Measuring prices in the electronic communications market: some thoughts about non-linear tariffs for mobile phone calls

Begoña García-Mariñoso, Íñigo Herguera, David Suárez

Dirección de Estudios y Estadísticas – CMT

Barcelona, 24 de marzo de 2011
Introduction

Information and its double role in regulatory agencies:

1) Internal- decision making
2) Published- accountability

Key indicators: penetration, market shares, revenues, price levels

Price data- blunt way to convey information on the degree/outcome of competition either comparing price levels of different geographical area or by tracking price changes with time.
Measuring prices is a challenging task due to non-linear tariffs.

For mobile phone calls: Prices depend on the time of the call or the destination network.
Volume discounts, semi-flat rates and flat rates
Call connection fees

Hard to summarize in a few indicators, something desirable in public reporting.

Usual approaches:

1) Proxy price levels using average revenues per user, line or minute.
2) Use of theoretical consumer profiles (known as baskets).

Drawbacks of 2:

a) Not all consumer profiles are equally relevant in all countries (between countries variability).
b) It is not possible to guarantee that the offers finally informed are the most relevant ones.
European NRAs and the EC have proxied prices using average revenue per minute or per call, normally sourced directly from operators (i.e. total revenue/total number of minutes).

Reasons: simplicity and comparability

We argue that reporting average expenditures per unit of consumption improves on this (mean of the expenditures per unit of consumption of different individuals).

\[
\text{Average Revenue} = \frac{\sum_{i=1}^{I} E_i}{\sum_{i=1}^{I} M_i} \quad \text{Average Expenditure} = \frac{\sum_{i=1}^{I} E_i/M_i}{I}
\]
1) From operators.

2) CMT and Red.es outsource the field work necessary to gather household data which consists of:

   a) Survey information (twice a year).
   b) Bill harvesting data (quarterly)

In 2010 the sample sizes were of around 3,000 households and over 6,000 individuals for the questionnaires and around 2,500 households for the bill harvesting data.
Sources of differences between AE and AR

Economic rationality: people will choose tariffs “adequate” to their consumption levels

For mobile calls, two types of tariffs:

a) Volume discounts \[\rightarrow\] large consumers go for 2-part tariffs with larger one-off payments (maybe lower price per minute)

a) Call connection fee \[\rightarrow\] those who tend to make longer calls pay less per minute

Both facts generates a difference between AE and AR.
Example with call connection fee: Sources of differences between AE and AR

1) If the price per minute for all calls is \( p \), then \( AE = AR \).

2) Add a call connection fee: \( c \). Each individual, \( i \), from 1 to \( I \), makes \( n_i \) calls. \( d_{ij} \) upper bar is the average duration of the calls of individual \( i \).

Average revenue per minute is:

\[
\frac{\sum_{i=1}^{I} \sum_{j=1}^{n_i} (d_{ij}p + c)}{\sum_{i=1}^{I} \sum_{j=1}^{n_i} d_{ij}} = p + \frac{c}{\left( \frac{\sum_{i=1}^{I} n_i \bar{d}_i}{\sum_{i=1}^{I} n_i} \right)} \tag{1}
\]

Average expenditure per minute:

\[
\frac{\sum_{i=1}^{I} \sum_{j=1}^{n_i} (d_{ij}p + c)}{\sum_{j=1}^{n_i} d_{ij}} = p + \frac{c}{\left( \frac{l}{\sum_{i=1}^{I} (1/d_{ij})} \right)} \tag{2}
\]
Example with call connection fee: differences between AE and AR

1) The effect of the call connection fee is that the price per minute of any call decreases with its length.

2) \( AR = AE \) if the average duration of calls is the same for all individuals.

3) If all individuals make the same number of calls, \( AE \geq AR \).

4) When the number of calls differs between individuals, the difference between \( AR \) and the \( AE \) can take any sign.

For \( AE < AR \) there must be a negative correlation between the average call duration and the number of calls of individuals. Loosely speaking those that phone more must make shorter calls.
## Average expenditures and revenues for mobile calls

<table>
<thead>
<tr>
<th>Post-paid calls</th>
<th>Panel de Hogares</th>
<th>Data provided by operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data of the second quarter of 2010</td>
<td>(2,481 individuals)</td>
<td></td>
</tr>
<tr>
<td>Average expenditure</td>
<td>29.1</td>
<td>Average revenue</td>
</tr>
<tr>
<td>Average revenue</td>
<td>13.3</td>
<td>Average revenue</td>
</tr>
<tr>
<td>Voice calls (euro cents per minute)</td>
<td>29.1</td>
<td>13.3</td>
</tr>
</tbody>
</table>
## Volume of minutes, impact on av. expenditure and av. revenue of mobile voice

<table>
<thead>
<tr>
<th>Volume of minutes quartile</th>
<th>Average expenditure (euro cents/minutes)</th>
<th>Average revenue (euro cents/minute)</th>
<th>Number of minutes per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>59.4</td>
<td>40.7</td>
<td>18.7</td>
</tr>
<tr>
<td>2nd</td>
<td>26.2</td>
<td>25.8</td>
<td>44.6</td>
</tr>
<tr>
<td>3rd</td>
<td>19.7</td>
<td>19.3</td>
<td>84.9</td>
</tr>
<tr>
<td>4th</td>
<td>10.9</td>
<td>7.9</td>
<td>301.5</td>
</tr>
<tr>
<td>Total</td>
<td>29.1</td>
<td>13.3</td>
<td>112.4</td>
</tr>
</tbody>
</table>
Volume of minutes, impact on av. expenditure and av. revenue of mobile voice

AR and AE depending on the 2.5% percentiles of volume of minutes
Conclusions

* Two apparently similar ways to report mobile call prices, the average expenditure per minute and the average revenue per minute differ in a striking way. The reason is the diversity in tariffs.

* AE and AR are complementary: their combination sheds a better light on price levels where price discrimination is present.

* We are left with the question on whether it would be legitimate to give any further interpretation to the difference between both measures. Greater competition for large users? Changes in the habits in calling behaviour? Difficult to disentangle.

* To derive the average expenditure per minute one needs access to micro-data, which is still scarce.