citizens and receiving feedback on local-level problems.

Furthermore, ECAPAG should ensure that Interagua pays the corresponding fines for not complying with contract components. ECAPAG should have link on its web page that state the level of Interagua's compliance and repercussions. This would decrease the notion that ECAPAG is Interagua pawn and has no real power of regulation.

3.b) EMAAP-Q

Rumors circulate that EMAAP-Q provides petty cash for municipal projects and is over-staffed. EMAAP-Q enjoys an enormous budget, which permits the cost of water to be subsidized but also may cause inefficiency. With no regulatory body that holds EMAAP-Q accountable, there is no assurance that the agency is responsibly managing citizen tax dollars efficiently and effectively. In addition, the agency is also responsible for its own water quality analysis, which decreases the legitimacy of its results. An independent body should be formed to test water samples, visit rural communities that suffer from poor sewage systems and review water production costs, subsidies and general expenditures.

4) Implement target subsidies

Ecuador is famous for its universal subsidies in gas, gasoline and water. Although this strategy is politically attractive, it detracts from the long-term financial sustainability of public companies. Interagua is currently trying to make the price of water equivalent to cost of production. However, EMAAP-Q continues to subsidize all citizens, regardless of their income. By targeting people in the first and second quintiles of poverty as identified by Selben, EMAAP-Q could invest more in much needed sewage projects in more rural areas or finance the projects that are to be concessioned. Citizens would possibly accept an increase in price if they see that the funds are going toward concrete projects that will continue to be operated by EMAAP-Q. It would be necessary to implement a communications strategy to inform citizens why the gradual decrease in subsidies is important.

5) Put tanquero services in the hands of Interagua and ECAPAG

Citizens in Guayaquil who do not have formal hook-ups to the Interagua system suffer because the service provided by *tanqueros*, which have no affiliation with Interagua or ECAPAG, is expensive, has fluctuating prices and is of poor quality. Interagua should consider providing water through trucks at a lower price than the *tanqueros*, as Quito did in the 90s.

VI. CONCLUSIONS

Through a comparative study between Ecuador's two largest cities, Quito and Guayaquil, we analyze how public versus private water provision systems have delivered in the areas of price, coverage and quality of water over time. In addition, we have conducted an institutional analysis of the two entities that provide water – Interagua with ECAPAG as a regulator in Guayaquil and EMAAP-Q in Quito – to measure both the external as well as internal management factors that have influenced, and indeed help to explain, the results obtained in the statistical analysis.

Results of our quantitative analysis show that the poor in Guayaquil continue to be worse off than the poor in Quito in terms of both coverage and price. Our analysis of Guayaquil before and after the concession indicate that there are no significant changes in the probability of a person with characteristics correlated to poverty having water services between 1995 and 2005. Our difference in difference analysis between the two cities showed that poor homes *decreased* their likelihood of having access to water in Guayaquil relative to Quito for this period. It is important to emphasize that the poor in *both* cities have less access to water than they did 10 years ago; however, in the period following the concession, the decrease is greater in Guayaquil than in Quito. In terms of price, water continues to be more expensive in Guayaquil than in Quito.

Our institutional analysis shows that current water provision in Guayaquil has been shaped by challenges presented by the external factors of high poverty levels and geographic misfortune; which have been further complicated by its clientelistic political

environment and corresponding lack of leadership in planning for and responding to these very problems. On the other hand, Quito (and EMAAP-Q) has benefited from good water quality and better urban planning in general, which has helped it keep ahead of the game for high immigration rates.

EMAAP-Q, as a public company, continues to out-perform Guayaquil in terms of the absolute price, coverage and quality of its water.[17] Given this success, it is logical to question whether it was necessary to privatize Guayaquil's water provision system in the first place. Why could the former public companies not have been sufficiently restructured to replicate the Quito model? This is by no means a simple question to answer. However, for the purposes of our immediate conclusions we operate from the premise that privatization of the Guayaquil system was inevitable given that 1) there was a crisis in the state of operations of the pre-privatization water and sewerage system; 2) the majority of attempts to reform the previous public water companies failed; 3) the level of needed infrastructure investment was too large to come from local sources alone; and 4) international lenders were no longer willing to lend without private sector involvement.

