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Satisfaction and protection of individual mobile telecommunications consumers: Need for regulation?

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Satisfaction and protection of individual mobile telecommunications consumers: Need for regulation?*

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Abstract

Mobile telecommunications markets have been studied primarily from the perspectives of mobile telecom operators, market organization and regulators. However, there have been few studies from the perspective of the private consumer, which is the object of this research. This paper is part of an ongoing project on the protection of individual mobile consumers. The main research questions of the project are whether, and to what extent, individual consumers of mobile telecommunications are satisfied or subject to dubious practices by mobile operators, possibly due to market failures, and whether improved regulation can increase the efficiency of the industry and the welfare of telecommunications consumers. The specific research question of this paper is how much customer satisfaction there is among private individual consumers of mobile telecommunications in Spain and what factors may be associated with this. Specifically, we formulate, estimate and interpret relationships between different aspects of satisfaction and its determinants. Some novelties of this paper are a new focus on individual consumers and the use of new data which convey high quality statistical information. We use cross-section data on 4953 individual consumers. We specify econometric models and estimate them using different techniques. Our data allow us to discriminate by operators, regions of residence (Autonomous Regions and provinces), gender, age and educational level, among others. Our results indicate that customers are less satisfied with the larger carriers like Telefónica and Vodafone, and more satisfied with smaller and newer operators. We measure the importance of each of the items of satisfaction to the overall satisfaction. We also estimate individual equations for each of the items of satisfaction and measure the importance of each of its determinants. Finally, we analyze the effects of the different types of complaints on each of the items of satisfaction.

Key words and phrases: Consumer satisfaction, consumer protection, mobile telecommunications, individual private consumers, survey data, cross section, econometric models.

JEL Classifications: C21, D12, L52, L96.

1. Introduction

This paper is part of an ongoing project on the protection of individual mobile consumers. The main research questions of the project are:

- a. Whether, and to what extent, individual consumers of mobile telecommunications are subject to dubious practices by mobile operators, possibly due to market failures, and
- b. Whether improved regulation can increase the efficiency of the industry and the welfare of individual telecommunications consumers.

The specific research question of this paper is how much customer dissatisfaction there is among private individual consumers of mobile telecommunications in Spain and what factors may be associated with this.

We have found few studies with a similar focus in the literature. In Spain, somewhat related studies include Álvarez and Caballero (1995), García Zaballos and Escribano (2002), González et al. (2003), Herguera (2001), Jarillo (1995), Osa (2001) and Soto et al. (2003), which focus on the perspective of mobile operators or regulators.

We also mention the website (<http://www.usuarioteleco.es/>) of the Ministry of Industry, which is a regulator of telecoms, where user complaints are dealt with. A recent survey on the satisfaction of business customers was performed by the *Comisión del Mercado de las Telecomunicaciones* (CMT) (2011), and there is also a survey called "Satisfacción de Usuarios de Servicios de Telecomunicación" by the *Centro de Investigaciones Sociológicas* (CIS), Spain (2009). We use these as the primary data sources for this paper.

In other countries, and from the point of view of mobile operators, we mention Dedrick et al. (2011), Lee (2011), Lescop and Isckia (2010), Ono and Tang (2010), Song (2010), and Zhang and Liang (2011), among others.

Other papers that deal with these topics from the point of view of the industrial organization are Karacuka et al. (2011), Lam (2010), and Symeou (2011). On the other hand, Davies et al. (2008), Diehl (2010), Palcic and Reeves (2010), and Renda (2010) adopt the point of view of the regulator.

As we have seen, the analysis of this market from the perspective of the consumer is not yet well developed, either from the point of view of the individual or that of business consumers. In this paper we analyze this market from the point of view of individual private consumers rather than business consumers because, in general, the latter's behavior differs from that of individual consumers and a unified treatment would not be appropriate or useful. We intend to analyze individual demand and the possible abuses inflicted on residential consumers of mobile services by mobile operators, as well as the protection that they receive from private and public institutions and any relevant regulations.

In order to analyze the satisfaction or dissatisfaction of consumers, we will use a representative survey for the whole country with data on 4953 individual consumers: "Satisfacción de Usuarios de servicios de telecomunicación", performed by the *Centro de Investigaciones Sociológicas* of Spain (CIS) (2009). The center is an official government body that produces high quality statistics which are well suited to our analysis. While the 2009 data may seem somewhat outdated, it must be noted first that the purpose of this project paper is not to produce a newsletter, but rather a study on relationships that are expected to be stable over time, and second that the project is currently developing a new survey on the satisfaction of mobile consumers to be launched next year and the study with 2009 data will be a useful point of comparison for the new 2013 study.

The rest of the paper is organized as follows: section 2 contains the description of the survey data; section 3 includes the analysis of different equations that synthesize customer satisfaction; section 4 presents several equations related to consumer complaints; while Section 5 concludes and presents some caveats and directions for further research.

2. Presentation of Data from the Survey

The CIS micro-data (2009) have been made available through the Internet. This is the first time that it has been used, although the basic tabulation of the results is available on the CIS website. The survey includes questions about individual socio-demographics, different operators, satisfaction with fixed and mobile telephony, satisfaction with fixed and mobile Internet, complaint resolutions, etc.

[Figure 1 goes here]

The data are representative nationwide, by province and Autonomous Community (shown in Figure 1) and also by gender, age and major telecommunications carrier, thus making them appropriate for the analysis that we perform in our research. We can identify the 17 Autonomous Communities¹ (A.C.) and 50 provinces of residence of each individual. The use of dummy variables to control for unobserved heterogeneity may substantially improve the within sample fit and the consistency and efficiency of the estimates.

