PRICE EQUALITY: THE DISTRIBUTIONAL IMPACT OF SIMPLIFYING MEXICO'S INCREASING-BLOCKS ELECTRICITY TARIFFS.

Tomas Damerau, Centro de Investigación y Docencia Económicas AC (CIDE), +491704456125/+5215524401911, tdamerau@gmail.com

Overview

In Mexico, the regulation of residential electricity tariffs (RET) has been widely criticized on efficiency and equity grounds ever since the sector's nationalization in the 1970s (López-Calva and Rosellón, 2002). Currently, RET underperform in terms of efficiency because they only cover about 40 percent of the supply's cost, and in terms of equity because they determine that better-off households receive a proportionally greater share of a complex mix of direct and cross-subsidies that cost about 1 percent of GDP. Both, cost-recovery and equitable subsidies' distribution are explicit goals of the regulatory framework.

At the center of these issues are both the design and level of RET's complex architecture. It consists of seven different weather-based increasing-block tariffs (IBT), each with three to four blocks and variations regarding consumption volume and seasonality. In total, about 40 different prices can apply at any month, but none of these ensure cost-recovery. Only an additional linear tariff (LT) for high-volume users does, but it has only been applied to 2 percent of the users.

The aim of this paper is to explore realistic policy alternatives that simplify the complex RET design and analyse its distributional impact to assess if efficiency and/or equity performance is improved. I apply two mutually exclusive alternatives in a counterfactual exercise: i) a flat-rate tariff (FRT) that ensures revenue-neutrality (RN) to the monopolist firm and maintains unchanged the size of the subsidies, and ii) a volume-differentiated tariff (VDT) to induce self-selection and raise revenues by removing the subsidies in the lower blocks to users who consume more than the tariff's blocks thresholds.

The paper is organized as follows. Section 2 provides an overview of the Mexican electricity sector by reviewing those elements in the regulatory framework that have led to the poor RET's performance in terms of efficiency and equity. Section 3 focuses on the actual RET design, its counterfactual alternatives and the indicators to measure their distributional impact. Section 4 describes the construction of the administrative database and the links with survey estimations. Section 5 presents the findings and section 6 concludes.

Methods

The methodology to assess the distributional impact of both types of alternative pricing schedules is inspired in Borenstein (2012). While he uses individual billing information and block-level census data, I use publicly available administrative and cross-sectional survey data to estimate the distributional impact on two mutually-exclusive population subgroups consisting of income-poor and non-income-poor aggregates at the municipality level.

First I estimate the actual consumption levels by combining administrative and survey data on three years (2010, 2012 and 2014); second, I use those estimates and the actual RET to estimate the revenue in the baseline scenario, accounting for a discrete decomposition of the revenue by the users' income-status at the municipality level. Third, under the assumption of price-inelastic consumption, I modify the prices according to the two alternative scenarios outlined above. Finally, I measure the impact with headcount, depth, inequality and welfare indicators.

To estimate consumption levels I combine the geographical distribution of users across tariffs as found in the administrative data with the webscrapped prices of IBT and LT to obtain month- and location-specific price schedules. I use those schedules in the cross-sectional household budget surveys of 2010, 2012 and 2014 to recursively estimate household-level heterogeneous consumption patterns across: time, tariff, season and income-poverty status, conditional on the IBT blocks when applicable.

Within the two alternative scenarios, on one hand the RN-FRT case raises the research and policy question: maintaining RN, at what level of aggregation should price equality hold? I identify five different levels where a RN-FRT can be considered of policy interest: a) municipality, b) the utility's firm business unit, c) regions, d) national, and e) tariff. A FRT at a geographically disaggregated level ensures RN at greater aggregation levels but not the way around and indeed, has different distributional impacts. On the other hand, the VDT alternative affects only those users who consume beyond the first block of an IBT. It consists of raising the price of those blocks that have been fully consumed before reaching the block where they end up consuming. In other words, the users lose their *virtual income* (Olmstead et al, 2007) derived from consuming at subsidized prices in the previous blocks. I assume the consumption patterns remains unchanged.

The impact indicators are: *i)* a *headcount ratio* that measures the number of income-poor users whose expenditure level drops relative to the number in the total population (HRg) or relative to the number of income-poor (HRp); *ii)* two *depth indicators* that separately measure the positive and the negative impact in terms of the expenditure's change with respect to the ex-ante expenditure (Da+,Da-) and with respect to the non-income poor in the same municipality (Dr+,Dr-); *iii)* the relative Gini indicator and its decomposition into within, between and overlapped *inequality* (G); and *iv)* assuming an utility-additive social welfare function, a measure of *welfare change* at different levels of inequality aversion (Newbery, 1995) (W).

Results

The weather-based criterion to apply the different IBT types does not create statistically different distributions of income-poor and non-income-poor users across tariffs and tariff blocks in most tariffs. As a consequence, the RN-FTR's impact in terms of HRg and HRp is rather small, on average less than 1 percent, but varies according to the aggregation level. As expected, none of the users benefit from the VDT alternative as it increases their electricity expenditures. Among the income-poor, the positive impact with respect to ex-ante spending is deepest if the RN-FTR is applied at a national level, however, it is clearly offset by the depth of the negative impact on those who are negatively affected. On average, at any RN aggregation-level, income-poor's expenditure increases by more than 100%, except when it is ensured at the tariff level, as that isolates the effect of the relatively expensive LT scheme. The depth of the income-poor's benefit, relative to their non-poor peers (Dr+) is also offset by the depth of the negative impact (Dr-) when applying a RN-FTR. In contrast, a VDT scheme lowers the size of the latter to about a third of the RN-FTR. On average the Gini indicator shows an inequality decrease from about 0.32 to 0.27 with a RN-FTR and an increase to 0.35 with a VDT scheme. Finally, at different inequality aversion levels, welfare drops between 1 and 2 percent, with a RN-FTR and by about 0.3-0.7 with the VDT alternative. With the VDT alternative, revenue increases range between 10 and 24 percent in 2010 and 2014 respectively.

Conclusions

The application of both alternative scenarios links efficiency and equity considerations in price regulation. On one hand, the RN-FTR that keeps efficiency unchanged fails to favour the majority of the income-poor population as the outlay of most income-poor soars and only a minor fraction of them benefits at all. Despite reducing expenditure inequality, the RN-FTR reduces overall welfare irrespective of the aggregation-level at which revenue-neutrality is set. On the other hand, the VDT alternative raises additional revenue and has a milder negative impact on the income-poor's expenditure level and a smaller aggregate welfare reduction, although it increases inequality. In this way, the VDT counterfactual alternative is preferable to the RN-FTR as it improves the efficiency performance and has a small negative distributional impact on the poor. However, if compared to the actual RET scheme, the VDT case shows that, if not accompanied by any additional compensatory measure, increased efficiency comes at the cost of a negative impact on the poor.

In sum, my analysis shows that there is substantial room for improving the performance of Mexico's residential electricity tariffs and evaluates two policy alternatives based on their efficiency and distributional implications. However, unless price regulation alternatives account for the residential users' living conditions, any tariff simplification is likely to hit hard on the income-poor.

References

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