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Optimal mobile termination rate: The Brazilian mobile market case

Carlos M. Baigorri [1], Wilfredo F.L. Maldonado *

Catholic University of Brasília, SGAN 916, Módulo B. Brasília DF, CEP 70790-160, Brazil

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ABSTRACT

This paper presents a study of the impacts of changes in the mobile termination rate in Brazil using 2008 as the base year. For this we use an extension of the monopolistic competition model used by Wright, Thompson, and Renard (2007) allowing for the charge of interconnection fee also from calls originating on mobile networks and differentiated prices for on-net and off-net calls. After calibration of the model parameters and estimation of the price elasticity of demand for mobile services, we conduct a comparative static analysis varying the mobile termination rate in order to find the optimal value for that parameter. Finally, we provide some discussions on policy regulation in that sector depending on the objective of the regulator agency.

1. Introduction

One of the main concerns for the National Regulatory Agencies (NRA)[2] in the cell phone market is the market power exhibited by the operators when fixing a mobile termination rate (MTR).

Studies on the impacts of the MTR are numerous. Wright (1999) proposed a theoretical model of competition between two interconnected cellular networks and showed that above-cost termination rates are a consequence of a coordination failure between cellular firms. In Valletti and Houpis (2005) it is proved that the optimal termination rate depends on the heterogeneity of customers, the intensity of competition and the level of network externality. Littlechild (2006) analyzed an alternative framework where the receiving party pays and show that under this system the price of calls decreases and the average minutes of usage increase leaving the mobile penetration rate almost unchanged. In Wright et al. (2007) it is developed a more general model with several firms and heterogeneous customers to analyze the effect of changes in the MTR on variables as the penetration rate and consumers and total surplus. Finally, Armstrong and Wright (2009) showed that in a differentiated interconnection charge framework, fixed-to-mobile charges are too high and the mobile-to-mobile termination charges are too low.

An analogous problem is analyzed by Uri (2002) and Albon and York (2006), where the author studies the problem of excessive originating and terminating access charges imposed by U.S. local exchange carriers, and finds that the carriers define higher charges for access service than those expected in a competitive market[3].

* Corresponding author. Tel.:+55 61 3448 7131.
E-mail addresses: Baigorri@anatel.gov.br (C.M. Baigorri), wilfredo@pos.ucb.br, willy@impa.br (W.F.L. Maldonado).
[1] Tel.:+55 61 2312 2007.

[2] For instance, the European Commission (CEC, 2009), India (TRAI, 2008), European Union (ERG, 2007), Colombia (CRT, 2007) and the USA (FCC, 2004) decided to establish a cost-based MTR in order to attain welfare optimality.

[3] The discussion about regulation mechanisms and its effects over the efficiency of the U.S. local exchange carriers can be found at Uri (2001). A broader and deeper discussion about regulation of telecommunications systems can be found at Uri (2004).

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In the last years Brazil has become the fifth worldwide market of mobile telecommunications. Nowadays the country has more than 250 million customers and a penetration rate over 130%. However, the usage of mobile phones is still small compared to other developing countries[4]. Among the reasons for the limited use of the service, there is the issue of the MTR[5].

On the other hand, it is argued that the high MTR in Brazil allows the viability of prepaid services, allowing greater access to service, especially to the low income classes[6]. Therefore, there is in the Brazilian market an intensive debate about the optimal price of interconnection, which on the one hand, influences the price of service, and on the other hand, affects the access of the low income classes to mobile telecommunication services.

Aiming to contribute with this still open discussion, this work adapts the Wright et al. (2007) model in order to include some features of the Brazilian market structure and proposes some regulation policies in that sector.

The paper is structured as follows. In Section 2 of this paper, the theoretical model is described. Section 3 presents one of the main ingredients of the empirical analysis, the estimation of the price-elasticity of the demand for mobile services. Section 4 presents the main results of the model and the welfare analysis. Section 5 contains the discussion about the results and Section 6 is reserved for the conclusions. The more technical aspects of this work were relegated to Appendix A and B available from the authors under request[7].

