



Paths to universalize water and sewage services in Brazil: The role of regulatory authorities in promoting efficient service



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ABSTRACT

The 2007 institution of a regulatory framework established ways to overcome deficits in Brazil's sanitation services, including economic efficiency. This study analyzes the performance of regulatory authorities in promoting the efficiency of water and sewage service providers in Brazil. The study was developed in three stages: analysis of efficiency with Data Envelopment Analysis (DEA) for 2006 and 2011; assessment of productivity using the Malmquist Index (MI); and document analysis of regulatory standards. Among the results, significant inefficiencies were detected and the mean for pure technical efficiency was higher among unregulated providers both for 2006 and in 2011. The MI showed gains in productivity from 2006 to 2011. The decomposed analysis of the index indicated a shift in the efficiency frontier to a higher level, but with a decrease in the providers' pure efficiency. From the analysis of the regulatory activity, we identified regulators that had not issued regulatory standards related to the promotion of allocative or productive efficiency. Analysis of the results shows that the regulatory performance has not ensured that providers achieve better performance.

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1. Introduction

Brazil has lived with a historic deficit in basic services that fosters inequities and enhances actual social gaps. Approximately 9.8 million households have no access to the water-supply network and 25.5 million have no access to the sewerage network (IBGE, 2010a). This deficit has a direct negative impact on Brazilians' quality of life, which in turn has effects on the health, the environment, and the economy and undermines sustainable development. It is noteworthy that water supply (WSS) and sewage services (SS), along with solid waste and urban drainage, constitute a broad concept of basic sanitation. This study addresses only basic sanitation and is limited to WSS and SS.

Brazil's sanitary history shows that the intensification of urbanization, which begun in the 1950s, highlighted the need for urban development policies and spurred the creation of the Water and Sewerage National Plan (PLANASA). PLANASA, which was established in 1969, was for many years the primary public sanitation policy initiative. The end of PLANASA in 1992 generated an institutional vacuum lasting nearly two decades until the creation

of a new policy capable of providing a national sanitation strategy.

Another important problem that has affected Brazil's sanitation sector is the lack of adequate economic regulation. As Marques Neto (2009) stressed, among the infrastructure sectors involving network industries and compulsory universal services, sanitation is one of the most complex because it brings together features of economic exploitation and public-service activities that also are inter-related other public policies. In such a complex sector, the role of regulation is even more important to preserve the public interest. Highlighting the importance of regulation, Galvão and Paganini (2009) also emphasized the characterization of sanitation as a natural monopoly in all segments of service provision.

With the enactment of Law No. 11,445 of January 5, 2007, the Law of National Basic Sanitation Guidelines (LNSB), and approval of regulatory Decree No. 7,217 of June 21, 2010, national guidelines were established for federal policy related to basic sanitation, thus providing the basic foundational framework for regulation in Brazil. Among the fundamental principles identified for the provision and regulation of public basic sanitation services, both universal access and efficiency are emphasized.

It should be understood that universalization “presupposes that the fundamental human rights of access to potable water and sewage services are ensured in sufficient quality and quantity”

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(Wartchow, 2009, p. 276). According to data from the National System of Sanitation Statistics (SNIS), in the “Diagnosis of Water and Sewage Services—2011” (Ministério das Cidades, 2013), the North and Northeast regions have Brazil's lowest rates of water supply and sewage services. The northern region has a water service rate equal to 54.6% and a sewage rate of only 9.6%; in the case of the Northeast region, the rate for water service is 71.2% and the rate for sewage is 21.3%. In both cases, the rates are well below the national average of 82.4% for water and 48.1% for sewage. Even in the Southeast region, which has the highest rates of basic sanitation (91.5% and 73.8% for water and sewage services, respectively), the treatment rate for collected sewage is only 41.2%, showing that weaknesses in the sector are present nationwide.

SNIS also exposes factors important for an analysis of the evolution of the overall efficiency of the sanitation sector, through the observation of some of the indicators of service providers' administrative-financial and operational performance. When comparing the years 2003 and 2011, there is a perceived improvement in service provider performance at different levels. In the case of operational indicators, one can highlight the rate of the population with sewage collection service, which increased by 24.9%; however, the rate at which water was lost during distribution (the percentage of the initial volume of water available in the distribution system wasted during the distribution process) improved by only 9.6% during the period. In this context, it is reasonable to question whether the advance in service providers' efficiency could have been higher.

