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Distributional effects of water tariff reforms – An empirical study for Lima, Peru

Julia Alexa Barde [a], Paul Lehmann [b,*]

[a] University of Freiburg (Germany), Department of International Economic Policy, Platz der Alten Synagoge, 79085 Freiburg, Germany
[b] Helmholtz Centre for Environmental Research – UFZ, Leipzig (Germany), Department of Economics, Permoserstr. 15, 04315 Leipzig, Germany

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ABSTRACT

This study analyzes the affordability and distributional implications of water tariff reforms for poor water customers under means-tested tariffs in comparison to increasing block tariffs (IBTs) using volumetric targeting. For this purpose, we employ a unique data set for Lima, Peru. Our analysis reveals that from a pro-poor perspective, the performance of means-tested tariffs is mixed. On the one hand, they distribute more income to poor households than the IBTs, given the assumption that the overall revenue to the water supplier remains constant. On the other hand, the share of poor customers who actually benefit from water subsidies declines with means-testing. Nevertheless, means-tested tariffs clearly outperform IBTs in terms of excluding non-poor customers from being subsidized. These findings should be generalized with care as the performance of the tariff crucially depends on the cut-off value for cross-subsidies and the block prices chosen under volumetric targeting and on the design of the means-test. Our analysis further suggests that a proper assessment of individual welfare effects should take household size into account and rest on a broad set of affordability and distributional indicators. Interestingly, our results are relatively insensitive to the price elasticity of water demand.

* Corresponding author. Tel.: +49 341 235 1076.
E-mail addresses: julia.alexa.barde@vwl.uni-freiburg.de (J.A. Barde), paul.lehmann@ufz.de (P. Lehmann).

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1. Introduction

The individual welfare effects of water tariffs and corresponding reforms are an important concern of public policy in developing countries [1,2]. Especially, affordability of water supply is often understood as a precondition for making (necessary) increases in average tariff levels politically feasible [3–5].[1] The classical economic intuition advises against differentiating the price signal for the sake of distributional and affordability concerns.[2] Instead, such concerns should be addressed by non-distorting income transfers, which increase the ability-to-pay of poor households [8]. However, this strategy may not be implementable in developing countries, in which social transfer systems are often either absent or deficient [9]. Consequently, tariff discrimination is the major means to safeguard affordability of water supply in many countries throughout the world. The dominant approach of tariff discrimination uses increasing block tariffs (IBTs) [10,11]. With IBTs, the marginal price of water increases stepwise with the quantity of water consumed. Therefore, consumers of small quantities – which are assumed to be poor with this type of tariff discrimination – face smaller prices per cubic meter than consumers of large quantities of water. Yet this approach is nowadays commonly criticized for being insufficiently targeted to the poor. As a response to this deficiency, means-tested tariffs are increasingly considered and have been implemented in some countries, such as Chile [9,11–20]. They are expected to be better targeted to poor customers as the tariff discriminates on the basis of individual welfare means. However, the empirical evidence on the actual performance of means-tested tariffs for water supply is still limited.

This study provides a quantitative assessment of the distributional effects of means-tested tariffs as compared to IBTs. We aim at examining how well the different tariff options are actually targeted to the poor and whether this affects affordability. For this purpose, we use a unique data set for the Metropolitan Area of Lima and Callao in Peru (shortly referred to as Lima in the following). It combines administrative data of the state-owned water and sanitation company *Servicio de Agua Potable y Alcantarillado de Lima* (SEDAPAL) with socio-economic data for the roughly nine million people living in Lima obtained from a recent expenditure survey by the Peruvian Statistical Office. We compare the effects of the existing IBTs to four alternative tariffs using different affordability and distributional measures. Inter alia, we evaluate a recent tariff reform proposal, which aims at improving the targeting of the poor in Lima. For our analysis, we distinguish between short-run and long-run effects. The latter take into account demand adjustments of households in reaction to price changes. Evaluating the effects of price reforms is particularly important in Lima, where water supply is extremely scarce. Subsidizing households via water tariffs and thereby deviating from full-cost pricing, which a priori reflects scarcity, should be done – if so at all – with extreme care.

Our analysis adds to the limited literature on distributional effects of water tariffs. A major strand of this literature bases its assessment on a consumer theory approach [7,18,20–25]. Using water demand estimates, these studies examine changes in consumer surplus for different consumer groups and for alternative tariff options. Their focus lies on a comparison of IBTs and tariff schemes that are closer to the efficient pricing rule.[3] The overall finding is that IBTs reduce overall social welfare but may increase the consumer surplus of poor customers (even though to different extents). A main problem of this literature with respect to our research question is that the data used rarely offers appropriate indicators to identify poor households. It also often remains at a highly aggregate level and uses, e.g., district average consumption levels of different income groups to quantify the effects. What is more, using the consumer theory approach for a developing country analysis is often difficult

[1] For the sake of brevity, we will refer to the entire process of water extraction, transportation, and purification as well as of wastewater collection and treatment as water supply throughout our paper.

[2] Affordability of water supply may not only be warranted for distributional concerns but also for efficiency reasons if water consumption produces positive externalities in terms of improved health outcomes, reduced incidence of epidemics, or reduced time spent on fetching water. In this case, the subsidized provision of a subsistence level of water supply may be economically first-best [6,7]. For a broader discussion on pricing water supply see, for example, [8].

[3] Given a cost-recovery constraint, the efficient pricing rule typically encompasses a uniform variable charge and a fixed charge. The variable charge is meant to reflect variable supply cost, while the fixed charge recovers the fixed costs of water infrastructure investments [26]. Alternatively, the tariff may be designed to decrease with increasing price elasticity of demand [27,28]. For an overview of the regulation of water supply, see, for example, [29].