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Regulating a monopoly with universal service obligations: The role of flexible tariff schemes

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ABSTRACT

This paper's purpose is to study the problem of a utility monopoly's regulator, which has a universal service goal that is binding, in the sense that there is no two-part tariff that can induce efficient consumption, self-finance the firm, and guarantee universal access at the same time.

The optimal two-part tariffs that the regulator should set under the following three regulatory rules are derived: no flexibility (the monopolist only offers the regulated plan), partial flexibility (the monopolist can offer alternative plans, but these—and the regulated one—must be available to all customers), and full flexibility (the regulated plan must be available to all customers, but the alternative ones could be offered to specific clients).

The solutions under the three schemes are characterized, and they provide an unambiguous ranking of regulatory rules: total flexibility is weakly better than partial flexibility, and partial flexibility is strictly better than no flexibility. As the regulatory scheme becomes more flexible, the optimally regulated two-part tariff increases its fixed component and decreases the variable one.

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1. Introduction

Network utility regulators, such as fixed telephony, electricity, and gas typically impose a universal service obligation (USO) on monopolists (or the main operator), which aims to guarantee all consumers equal access to the service at a reasonable cost. The universal service goal is typically based on equity and/or efficiency grounds (for those services that exhibit positive externalities) and has been a central element of many industrial and regulatory policies.

These USOs are still quite common in developing and underdeveloped countries, where access to certain services—e.g., fixed telephony, broadband access, water and sewer services, etc.—is far from being universal.¹ In these countries, the universal access problem typically has two different dimensions: one of these is the rural dimension, which is mainly associated with underdeveloped networks with higher costs in less populated areas²; while the other is related to the (un)willingness of low income consumers to pay for services in areas where networks are available.³

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¹ Although the results are general for most network utilities, for concreteness the paper will refer mainly to the fixed telephony case.

² In Latin America, there have been two main approaches to foster telecom network development in rural areas. Some countries like Mexico, Brazil and Venezuela imposed network expansion obligations when they privatized their national monopolies, while other countries like Chile and Peru relied on reverse auctions for minimum subsidies to provide connectivity in remote areas (García-Murillo & Kuerbis, 2005).

³ The number of main fixed lines per one hundred urban inhabitants in Latin America ranges from 3.7 in Paraguay and 4.4 in Bolivia to 21.7 in Argentina and 26.6 in Uruguay, while in developed nations with percentage levels of urban population similar to those of Uruguay and Argentina (above 85%), such as the UK or Germany, the same figure is near 50 (source, ITU statistics at <http://www.itu.int> on Main Telephone Lines in 2007, and The United Nations World Population Prospects: The 2006 Revision at <http://data.un.org> on percentage of urban population).

This paper focuses on the second dimension, i.e. universal access of low income consumers (although it is briefly discussed how the other case can be accommodated within the same analytical framework). This concern is operationalized throughout the paper introducing a binding participation constraint for low-valuation customers.

By imposing a universal access constraint on the regulator's problem, the optimal two-part tariffs that regulators should set are derived under three different regulatory schemes:⁴ one in which the monopolist is forced to offer a single regulated two-part tariff, and the other two in which the monopolist is able to offer alternative tariff schemes, but must always offer the regulated tariff. The latter two schemes differ in the degree of flexibility permitted to the monopolist to price discriminate among consumers: in the first scheme, all tariffs—including the one set by the regulator—must be readily available for all customers, and in the second, only the regulated tariff needs to be offered to all consumers, so the monopolist can tailor alternative tariff schemes for each consumer group.⁵

Regulatory schemes where the main operator is granted flexibility to design alternative plans have been seen more frequently in Latin America in the last few years. In 2004, the Chilean authority (SubTel) granted the regulated operator (Telefonica CTC) the flexibility to offer different tariff schemes, in addition to the regulated one. The Colombian authority (CRT) has been using a similar regulatory framework since 2005: the regulator defines the Basic Plan's maximum tariff, which must be offered with the firm's alternative plans. Several other Latin American countries (Brazil, Mexico, and Peru) allow their main fixed telephony operators to offer alternative plans beyond the regulated ones as well. The regulatory schemes, however, have several differences: In Peru and Mexico a cap is set on a basket of plans; while in Brazil the regulator defines two plans that all operators must offer.