Thus, satisfactory performance of the government's regulatory activities is essential for monitoring not only the evolution of the sector's efficiency but also whether this efficiency serves the universalization process. Such regulatory activities were planned in the LNSB and classified by Galvão et al. (2008) into the following groups: inspection, standardization, tariff regulation, and ombudsmanship. Standardization activities encompass issuing rules on technical, economic and social dimensions of service provision, including progressive goals for expanding and evaluating efficiency. It is an essential activity for consolidating the new regulatory framework and replacing the self-regulatory paradigm from PLANASA (Ximenes and Galvão, 2008). Therefore, regulatory performance is represented in this study by standardization, i.e., by standards (resolutions, decisions and technical notes) issued to promote provider efficiency.

To understand one of the paths that can lead to universal access to basic sanitation, this study analyzes the role of regulatory authorities with respect to promoting the efficiency of Brazil's WSS and SS providers. Confirming the importance of this theme, Abbott and Cohen (2009) found that in the last 20 years, the research has increasingly been interested in WSS and SS productivity and efficiency. The authors' literature review summarized, among other things, the results of studies related to scale economies, scope economies, property ownership, and the impact of regulation. Of these four main themes, the impact of regulation has been the least explored, with only seven studies pointing to a positive impact on the level of service providers' productivity and efficiency.

Among the studies for the Brazilian case that point to regulation as an element that can contribute to the WSS and SS universalization process by promoting provider efficiency, only Barbosa (2012) associated the efficiency results, obtained from the Data Envelopment Analysis (DEA), with regulatory variables. These were: experience of the regulatory authority (measured in years); specialization (i.e., if the agency exclusively regulated the sanitation sector); and the economic regulatory method used for tariff review. His aim was to develop a financial performance score for the WSS and SS providers and to explain performance based on the regulatory framework to which they are subjected.

Some other studies applied DEA to the Brazilian sanitation sector, but without relating the results to regulatory variables. Ferro et al. (2014) reviewed previous efficiency frontier studies for the Brazilian water and sanitation industries and only two of the six studies used DEA. Tupper and Resende (2004) discussed the feasibility of implementing efficiency-inducing yardstick schemes in the Brazilian sanitation sector in view of the need to encourage greater efficiency cost savings in the industry. Motta and Moreira (2006) analyzed how the performance in the sector is affected by types of WSS and SS providers (considering ownership and coverage). They applied the Malmquist Index to analyze the forces behind productivity scores and to investigate whether and how the absence of tariff regulation is associated with decreased efficiencies.

Besides those reviewed by Ferro et al. (2014), the following studies applied DEA to analyze the efficiency of WSS and SS providers. Carmo and Távora Junior (2003) applied a DEA model with the aim of determining the efficiency score of 26 WSS and SS providers and also evaluated the average efficiency for each Brazilian region. Grigolin (2007) conducted an efficiency analysis that compared the performance of 57 WSS and SS providers of the state of São Paulo, according to their ownership and coverage, contributing to the formulation of a future tariff policy for the sector. Sampaio and Sampaio (2007) presented efficiency scores for 36 Brazilian WSS and SS providers, as well as an analysis of efficiency for the Brazilian regions. Also on the efficiency measurement of WSS and SS providers by region, Sato (2011) studied 26 companies based in capitals of the Brazilian states.

In this context, our study contributes to this research by measuring the efficiency of WSS and SS providers using DEA and analyzing the evolution of providers' productivity using the Malmquist Index. We seek to add new elements to the analysis of efficiency among Brazilian regions and performance among types of WSS and SS providers in relation to property ownership (public or private) and coverage (local or regional). In addition, to the best of our knowledge, there are no prior studies that used standardization to assess the influence of regulation on providers' efficiency. We also innovate by comparing the efficiency scores between the regulated and unregulated providers.

This article is divided into five sections: this introduction, a characterization of the Brazilian sanitation sector (water and sewage services), the strategies selected for operationalizing the research, the main results and, finally, the conclusions.

2. Sanitation in Brazil: institutional aspects of the WSS and SS

Understanding the sanitation sector requires an understanding of its political-institutional aspects, such as the types of arrangements made by service providers and regulatory authorities. For this purpose, data were systematized from the Brazilian Institute of Geography and Statistics (IBGE) National Survey of Basic Sanitation (PNSB), taking the year 2008 as a reference and contemplating all of Brazil's municipalities, and data from the SNIS's “Diagnosis of Water and Sewage Services—2011.” The latter dataset collected information about water for 88.8% of Brazilian municipalities for 2011 and information about sewage for 52.6% of municipalities. In addition, data were obtained from the publication “Basic Sanitation—Regulation 2013” of the Brazilian Association of Regulatory Agencies (ABAR), which had the participation of 27 regulators, with reference to the year 2012.

According to data from the PNSB (IBGE, 2010b), 46.8% of Brazilian municipalities' WSS are served by providers classified as mixed-economy companies, followed by providers directly administered by the government that serve 30.5% of the municipalities. This relationship is reversed with respect to sewage

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