[Figure 2 goes here]

Figure 2 shows the respective market shares of Movistar (48.0%), Vodafone (30.3%), Orange (18.7%), Yoigo (1.7%) and Mobile virtual operators (1.3%).

[Figure 3 goes here]

In Figure 3 we observe histograms of 10 measures of satisfaction related to relevant aspects of mobile telephony services. The first panel shows general satisfaction while the rest correspond respectively to cost, communication quality, customer care, bill clarity, adequacy of rates, coverage, easy-to-find rates and offers, convenience for acquiring new handsets, bill clarity^[101] and complementary services. We observe substantial variability across the histograms of each measure of satisfaction. While all of them have uni-modal and asymmetric empirical distributions, the modes are generally different, as are the patterns of asymmetry, as seen in Table 1. This suggests that it is worthwhile to perform individual analyses for each of them.

[Table 1 goes here]

a. Descriptive statistics of selected variables.

The descriptive statistics of the different measures of satisfaction with different aspects of mobile telephony are given in Table 1. Note that the averages of the different measures of satisfaction vary between 5.62 and 7.18, while the standard errors vary between 1.78 and 2.25.

¹ Andalusia, Aragon, Asturias, Balearic Islands, Basque Country, Canary Islands, Cantabria, Castile-La Mancha, Castile and Leon, Catalonia, Valencia, Extremadura, Galicia, La Rioja, Madrid, Murcia, Navarra.

b. Scatter plots.

In Figures 4 and 5, we present some histograms and scatter plots that may give an insight into the relationships present in the sample: General satisfaction by operators; Satisfaction vs. other possible determinants: education and expenditure.

[Figures 4 and 5 go here]

3. Empirical models for customer satisfaction of mobile consumers.

In this section we present ten multivariate models of different aspects of individual customer satisfaction that are estimated with our CIS cross section survey data.

Here, in order to approximate unknown relationships, we analyze our data using general linear models estimated by least squares-type methods. The observed measures of satisfaction vary between 1 and 10 in our sample. We will treat the observed measures as, y , a variable observed with a measurement error of an underlying latent unobservable measure, y^* . While data on satisfaction are somewhat ordinal, we treat them as cardinal, assuming that the differences between adjacent values of the satisfaction indices are constant across values of the index and across individuals.

See Anderson and Fornell (2000) for an excellent discussion of cardinality versus ordinality in this context. Note that the cardinality assumption is implicit when averages and standard deviations of (supposedly ordinal) indexes are computed, even by researchers that insist on the ordinal nature of satisfaction indices, e.g. Peel et al. (1998), page 81.

We will assume a linear relationship between its possible determinants, and therefore write models which are linear both in the explanatory variables and in the parameters that summarize the relationships between each dependent variable and its determinants. This type of model has several advantages, especially the direct interpretability of the estimated coefficients.

A natural alternative to this approach is ordered probit (or logit). Wooldridge (2010) recommends to start with linear regression and, if necessary, to continue with OPROBIT. This approach has been used by Papke (2000) and Peel et al. (1995). Moreover, in a companion to this paper by Garin et al. (2012), we also perform OLS

and OPROBIT. In our case, and in the previously mentioned cases, the results are similar to those of linear regression in terms of signs and significance of coefficients, and in most cases they obtain marginally better (or worse) fits than linear regression.

[Table 2 goes here]

3.a. General satisfaction vs. satisfaction with specific items.

We start with a model that relates total satisfaction to each of its 9 components. It is reasonable to hypothesize that total satisfaction will be related to each of the components of satisfaction, although the relationship may include an error term, since it will not be exact or exhaustive. However, the weight of each of the components is not known a priori. Table 2 summarizes the estimation of the weights (coefficients) of each of the components of satisfaction, assuming that they are linearly related to general satisfaction. Since all of them are measured in the same units, the coefficients and their standard errors can be compared directly.

The equation has been estimated by OLS. Then we have detected outliers, corresponding to residuals that are larger than 3 standard deviations, and proceeded to treat them using one dummy variable for each of them. Next we tested for heteroskedasticity using both versions of White's test, with only the square terms of the regressors and also including all cross terms. These tests are sensitive to general misspecification of the conditional second moment. Upon detecting heteroskedasticity, we re-estimate the covariance matrix of the estimated coefficients using the Eicker-White (Eicker (1967) and White (1980) heteroskedasticity consistent covariance matrix estimator.

In Table 2 we observe first that all coefficients are positive and significant and that the most important components are those of customer care .145 (6.51), communications quality .136 (4.74) and complementary services .124 (4.90), followed by adequacy of rates .099 (4.24), cost .085 (4.77), easiness of acquiring new handsets .068 (3.21), bill clarity .067 (2.80) and coverage .067 (3.08), while the least important is easily finding rates and offers .02 (0.81).

[Figure 6 goes here]

We also observe in Table 2 that the operator dummies are insignificant, as can be expected, and that the dummies for Autonomous Communities are jointly significant.

They are used to control for the heterogeneity that may be present due to the peculiarities of each individual autonomous community.

After analyzing the components of overall satisfaction, we proceed to the determinants of overall satisfaction and the satisfaction with specific items contained in Table 3.

- a. The analysis of the valuations of each of the operators by their customers, that is, the **operator** effect. We factor out the influence of other possible explanatory variables to isolate the pure operator effects.
- b. We also investigate the factors that are influential in the valuation of the mobile carriers by their customers, that is, what is the effect of the control variables, including geographical location, age, gender, education, expenditure, etc.