Two relevant questions arise: First, how much flexibility should the monopolist have to design tariff schemes which differ from the one designed by the regulator? And second, what is the regulator's optimal tariff plan for the different regulatory schemes?

This paper shows that the regulatory scheme which gives full flexibility to the monopolist Pareto dominates the one in which all tariffs must be available to all customers for some parameter configurations (and is equally good for all other parameters). Both flexible schemes strictly dominate the more rigid and traditional one in which the monopolist can only offer the regulated tariff. In the paper it is characterized when the flexible regulatory schemes are first-best efficient and when this is true only for the fully flexible scheme. It is also characterized how the optimally regulated two-part tariff should change when the regulatory scheme changes from the most rigid one to the flexible ones. The predicted changes are consistent with the changes observed in Chile and Colombia when more flexible regulatory regimes were introduced.

The case of partial flexibility—where all alternative tariffs must be available to all customers—although weakly dominated, might be relevant for political economy reasons, as it could be hard for the regulator to explain why certain plans are available to some customers but not to others. It is precisely in the situation when a certain group would prefer the tariff scheme intended for a different group that the fully flexible regulatory scheme strictly dominates the one of partial flexibility.

These results are derived in a simple setup in which the unique information asymmetry between the regulator and the monopolist is related to the type of each consumer: it is assumed to be known by the firm but not by the regulator. Different information structures could also be relevant. For example, it could be the case that neither the regulator nor the firm knows each consumer type (we briefly discuss this case as a straightforward extension of our main results, see footnote 27). Or, it could be the case that in addition to the information asymmetry assumed, the firm has better information than the regulator about its own costs. In this case, naturally, the first-best would be unattainable in a one-period model like the one considered here, since the low cost firm would always have an informational rent.⁶

This paper's findings are in line with the literature on price delegation, where the regulator (the less informed party) finds it convenient to allow the firm (the more informed party) to set prices within certain constraints. In the context of asymmetric information about costs (but symmetric about the demand), [Loeb and Magat \(1979\)](#) first proposed a subsidy scheme in which the regulator gives the firm a subsidy equal to the consumers' surplus, which incentivizes the firm to maximize it by setting first-best efficient tariffs. In a dynamic context, and assuming the regulator is able to observe the firm's profits with a lag, [Sappington and Sibley \(1988\)](#) proposed a mechanism in which each period rewards the firm with a subsidy equal to the incremental consumers' surplus (Incremental Surplus Subsidy, ISS). This mechanism induces the firm to immediately set prices equal to the marginal cost, and the rents obtained by the firm are limited to the increase of the first-period consumers' surplus that results from changing the price from an exogenous level to the efficient one. With asymmetric information about the demand, [Riordan \(1984\)](#) showed how a regulator can design a tax/subsidy scheme—where the tax or subsidy is tied to the uniform price that the firm announces—which induces the firm to choose efficient

⁴ The two-part tariff refers to a monthly fixed charge and a per-unit price. In most Latin American countries, unlike for example the US, the per-minute price for local calls is not zero.

⁵ Throughout the paper it is implicitly assumed that the regulator has no instruments other than tariffs and the regulatory scheme. This is a reasonable assumption for many countries, especially for the type of universal access problem addressed: the access of low-income customers.

⁶ The simpler setup, however, is better suited to convey the intuition of our results. Moreover, the qualitative results about how the regulated plan should be modified if the regulated firm is granted more flexibility, is valid regardless of how the original regulation was decided. The ranking of the efficiency of the different regulatory regimes, it is conjectured, would also be preserved if the regulator defined a menu of two-part tariffs such that the firm would self-select depending on its costs.

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