

Regulatory impact on Quality of Electricity Distribution Services: The case of Latin America and the Caribbean

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1. Motivations underlying the research

Low quality through frequent and prolonged interruptions can constitute a barrier to economic development and competitiveness, causing high costs, business losses, and negative effects on the population's quality of life. According to the 2018–2019 survey of the Latin American Public Opinion Project (LAPOP), power outages are a concern for more than 34% of respondents.

The avoidance of interruptions in the electricity supply depends on the proper functioning and coordination of the entire chain: generation, transmission, and distribution. In this study, we focus on distribution companies, where the existence of *good regulation* plays the most important role. Due to economies of scale, a single distribution company provides electricity for each geographical area, acting as a natural monopoly in each zone. Given the absence of intra-zone competition in distribution and the difficulty of creating a cost-effective decentralized option for most consumers, the market structure does not provide enough incentives for service quality. In this context, regulatory frameworks are essential tools for promoting quality of service.

In the 2000s, most European countries introduced service quality incentives based on a rewards and penalty scheme. Something similar happened in Latin America and the Caribbean (LAC), with some early adopters, such as Peru in 2004, and some very late ones, such as Brazil in 2018. The type of quality regulation we consider here is what is generally called *incentive regulation*, as it provides financial incentives for the provision of service quality, regardless of whether the incentive is a fine that goes to the government or compensation for or a rebate to consumers. In the last two decades, there has been a substantial increase in access to electrification together with an improvement in the quality of electricity services in LAC. However, improvements in quality have been lower than the improvements observed in other regions.

2. A short account of the research performed

The international standard for measuring quality as continuity of service comes from the IEEE Std 1366–1998 Guide for Electric Power Distribution Reliability Indices, updated in 2012. The IEEE (2012) defines the System Average Interruption Duration Index (SAIDI) as the total number of minutes of service interruptions in a year divided by the number of customers served. Similarly, it defines the System Average Interruption Frequency Index (SAIFI) as the total number of customer interruptions in a year divided by the customers served.

In this study, we examine whether the implementation of quality regulation has an impact on quality as defined by the SAIDI and SAIFI indicators. With this purpose, countries with at least two electricity distributors and a single regulator were chosen for the analysis.^e Of 160 companies surveyed, only 143 had data on SAIDI and SAIFI, which we use as dependent variables in our econometric estimation. Then, looking at the history of regulations, as well as the implementation of continuity indicators compatible with international quality standards, we consider the year of the most important

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e The selected companies are in the following countries: Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Panama, and Peru.

incentive quality regulation as the explanatory variable in our model.^a We also consider in our estimation the importance of ownership for quality results. We use panel data with firms across years and include both firm fixed effects and year variables. The independent variable regulation is a dummy variable that starts taking the value 1 the year immediately after the key quality regulation measure is approved (and 0 otherwise). This is the case because in general, there is a small delay between the approval of a measure and its actual implementation. We use the two-stage least squares (2SLS) method since we are confronted with two problems. First, the implementation of a quality regulation may be motivated by the existence of poor quality. This is what is generally known as reverse causality. Second, it is likely that the implementation of quality regulation is due to administrative changes in regulatory authorities that simultaneously influence service quality and the implementation of the regulation itself.

3. Main conclusions and policy implications of the work

Our main result is that incentive quality regulation had a positive and significant effect on quality improvement for the case of the distribution companies operating in LAC. Moreover, we calculate that between 2003 and 2019, in a sample of 143 electricity distributors, the SAIDI and SAIFI decreased after the implementation of the quality regulation by an average of 40% and 45%, respectively. We also estimate that on average, private firms outperformed public ones in terms of quality; however, since their performance was more dispersed, the worst firms in terms of quality were also private.

Few papers have empirically estimated the impact of regulation on quality. They mostly do so on a country-by-country basis and for developed countries. Moreover, their results are not aligned, as they study different types of regulatory instruments that have been applied in different contexts and regions. The results of this research point to the importance of regulation for the quality of electricity service implemented in LAC countries. In this regard, it is in line with most of the theoretical literature on the matter, as well as with empirical studies for Italy and the United State. In contrast to the findings for the UK, quality regulation in LAC has been sufficient to increase electricity quality measures in terms of continuity of service. The lack of stylized facts on the matter underlines the importance of continuing efforts to understand the impact of regulation on quality as well as the best way to formulate that regulation to achieve the optimal quality of electricity services.

Our results are particularly relevant for policymakers since they highlight the need to implement incentive regulation to improve quality in countries that do not yet have it. Moreover, they offer elements for comparison between regulators and between distribution companies in the region.

a *Incentive regulation* in the sense that it includes some type of penalty paid by the company in the case of an outage.