[Table 3 goes here]

Table 3 contains the results of the estimation of the different models of satisfaction. The first row indicates that it is the model in which we control for Autonomous Communities, using a dummy for each one of them minus one (a total of 16 dummies). Then the M1 through M10 correspond to the ten different models. The dependent variable of each of them is in the second row of the table, starting with satisfaction overall, satisfaction with cost, satisfaction with the quality of communications, satisfaction with customer care, satisfaction with bill clarity, satisfaction with adequacy of rates, satisfaction with coverage, satisfaction with finding rates and offers easily, satisfaction with acquiring new handsets easily and satisfaction with complementary services.

The first column contains the names of the different explanatory variables, which start with the carriers: Movistar, Vodafone, Orange and VMO (we take Yoigo as a basis for comparison). These are followed by the rest of the socio-economic explanatory variables that have turned out to be significant in at least one of the models. And finally are the selected summary statistics such as the number of observations, coefficient of determination, F test of joint significance and the White test for heteroskedasticity.

3.b. Model M1, general satisfaction vs. explanatory variables

Starting with column M1 in Table 3, we find that the dependent variable is the overall satisfaction, and then we find the estimated coefficient for Movistar which is -.42, while

the t-statistic -1.81 is below the estimated coefficient, which is marginally significant. The interpretation of the estimated coefficient is that, after controlling for all the explanatory variables, a customer tends to be less satisfied for the mere fact of being a customer of Movistar than if he/she were a customer of Yoigo. In other words, being a customer of Movistar makes you essentially 0.42 (only marginally significant) unhappier on a scale from 1 to 10, and that is factoring out the effect of the other explanatory variables.

A similar interpretation applies to the coefficients of Vodafone, .34 (-1.43) points less satisfied than a customer of Yoigo, and to the customers of Orange, which are .46 (-1.92) points less satisfied than with Yoigo. Only the customers of virtual mobile operators are equally satisfied as those of Yoigo, since the estimated coefficient is only -.024 (-0.07) and insignificant.

The next block of explanatory variables in model M1 of Table 3 is: minimum daily consumption, which is insignificant, and if a customer has contracted mobile internet, with which he/she tends to be more satisfied by 0.52 (4.03) points. Spaniards tend to be less satisfied than foreign nationals by -.29 (-3.37) points and males tend to be less satisfied than females by -.13 (-2.49) points.

The next block of explanatory variables in model M1 is related to the various complaints that a customer may have filed in the last 12 months. The variables are dummies that take the value of 1 if at least one specific complaint has been filed and 0 otherwise. This block of 7 variables consists of Delay in establishing the service, Coverage problems, Incorrect billing, Incorrect billing for services not used, Breach of contract or commercial offer, Difficulty in cancelling the service, and Difficulty in obtaining the required information.

We can see that the overall satisfaction is significantly and negatively affected by Coverage problems -.50 (-6.91), Incorrect billing -.40 (-2.63), Incorrect billing for services not used -.37 (-2.34) and Difficulty in obtaining the required information -.72 (-5.37). In the above paragraph the first number represents points of satisfaction on a scale of 1 to 10, and the second is the t statistic. We observe that each of the specific estimates indicates an important effect on overall satisfaction of the different types of problems that may result in complaints by the customers.

We also use a constant together with 16 dummies to control for the possible heterogeneity across autonomous communities. We then show the number of individual dummies that we used in each model to treat the outliers (with residuals larger than 3 standard errors).

At the bottom of the column we show the number of observations, 3311, the coefficient of determination, 0.262, the F test of joint significance, 101.38 which is highly significant, with a p-value of 0.000, followed by a significant White test of heteroskedasticity of unknown form with a p-value of 0.000, which rejects the null of homoskedasticity. We estimate the variance covariance matrix of the estimated coefficients consistently using the Eicker-White (White (1980)) estimator.

3.c. Models for satisfaction with specific items, M2-M10.

Models M2 to M10 are specified and estimated using similar techniques to those of model M1. In the rest of Table 3, we observe that:

1. The satisfaction with respect to cost (M2) is significantly lower than that for the base category for all carriers, with the highest difference for Movistar which is -2.06 (-8.39) points. All the differences are negative and significant.
2. The differences in satisfaction with respect to communications quality are small and insignificant.
3. The differences in satisfaction with customer care are negative and significant for the three major carriers, with the largest one pertaining to Movistar with an estimate of -0.88 (-4.28) points.
4. The differences in satisfaction with respect to bill clarity are negative and significant for the major carriers, with the largest one for Movistar with an estimate of -0.94 (-3.59) points.
5. The differences in satisfaction with respect to adequacy of rates are negative, with the largest one for Movistar with an estimate of -1.41 (-6.01) points.
6. The pattern of the differences in satisfaction with respect to coverage changes significantly with respect to the previous ones. The only negative differences are those of Orange with -.52 (-2.14) points below Yoigo. On the other hand, the

satisfaction with the coverage of Movistar has a positive, although insignificant, value.

7. With respect to the issue of easily finding rates and offers, all major carriers have negative and significant differences, the largest being for Movistar with $-.89$ (-3.94) points.
8. The satisfaction with respect to easily acquiring new handsets is also negative for all carriers, the largest and most significant being for Movistar with an estimate of $-.75$ (-1.97).
9. The satisfaction with respect to complementary services also shows negative but insignificant differences for all carriers.

Summarizing, if we control for the effect of other relevant variables, Movistar is the carrier that gives less satisfaction to its customers, except possibly in communications quality, coverage and complementary services.