Although Guayaquil has not yet been able to reach Quito's completion level in the areas of price, coverage and quality, despite the private concession of its water services, it should be recognized that when Interagua assumed operations in 2001 it inherited a majority of the historical problems and challenges of the Guayaquil water network. Many of such problems take years of infrastructure investment and expansion to correct.

Our institutional analysis shows that Interagua appears to be making strides in increasing operational efficiency, an area which when combined with the completion of contract goals in coverage expansion, continuity and pressure should translate to positive improvements in service quality and coverage for marginal communities. As more poor communities become connected to the network (with individual water meters) and technical failures in the system become addressed with water continuity increasing

[17] This result is consistent with most empirical research on water in the US and Europe (Bel 2006).

throughout the municipality, we should expect to see positive impacts on the current price paid for water by poor communities. This of course will depend upon both the percentage of the poor population that is able to count on water from the public network for *all* of their needs, therefore eliminating the purchasing of the more expensive *tanquero* water, and on the future adjustments made to the tariff structure.[18]

A challenge in private sector operations, however, is that an increase in efficiency can either result in a corresponding increase in the funds available for investment in infrastructure development and expansion of coverage or an increase in profit for company shareholders. Unfortunately, the fact that so little budget data has been made available by Interagua, makes it difficult to thoroughly measure the impacts of these efficiency gains. In addition, the fact that Interagua is just beginning its fifth contract year makes it still too soon to measure the real repercussions on Guayaquil's poor or the absolute success or failure of the privatization endeavor.

While it appears that water provision for poor communities is improving in Guayaquil, especially when compared to the services that were provided by the public companies prior to ECAPAG, the current system is not without its faults. While price, coverage and quality are all important indicators that impact marginal communities in numerous ways, community participation and accountability in the provision of public goods and services are also key elements that are all too often forgotten. The fact that water is a public good, whether it is publicly or privately provided, means that the ability of poor communities to participate in and impact the important decisions that surround the provision of water services to their areas is critical. Mechanisms for true public/citizen accountability must exist for both private providers of water services and their regulators. Unfortunately this is an area in which both Interagua and ECAPAG have thus far failed miserably. In order for the experiment in water privatization in Guayaquil to be truly considered a success for its poorest communities, it must not only meet its obligations to expand coverage, improve quality and control price but it must also find a meaningful way to include "public sector accountability" in its operations.

[18] Concrete results on quality of water will be included when analyses are concluded.

The continued success of EMAAP-Q, in achieving high standards in price, coverage and quality in the provision of its water services in Quito, raises an important issue for the ultimate conclusions of this study. The Quito-Guayaquil comparison shows us that the issue may not so much be whether a public or private system of water provision ultimately provides the most benefits for the poorest sectors of a community. Rather what matters most is that the company, in whichever sector, is well-run, with high levels of management capacity and oversight. As was seen in the case of Guayaquil, fixing the failures of decades of mismanagement did not come from simply opening the sector up to concession. Pre-privatization ECAPAG, a public *not private* entity, must also be recognized for having laid the groundwork that was necessary for the fundamental changes in service provision to occur. In other words, if the ultimate goal is to ensure that poor communities are able to have fair access to their entitled portion of a public good, such as water, *less* emphasis needs to be placed on whether the provider of that good is public or private and *more* emphasis needs to be directed at improving their institutional capacity to provide those services in an efficient, transparent and accountable manner.