2. The theoretical model

The model departs from that used by Wright et al. (2007) in order to adjust some features of the Brazilian market.

There are "N" potential heterogeneous consumers of mobile telephony services, where the heterogeneity is represented by a random variable $a_i \sim U[a_{\min}; a_{\max}]$ contained in the utility function of them. The utility function is a quasilinear function with constant price elasticity of demand $\varepsilon > 0$. There are "J" monopolistic competitors in the mobile phone market and a monopolistic operator on the landline telephony market, being a non-integrated operator[8]. Operator $j \in J$ competes with their peers maximizing its profit by choosing their rentals (r_j) and their unitary prices ($p_j^{mn}; p_j^{mf}; p_j^f$)[9] (M2M on-net calls, M2M off-net calls and M2F calls), given the rental and the prices chosen by the other operators. Consumers have utility arising from making telephone calls and from subscribing to the $j \in J$ network (network benefits).

The monopolistic competition among operators follows the characterization of Wright et al. (2007), assuming that each operator is located on a vertex of a J-simplex and that the individuals are uniformly distributed along the edges of this simplex. Normalizing the total edge length of the simplex by one, each edge will have the length $L = 2/(J(J-1))$. Thus, if individual i is located in one of these edges, the number $x_{i\to j} \in [0, L]$ will represent the distance between individual i and the vertex of operator j. Let β_j be the maximum benefit from being a customer of operator j and t a parameter representing the rate at which the maximum benefit β_j declines as the distance $x_{i\to j}$ increases.

With all those elements, the indirect utility of consumer i with parameters $(x_i; a_i)$when being a customer of operator j results

$$U_{i,j}(x_i, a_i) = (\rho a_i)^{\varepsilon} \delta^{\varepsilon-1} \varepsilon^{-1} [(s_j p_j^{mn})^{1-\varepsilon} + (s_{\neq j} p_j^{mf})^{1-\varepsilon} + (p_j^f)^{1-\varepsilon}] + \beta_j - t x_{i\to j} - r_j, \quad (1)$$

where $\delta = (\varepsilon-1)/\varepsilon$, $\rho \in [0, 1]$ is the penetration rate of the mobile phone market, $s_j \in [0, 1]$ is the market share of provider j and $s_{-j} \in [0, 1]$ the market share of all others. The derivation of Eq. (1) can be found in Appendix A.

In this point it is important to note that the model misses the impact of the value that mobile subscribers place on receiving calls. Other works, like Harbord and Hoerning (2012), assume that receiving call increases the consumers welfare. Depending on the strength of the call externalities the tradeoff between choosing a high or low MTR is not detected in the model, indicating a straightforward decision. In this sense, the present model considers that there is no externality, so it possible to clearly identify the dilemma of establishing the MTR.

The decision rule for individual i choosing the mobile operator j (which is represented by $i \in j$) is given by Eq. (2):

$$\text{If } \left(U_{i,j}(x_i, a_i) > 0, \text{ and } U_{i,j}(x_i, a_i) > U_{i,k}(x_i, a_i), \forall k \neq j\right) \Rightarrow i \in j \quad (2)$$

The demand for calls originated in the landline network to mobile network customers will be modeled through a linear demand function defined as

$$Q = B_1 - B_2 P \quad (3)$$

where P is the price charged per minute when making calls from landline networks to mobile networks and Q is the demand of these kind of calls.

[4] According to the Merrill Lynch (2009), the average usage, in Brazil is 90 min, one of the lowest in the world.

[5] In Brazil, the value of this rate is one of the largest in the world.

[6] As evidence of this argument, we have that in Brazil 82.3% of more than the 200 million consumers are using pre-paid services

[7] The Appendixes can be requested to baigorri@anatel.gov.br and wilfredo@pos.ucb.br. Appendix A presents in detail the theoretical model discussed in Section 2 and its solution. Appendix B shows the specification and calibration of the parameters presented in Section 2

[8] The non-integrated operators are those one that operates only on the landline telecommunication market.

[9] Wright et al. (2007) considers the unitary prices ($p_j^m; p_j^f$), once that he considers $p_j^{mn} = p_j^{mf}$.