The next least satisfying carriers are Vodafone and Orange, which are very close together in most aspects of consumer satisfaction, except for the significantly worse coverage of Orange.

We have also performed similar estimations controlling for the 50 different provinces instead of the 17 Autonomous Communities. They are available from the authors upon request. We observe very similar coefficients to those in Table 3. We test the hypothesis that the coefficients are equal against the alternative that they are different. F tests of homogeneity of coefficients do not reject the null hypothesis of equality of coefficients at the 0.05 level of significance. We therefore base our inference on Table 3, which controls for Autonomous Communities, includes fewer parameters and allows for more efficient estimation.

4. Satisfaction with specific items and mobile customer complaints.

Next let's consider in Table 3 the block of variables related to the complaints filed by individual customers. We focus now on columns M2 to M10 and on the rows corresponding to the variables. This block of 7 variables consists of Delay in establishing the service, Coverage problems, Incorrect billing, Incorrect billing for

services not used, Breach of contract or commercial offer, Difficulty in cancelling the service, and Difficulty in obtaining the required information.

The general conclusions that can be drawn from the estimation of the unknown parameters can be summarized as follows:

1. With respect to satisfaction with **cost**, the relevant variables are: having filed at least one complaint for coverage problems $-.45$ (-4.77), difficulty in terminating the service $-.69$ (-2.61) and difficulty in obtaining the required information $-.78$ (-4.64). Note that the estimates of the coefficients are high when measured on a scale of 1 to 10, and also in relation to the range of variation of the dependent variable.
2. With respect to satisfaction with communications **quality**, all the estimated coefficients of the complaints are negative, as expected, they have relatively high coefficients and the most significant ones are: Delay in establishment of service $-.53$ (-2.09), coverage problems $-.98$ (-13.33) and difficulty in obtaining the required information $-.34$ (-2.48).
3. In a more general view of the relevant block of Table 3, we observe that **coverage** problems are always relevant and have a negative effect on all measures of satisfaction.
4. The next most important source of dissatisfaction is the Difficulty in obtaining the **required information**, in all but one of the models.
5. Next comes the **breach of contract** or commercial offer, which has a negative and significant effect on four measures of satisfaction.

5. Conclusions

This research is part of an ongoing project on the protection of individual mobile consumers. The main research questions of the project are whether, and to what extent, individual consumers of mobile telecommunications are subject to dubious practices by mobile operators, possibly due to market failures, and whether improved regulation can increase the efficiency of the industry and the welfare of individual telecommunications

consumers. The specific research question of this paper is how much customer satisfaction there is among private individual consumers of mobile telecommunications in Spain and what factors may be associated with this. We use data on 4953 individual consumers from the survey: “Satisfacción de Usuarios de servicios de telecomunicación”, of the *Centro de Investigaciones Sociológicas* (CIS), Spain. Our data include regions of residence (Autonomous Regions and province), gender, age and educational level. We formulate, estimate and interpret relationships between different aspects of satisfaction and its possible determinants. We specified parametric linear regression models and estimate them using different techniques.

We find that the items that comprise **overall satisfaction** have positive and significant effects, and the effects of the most important items are: customer care .145 (6.51), communications quality .136 (4.74) and complementary services .124 (4.90), followed by adequacy of rates .099 (4.24), cost .085 (4.77), easiness of acquiring new handsets .068 (3.21), bill clarity .067 (2.80) and coverage .067 (3.08), while the least important is easily finding rates and offers .02 (0.81).

Next, we model the **determinants of overall satisfaction**. After controlling for all the explanatory variables, a customer tends to be less satisfied for the mere fact of being a customer of Movistar than if he/she were a customer of Yoigo. In other words, being a customer of Movistar makes you essentially 0.49 unhappier on a scale from 1 to 10, and that is factoring out the effect of the other explanatory variables.

A similar interpretation applies to the coefficients of Vodafone, whose customers are .34 (-1.43) points less satisfied than a customer of Yoigo, and to the customers of Orange which are .46 (-1.92) points less satisfied than Yoigo. Only the customers of virtual mobile operators are equally satisfied as those of Yoigo, since the estimated coefficient is only -.024 (-0.07) and insignificant. Our results indicate that the customers are less satisfied with the larger well established carriers, like Telefonica and Vodafone, and more satisfied with smaller and newer operators.

We also find that **overall satisfaction** is significantly and negatively affected by Coverage problems, -.50 (-6.91), Incorrect billing, -.40 (-2.63), Incorrect billing for services not used, -.37 (-2.34) and Difficulty in obtaining the required information, -.72 (-5.37).

Summarizing, if we control for the effect of other relevant variables, Movistar is the carrier that gives less satisfaction to its customers, except possibly in communications quality, coverage and complementary services.

The next least satisfying carriers are Vodafone and Orange, which are very close together in most aspects of consumer satisfaction, except for the significantly worse coverage of Orange.

The general conclusions that can be drawn from the estimation of the block of variables that represent filing of complaints for different reasons are:

- a. With respect to satisfaction with **cost**, the relevant variables are: having filed at least one complaint for coverage problems $-.45$ (-4.77), difficulty in terminating the service $-.69$ (-2.61) and difficulty in obtaining the required information $-.78$ (-4.64). Note that the estimates of the coefficients are high when measured on a scale of 1 to 10.
- b. With respect to satisfaction with communications **quality**, all the estimated coefficients of the complaints are negative, as expected, they have relatively high coefficients and the most significant ones are: Delay in establishment of service $-.53$ (-2.09), coverage problems $-.98$ (-13.35) and difficulty in obtaining the required information $-.34$ (-2.48).
- c. In a more general view of the relevant block of Table 3, we observe that **coverage** problems are always relevant and have a negative effect on all measures of satisfaction.
- d. The next most important source of dissatisfaction is the Difficulty in obtaining the **required information**, which is significant in all but one of the models.
- e. Next comes the **breach of contract** or commercial offer, which has a negative and significant effect on four measures of satisfaction.