The provision of public services is about more than efficiency, it requires attention to equity and accountability as well. Both Quito and Guayaquil have implemented important reforms in their water systems but Quito has continued to exhibit superior performance both before and after Guayaquil's privatization. Ownership is not the key factor in determining quality performance. Management and oversight are. Our study has shown both quantitatively and qualitatively that Quito's public water system has outperformed Guayaquil's system both before and after privatization. While each city faces differences in geography, climate, and demographic variables, the key difference is management. Quito's EMAAP-Q has a culture of innovation, quality control and an ethos of public service. Guayaquil's systems, both public and private, have suffered from political interference and despite recent improvements, still exhibit lack of an ethos of public service.

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Batallón de Suburbio	*December 4, 2005*

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VIII. ANNEXS

Table 1: Results from the Citizen Consultation on Water and Sewerage Services conducted by the Observatorio Ciudadano de Servicios Públicos, 2005.

1) Do you believe that Interagua and ECAPAG are fulfilling their responsibilities to ensure quality water and sewerage services that are accessible to all citizens of Guayaquil?

   Yes: 4,297 No: 34,344

2) Do you believe that the concession contract for potable water and sewerage services between ECAPAG and Interagua should be revised to contain clauses that guarantee the rights of all citizens of Guayaquil?

   Yes: 38,439 No: 2,832

3) Do you agree that the municipality of Guayaquil should reassume responsibility, regulation and control over the service of potable water and sewerage in Guayaquil?

   Yes: 38, 012 No: 3,889

4) Do you believe that the citizenry and user/consumer organizations should have representation and an active participation in the decision-making, regulation and control organisms of public services?

   Yes: 38,654 No: 2,848

Table 2
Ecuador, Income-Expenditure Surveys by Year and City. Descriptive Statistics[19]

Year: 1994

	Quito				Guayaquil			
	Mean	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Water services	0.94	0.24	0	1.00	0.82	0.39	0	1.00
Income	1.94	2.77	0	38.88	1.94	2.67	0	31.75
Share of expenses in alimentation	0.24	0.19	0	0.99	0.29	0.20	0	1.00
# household members	4.21	1.78	1	15.00	4.84	2.03	1	16.00
# members below age 5	0.53	0.75	0	4.00	0.61	0.81	0	5.00
Years of education head household	10.12	4.96	0	22.00	9.01	4.89	0	22.00
Observations	1737				1713			

Year: 2004

	Quito				Guayaquil			
	Mean	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Water services	0.97	0.16	0	1.00	0.80	0.40	0	1.00
Income	1.87	1.31	0	10.94	1.55	1.08	0	7.30
Share of expenses in alimentation	0.32	0.18	0	0.84	0.45	0.22	0	0.91
# household members	3.78	1.71	1	14.00	4.36	2.21	1	26.00
# members below age 5	0.43	0.68	0	3.00	0.59	0.85	0	6.00
Years of education head household	10.51	4.89	0	20.00	9.32	4.65	0	20.00
Observations	2460				2822			

[19] *Water services* refers to the percentage of the households that have access to a public water network; *income* is measured in terms of the number of representative baskets of goods and services (BGS) that it could buy with its total earned income; *share of expenses in alimentation* is the percentage of total expenditure that a household spends toward alimentation; the *number of household members* and the *number of children below age five* are measured in units; finally, the number of years of education of the head of the household include all primary, secondary, and higher education.

Table 3
Probit estimates of access to water services. Dependent variable equals to one if household is covered.
Guayaquil: Before and After Privatization.