Summarizing, we have found significant and sizeable effects of the different variables on satisfaction, suggesting that they can be manipulated by the operators and regulators to enhance consumer satisfaction.

It is likely that the reason why some carriers have been steadily losing market share is because of unsatisfied customers and not because of aggressive competition. Operators should look at their own performance and customer satisfaction and try to work on the variables that influence satisfaction that lie within their control.

Further research to analyze other aspects of the problem, such as market imperfections and efficient regulatory measures, is under way within the general framework of the project for analyzing the behavior of individual private consumers of telecommunications in Spain.

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Figure 1. Map of Spain's Autonomous Communities.



Figure 2. Mobile operators by market share

(give numbers of market %)

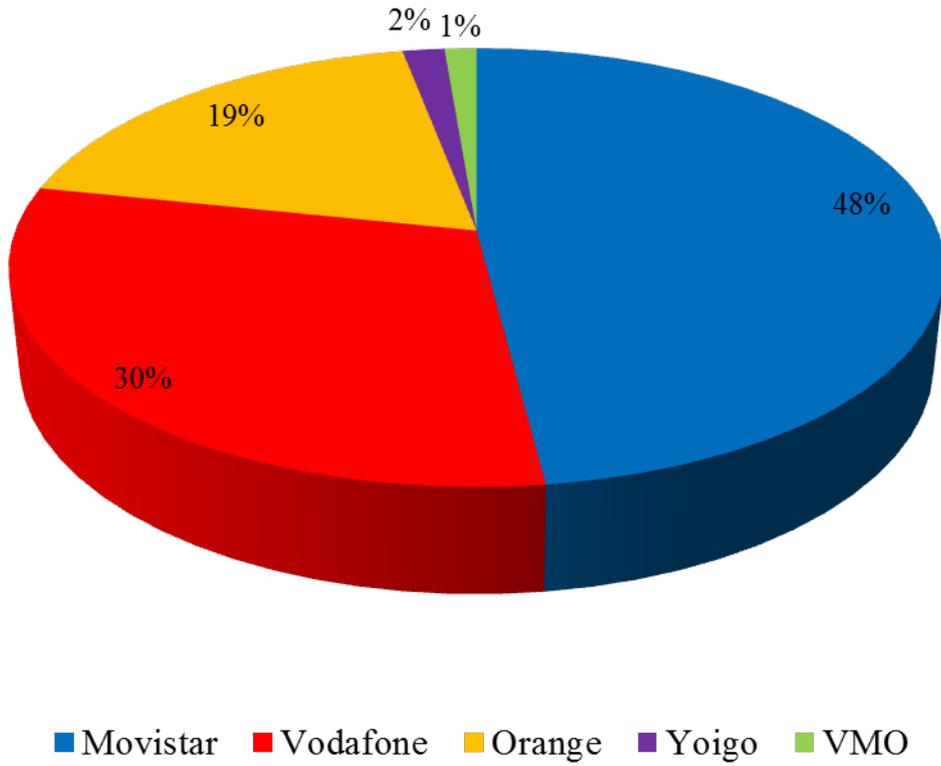


Figure 3. Satisfaction with specific aspects of mobile telephony.

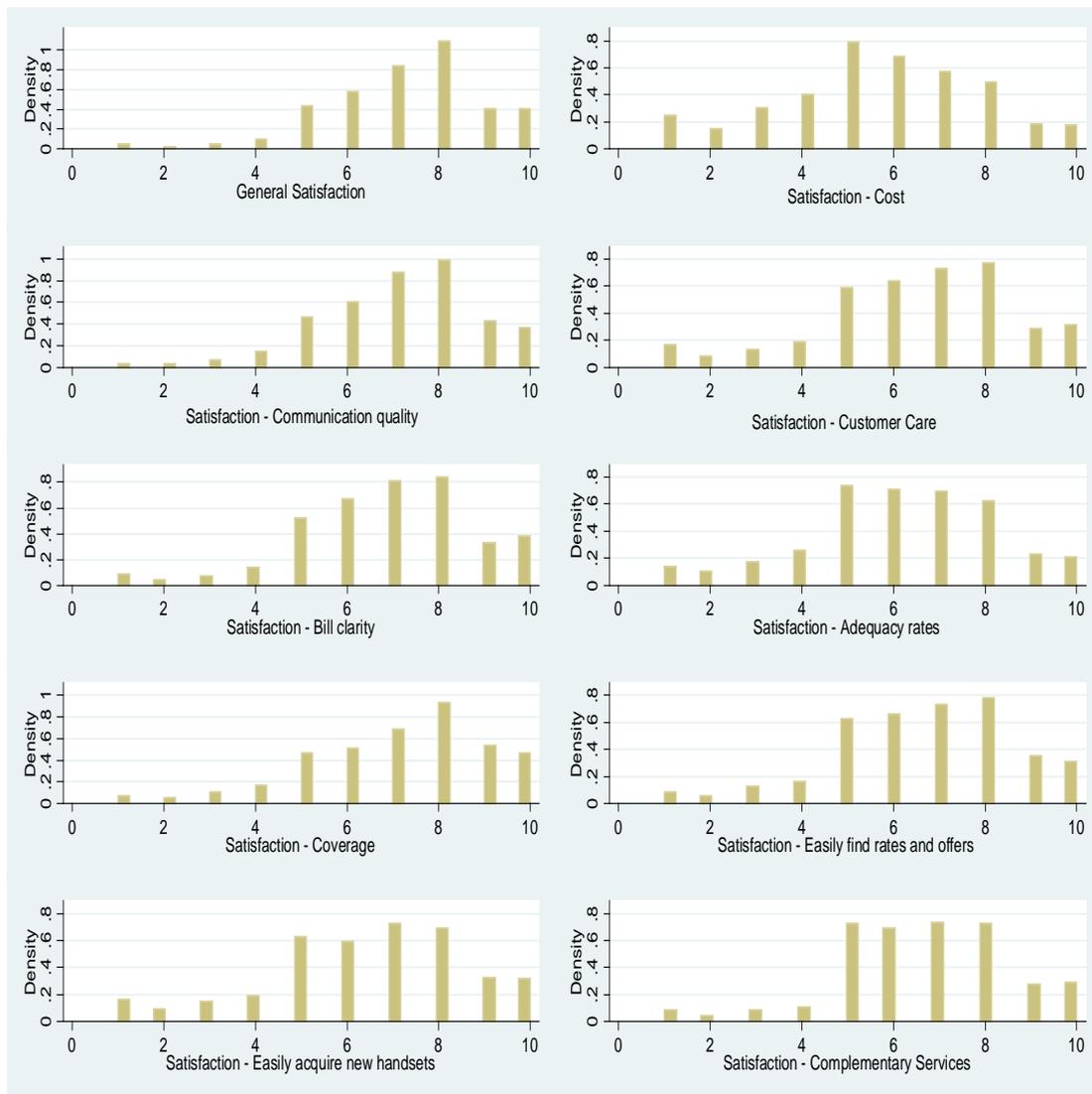


Figure 4

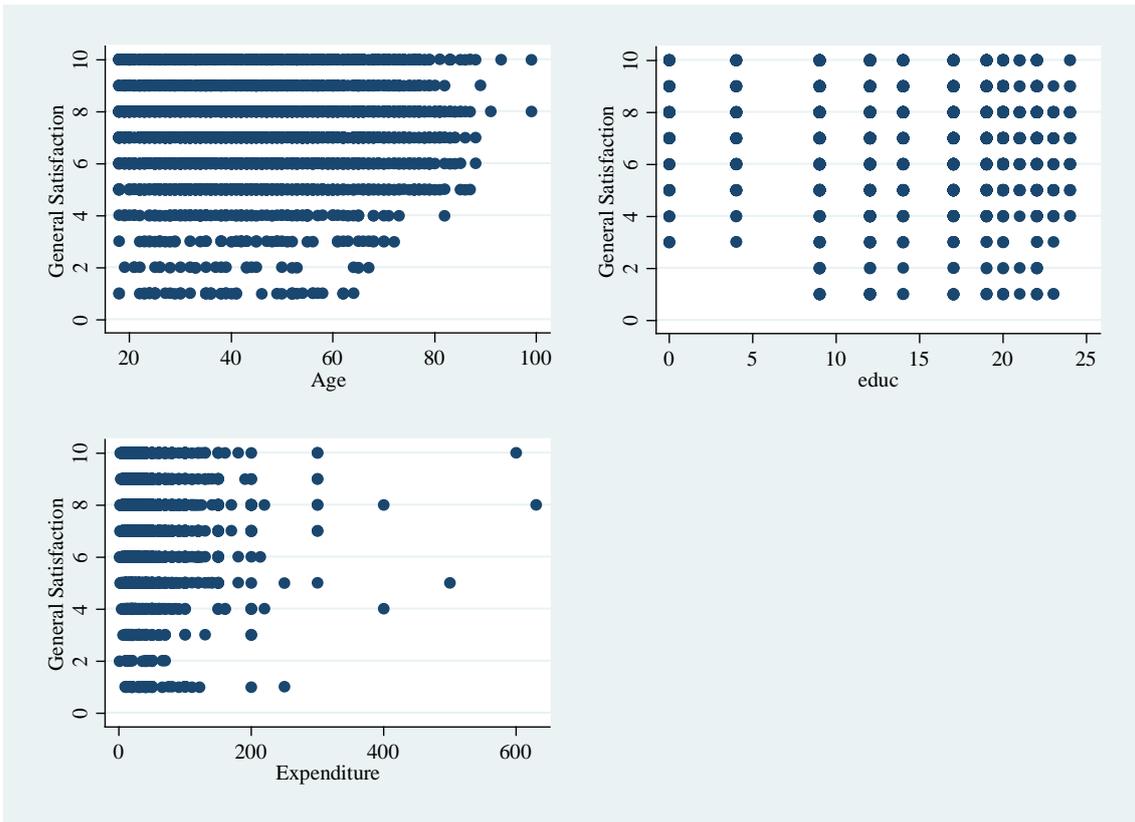


Figure 5



Figure 6

Model Satisfactions: estimated coefficients

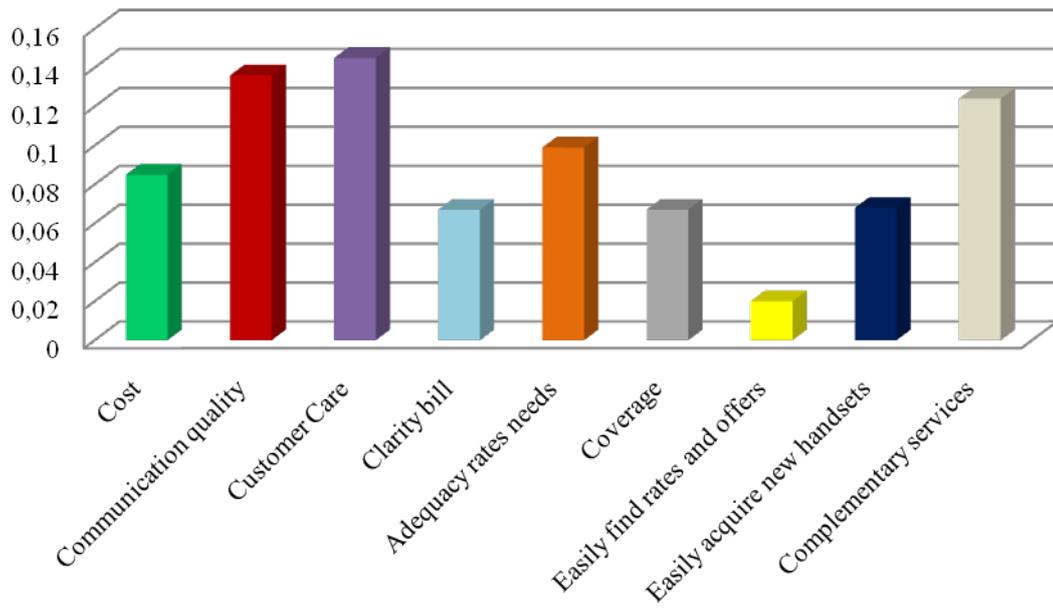


Table 1. Descriptive statistics of selected variables

Variable	Obs.	Average	Std. Dev.	Min	Max
Satisfaction overall	4177	7.18	1.79	1	10
Satisfaction Cost	4045	5.62	2.25	1	10
Satisfaction Communication quality	4130	7.09	1.78	1	10
Satisfaction Customer Care	3555	6.48	2.18	1	10
Satisfaction Bill clarity	3223	6.88	1.95	1	10
Satisfaction Adequacy of rates	3605	6.15	2.10	1	10
Satisfaction Coverage	4121	7.09	2.05	1	10
Satisfaction easily find rates and offers	3513	6.67	2.01	1	10
Satisfaction easily acquire new handsets	3524	6.44	2.22	1	10
Satisfaction Complementary Services	2907	6.63	1.94	1	10

Variable	Obs	Average	Std. Dev.	Min	Max
Broadband mobile Internet	4233	.04	.21	0	1
Expenditure	4562	30.72	37.51	0	630
Education	4936	13.45	5.74	0	24
Male	4953	.49	.50	0	1
Age	4953	46.79	17.94	18	99

Carriers	Obs.	Average	Std. Dev.	Min	Max
Movistar	4206	.48	.50	0	1
Vodafone	4206	.30	.46	0	1
Orange	4206	.19	.39	0	1