	Household's Percapita Income Quintile									
	1		2		3		4		5	
	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect
Constant	0.047		-0.121		0.335 *		-0.062		1.039 ***	
	(0.151)		(0.170)		(0.180)		(0.207)		(0.265)	
Privatization fixed effect	-0.188 **	-0.066 **	-0.071	-0.023	-0.079	-0.019	0.115	0.018	-0.335	-0.022 *
	(0.083)	(0.029)	(0.090)	(0.029)	(0.106)	(0.026)	(0.136)	(0.022)	(0.212)	(0.012)
Number of household members	0.081 ***	0.029 ***	0.085 ***	0.027 ***	0.048	0.012 *	0.176 ***	0.027 ***	0.032	0.002
	(0.021)	(0.007)	(0.025)	(0.008)	(0.030)	(0.007)	(0.049)	(0.007)	(0.059)	(0.004)
Number of household members < age 5	-0.18 ***	-0.064 ***	-0.151 ***	-0.049 ***	-0.229 ***	-0.057 ***	-0.233 **	-0.036 **	-0.089	-0.006
	(0.045)	(0.016)	(0.055)	(0.018)	(0.074)	(0.018)	(0.113)	(0.017)	(0.177)	(0.012)
Years of education head of household	0.038 ***	0.013 ***	0.066 ***	0.021 ***	0.065 ***	0.016 ***	0.074 ***	0.012 ***	0.071 ***	0.005 ***
	(0.012)	(0.004)	(0.012)	(0.004)	(0.012)	(0.003)	(0.013)	(0.002)	(0.017)	(0.001)
Number of observations	1043		1006		913		851		719	

Standard errors in parenthesis
The covariance matrix was calculated using White Heteroskedasticity-Consistent Method
* significant at the 10% level
** significant at the 5% level
*** significant at the 1% level

Table 4: Probit estimates of access to water services. Dependent variable equals to one if household is covered.

Guayaquil versus Quito, Before and After Privatization.

	Household's Percapita Income Quintile									
	1		2		3		4		5	
	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect
Constant	0.625 ***		0.78 ***		0.74 ***		0.761 ***		1.361 ***	
	(0.139)		(0.160)		(0.163)		(0.206)		(0.335)	
Privatization fixed effect	-0.419 **	-0.126 **	-0.256	-0.06	-0.673 ***	-0.122 ***	-0.492 *	-0.041	-0.779 **	-0.03
	(0.165)	(0.052)	(0.177)	(0.043)	(0.190)	(0.038)	(0.268)	(0.025)	(0.382)	(0.021)
Guayaquil fixed effect	-0.653 ***	-0.175 ***	-0.838 ***	-0.177 ***	-0.401 ***	-0.062 ***	-0.626 ***	-0.047 ***	-0.333	-0.008
	(0.100)	(0.025)	(0.131)	(0.026)	(0.137)	(0.021)	(0.192)	(0.016)	(0.281)	(0.008)
Year (2004) fixed effect	0.219	0.062	0.172	0.039	0.594 ***	0.104 ***	0.579 **	0.051 **	0.438	0.012
	(0.141)	(0.039)	(0.152)	(0.035)	(0.159)	(0.030)	(0.236)	(0.024)	(0.334)	(0.010)
Number of household members	0.072 ***	0.02 ***	0.055 **	0.012 **	0.045 *	0.007 *	0.136 ***	0.01 ***	0.024	0.001
	(0.018)	(0.005)	(0.022)	(0.005)	(0.026)	(0.004)	(0.039)	(0.003)	(0.054)	(0.001)
Number of household members < age 5	-0.158 ***	-0.045 ***	-0.111 **	-0.025 **	-0.239 ***	-0.037 ***	-0.154	-0.011	-0.062	-0.001
	(0.040)	(0.011)	(0.048)	(0.011)	(0.065)	(0.010)	(0.099)	(0.007)	(0.149)	(0.003)
Years of education head of household	0.055 ***	0.016 ***	0.074 ***	0.017 ***	0.067 ***	0.01 ***	0.066 ***	0.005 ***	0.074 ***	0.002 ***
	(0.010)	(0.003)	(0.011)	(0.002)	(0.010)	(0.002)	(0.012)	(0.001)	(0.015)	(0.000)
Number of observations	1747		1746		1747		1744		1745	

Standard errors in parenthesis
The covariance matrix was calculated using White Heteroskedasticity-Consistent Method
* significant at the 10% level
** significant at the 5% level
*** significant at the 1% level

Table 5
Migration patterns in Quito and Guayaquil
Answer to the question: Where did you live in January 1999?
(ENDEMAIN 2004)