Virtual Mobile Operators	4206	.01	.11	0	1
Yoigo	4206	.02	.13	0	1

Table 2. General satisfaction vs. satisfaction with specific aspects

Dependent variable:	General Satisfaction
Movistar	-.050 (-0.21)
Vodafone	.015 (0.06)
Orange	-.049 (-0.20)
VMO	.007 (0.02)
Satisfaction Cost	.085 (4.77)
Satisfaction Communication quality	.136 (4.74)
Satisfaction Customer Care	.145 (6.51)
Satisfaction Bill clarity	.067 (2.80)
Satisfaction Adequacy of rates	.099 (4.24)
Satisfaction Coverage	.067 (3.08)
Satisfaction Easily find rates and offers	.02 (0.81)
Satisfaction Easily acquire new handsets	.068 (3.21)
Satisfaction Complementary Services	.124 (4.90)
+16 dummies for A.C. F (p-value)	F(16,2174) = 2.90 (0.0001)
Constant	1.844 (6.22)
Number of outliers	29
F (joint signif. coefficients) (p-value)	104.94 (0.0000)
White test, χ^2 (p-value)	278.62 (0.0000)
Degrees of freedom White	32
R ²	0.5757
n	2206

Notes: In parenthesis t-statistics. We use heteroskedasticity consistent covariance matrix estimates (Eicker-White).

Table 3. Equations of overall and specific items of individual customer satisfaction.