		Consumption quintile					
		1	**2**	**3**	**4**	**5**	**Overall**
Quito	Number of Respondents	290	389	416	580	580	2,255
	% Lived in same city	78%	86%	86%	90%	95%	88%
	% Lived somewhere else	22%	14%	14%	10%	5%	12%
Guayaquil	Number of Respondents	203	433	541	500	375	2,052
	% Lived in same city	92%	92%	98%	97%	93%	95%
	% Lived somewhere else	8%	8%	2%	3%	7%	5%
Difference in migration rates between Quito and Guayaquil		0.145	0.058	0.121	0.074	-0.013	0.070
		(0.031)	(0.022)	(0.018)	(0.014)	(0.016)	(0.008)

Source: ENDEMAIN 2004
Standard errors in parenthesis

Table 6
Changes in water quality over the last six years.
Dependent variable: Has the quality of water improved, remained constant, or decreased over the past six years?

	LinearRegression			Ordered probit		
	(1)	(2)	(3)	(1)	(2)	(3)
Constant	2.838 ***	2.846 ***	2.959 ***			
	(0.039)	(0.046)	(0.145)			
Guayaquil fixed effect	0.046	0.021	0.021	0.091	0.04	0.041
	(0.035)	(0.077)	(0.079)	(0.070)	(0.151)	(0.155)
Household belongs to	0.118 **	0.072	0.068	0.233 **	0.142	0.135
income quintile No 1	(0.059)	(0.093)	(0.098)	(0.117)	(0.185)	(0.193)
Household belongs to	0.082	0.043	0.04	0.161	0.085	0.082
income quintile No 2	(0.057)	(0.079)	(0.086)	(0.113)	(0.154)	(0.167)
Household belongs to	-0.012	-0.056	-0.054	-0.03	-0.12	-0.116
income quintile No 3	(0.050)	(0.069)	(0.073)	(0.099)	(0.137)	(0.143)
Household belongs to	-0.045	-0.005	-0.005	-0.092	-0.013	-0.014
income quintile No 4	(0.052)	(0.068)	(0.070)	(0.103)	(0.135)	(0.138)
Guayaquil and household		0.078	0.083		0.157	0.166
income quintile No 1		(0.124)	(0.124)		(0.245)	(0.246)
Guayaquil and household		0.082	0.096		0.161	0.189
income quintile No 2		(0.116)	(0.119)		(0.229)	(0.234)
Guayaquil and household		0.091	0.092		0.187	0.189
income quintile No 3		(0.102)	(0.103)		(0.202)	(0.203)
Guayaquil and household		-0.09	-0.089		-0.178	-0.176
income quintile No 4		(0.106)	(0.107)		(0.209)	(0.210)
Household demographic variables [a]	No	No	Yes	No	No	Yes
Number of observations	1131	1131	1131	1131	1131	1131
R2	0.01	0.02	0.02			

Standard errors in parenthesis
The covariance matrix was calculated using White Heteroskedasticity-Consistent Method
[a] Demographic variables include: the number of children (age 5 and younger) in housing unit, head of household's age, gender, education, marital status, and employmet status.
* significant at the 10% level
** significant at the 5% level
*** significant at the 1% level

Table 7
Changes in water continuity over the last six years.
Dependent variable: Has the amount of time when water services are available increased, remained constant, or decreased over the past six years?

	LinearRegression			Ordered probit		
	(1)	(2)	(3)	(1)	(2)	(3)
Constant	2.839 ***	2.852 ***	2.889 ***			
	(0.035)	(0.039)	(0.145)			
Guayaquil fixed effect	0.054	0.015	0.026	0.101	0.039	0.06
	(0.037)	(0.075)	(0.079)	(0.071)	(0.145)	(0.152)
Household belongs to	0.081	-0.076	-0.089	0.155	-0.139	-0.168
income quintile No 1	(0.063)	(0.097)	(0.098)	(0.121)	(0.187)	(0.190)
Household belongs to	0.114 **	0.108	0.1	0.225 **	0.221	0.206
income quintile No 2	(0.057)	(0.075)	(0.079)	(0.110)	(0.147)	(0.154)
Household belongs to	0.066	0.015	0.012	0.13	0.037	0.032
income quintile No 3	(0.051)	(0.064)	(0.069)	(0.100)	(0.127)	(0.135)
Household belongs to	-0.025	0.017	0.011	-0.049	0.038	0.027
income quintile No 4	(0.049)	(0.061)	(0.062)	(0.095)	(0.118)	(0.120)
Guayaquil and household		0.244 *	0.245 *		0.451 *	0.456 *
income quintile No 1		(0.132)	(0.133)		(0.253)	(0.255)
Guayaquil and household		0.025	0.025		0.034	0.036
income quintile No 2		(0.117)	(0.120)		(0.225)	(0.230)
Guayaquil and household		0.11	0.106		0.196	0.189
income quintile No 3		(0.106)	(0.109)		(0.206)	(0.211)
Guayaquil and household		-0.094	-0.098		-0.195	-0.205
income quintile No 4		(0.104)	(0.106)		(0.201)	(0.205)
Household demographic variables [a]	No	No	Yes	No	No	Yes
Number of observations	1131	1131	1131	1131	1131	1131
R2	0.01	0.02	0.02			

Standard errors in parenthesis

The covariance matrix was calculated using White Heteroskedasticity-Consistent Method

[a] Demographic variables include: the number of children (age 5 and younger) in housing unit, head of household's age, gender, education, marital status, and employmet status.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level

Table 8
Changes in water pressure over the last six years.
Dependent variable: Has the pressure of water improved, remained constant, or decreased over the past six years?

	LinearRegression			Ordered probit		
	(1)	(2)	(3)	(1)	(2)	(3)
Constant	3.018 ***	3.044 ***	3.01 ***			
	(0.039)	(0.045)	(0.176)			
Guayaquil fixed effect	-0.1 **	-0.177 **	-0.166 *	-0.171 **	-0.305 **	-0.287 **
	(0.039)	(0.082)	(0.085)	(0.067)	(0.142)	(0.145)
Household belongs to income quintile No 1	0.022	-0.105	-0.105	0.038	-0.182	-0.182
	(0.069)	(0.095)	(0.099)	(0.117)	(0.164)	(0.170)
Household belongs to income quintile No 2	-0.039	-0.135 *	-0.134 *	-0.068	-0.233 *	-0.233 *
	(0.060)	(0.077)	(0.081)	(0.102)	(0.132)	(0.139)
Household belongs to income quintile No 3	-0.074	-0.101	-0.1	-0.127	-0.175	-0.173
	(0.056)	(0.073)	(0.076)	(0.096)	(0.125)	(0.131)
Household belongs to income quintile No 4	-0.124 **	-0.099	-0.097	-0.214 **	-0.171	-0.168
	(0.056)	(0.070)	(0.071)	(0.096)	(0.120)	(0.121)
Guayaquil and household income quintile No 1		0.221	0.21		0.382	0.363
		(0.138)	(0.140)		(0.237)	(0.241)
Guayaquil and household income quintile No 2		0.208 *	0.208 *		0.357 *	0.358 *
		(0.123)	(0.125)		(0.211)	(0.214)
Guayaquil and household income quintile No 3		0.08	0.069		0.138	0.12
		(0.116)	(0.117)		(0.199)	(0.201)
Guayaquil and household income quintile No 4		-0.044	-0.056		-0.075	-0.096
		(0.117)	(0.117)		(0.200)	(0.200)
Household demographic variables [a]	No	No	Yes	No	No	Yes
Number of observations	1131	1131	1131	1131	1131	1131
R2	0.01	0.02	0.02			

Standard errors in parenthesis

The covariance matrix was calculated using White Heteroskedasticity-Consistent Method

[a] Demographic variables include: the number of children (age 5 and younger) in housing unit, head of household's age, gender, education, marital status, and employmet status.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level