Controlling by A.C. Endogenous →	M1	M2	M3	M4	M5
	Satisfaction overall	Satisfaction Cost	Satisfaction Communication quality	Satisfaction Customer Care	Satisfaction Bill clarity
Movistar	-.42 (-1.81)	-2.06 (-8.39)	-.24 (-1.13)	-.88 (-4.28)	-.94 (-3.59)
Vodafone	-.34 (-1.43)	-1.74 (-7.00)	-.20 (-0.96)	-.58 (-2.79)	-.78 (-2.95)
Orange	-.46 (-1.92)	-1.54 (-6.08)	-.32 (-1.51)	-.69 (-3.27)	-.80 (-3.01)
VMO	-.024 (-0.07)	-1.01 (-2.37)	-.09 (-0.31)	-.34 (-1.02)	-.46 (-1.21)
Less than one year (Time in that operator)					-.14 (-1.25)
Cheaper calls at certain times or days of the week					-.26 (-3.67)
Minimum monthly consumption	-.04 (-0.79)	.34 (4.37)			
Cheaper calls to numbers chosen by you				.18 (2.66)	.24 (3.38)
Has contracted mobile broadband Internet	.52 (4.03)				
Expenditure	-.002 (-1.77)	-.012 (-6.89)	-.0008 (-0.65)		.0019 (2.10)
Expenditure sq	7.06e-06 (2.08)	.00003 (4.96)	2.39e-06 (0.53)		
Education		-.012 (-1.58)	-.007 (-1.29)		
Spanish	-.29 (-3.37)	-.35 (-2.90)	-.32 (-3.77)	-.46 (-4.31)	
Male	-.13 (-2.49)		-.06 (-1.18)		
Age				.008 (3.18)	
Delay in establishing the service	-.24 (-1.29)	.15 (0.49)	-.53 (-2.09)	-.18 (-0.72)	-.64 (-2.03)
Coverage Problems	-.50 (-6.91)	-.45 (-4.77)	-.98 (-13.33)	-.47 (-5.40)	-.30 (-3.29)
Incorrect billing	-.40 (-2.63)	-.39 (-1.82)	-.19 (-1.09)	-.58 (-2.76)	-.49 (-2.22)
Incorrect billing for services not used	-.37 (-2.34)	-.30 (-1.41)	-.34 (-1.99)	-.52 (-2.56)	-.75 (-3.69)
Breach of contract or commercial offer	-.23 (-1.31)	-.43 (-1.80)	-.16 (-0.87)	-.29 (-1.29)	.19 (0.80)
Difficulty in cancelling the service	-.12 (-0.64)	-.69 (-2.61)	-.22 (-1.20)	-.47 (-2.05)	-.26 (-1.02)
Difficulty in obtaining the required information	-.72 (-5.37)	-.78 (-4.64)	-.34 (-2.48)	-1.54 (-9.60)	-.65 (-4.20)
+16 dummies for A.C. F (p-value)	F(16,3441)= 5.19 (0.0000)	F(16,3409)= 4.26 (0.0000)	F(16,3704)= 6.26 (0.0000)	F(16,3256)= 11.03 (0.0000)	F(16,2832)= 8.20 (0.0000)
Constant	7.97 (30.81)	8.25 (27.84)	7.88 (32.65)	7.14 (29.30)	7.43 (26.83)
Num. outliers	55	2	38	70	31
F (p-value)	101.38 (0.0000)	11.47 (0.0000)	124.27 (0.0000)	70.40 (0.0000)	49.85 (0.0000)

White test, χ^2 (p-value)	64.91 (0.0000)	63.10 (0.0001)	81.04 (0.0000)	158.86 (0.0000)	81.82 (0.0000)
Degrees of freedom	35	33	34	32	33
R ²	0.2624	0.1072	0.2119	0.2812	0.1969
n	3311	3285	3552	3139	2620

Notes: Using heteroskedasticity consistent covariance matrix estimates (Eicker-White)

Controlling by A.C.	M6	M7	M8	M9	M10
Endogenous 	Satisfaction adequacy rates	Satisfaction coverage	Satisfaction easily find rates and offers	Satisfaction easily acquire new handsets	Satisfaction complementary services
Movistar	-1.41 (-6.01)	.11 (0.44)	-.89 (-3.94)	-.75 (-1.97)	-.43 (-1.56)
Vodafone	-1.16 (-4.89)	-.22 (-0.91)	-.58 (-2.56)	-.39 (-1.02)	-.31 (-1.11)
Orange	-1.08 (-4.50)	-.52 (-2.14)	-.69 (-2.99)	-.46 (-1.18)	-.42 (-1.49)
VMO	-.81 (-1.84)	-.30 (-0.84)	-.71 (-1.80)	-.51 (-0.92)	-.46 (-1.08)
More than five years (Time in that operator)		.11 (1.71)			
Contract Holder: respondent				.66 (2.54)	
Contract Holder: couple				.58 (2.01)	
Contract Holder: father/mother				1.03 (3.13)	
Contract Holder: other				.84 (1.54)	
Cheaper calls at certain times or days of the week		-.22 (-3.43)			
Cheaper calls to numbers chosen by you	.25 (3.38)	.20 (3.10)	.27 (4.08)	.30 (3.42)	.21 (2.96)
Has contracted mobile broadband Internet	.75 (3.93)		.55 (3.67)	.68 (3.76)	.55 (3.85)
Expenditure	-.0058 (-3.45)				
Expenditure sq	.00001 (2.46)				
Spanish	-.24 (-2.12)	-.46 (-4.92)			
Male			-.09 (-1.40)		
Age				.02 (4.93)	
Delay in establishing the service	-.30 (-1.13)	-.14 (-0.47)	.07 (0.24)	-.09 (-0.26)	.16 (0.56)
Coverage problems	-.57 (-6.22)	-1.88 (-21.83)	-.59 (-6.72)	-.49 (-4.23)	-.62 (-7.10)
Incorrect billing	-.24 (-1.21)	-.22 (-1.22)	-.12 (-0.58)	-.18 (-0.73)	-.56 (-2.48)
Incorrect billing for services not used	-.44 (-2.09)	-.13 (0.68)	-.40 (-2.04)	-.23 (-0.86)	-.37 (-1.84)
Breach of contract or commercial offer	-.51 (-2.20)	-.22 (-1.12)	-.68 (-2.77)	-.58 (-2.15)	-.51 (-2.09)
Difficulty in cancelling the service	-.65 (-2.67)	-.21 (-0.88)	-.29 (-1.09)	-.59 (-2.02)	-.46 (-1.76)
Difficulty in obtaining the required information	-1.00 (-6.40)	-.02 (-0.14)	-1.03 (-6.23)	-1.05 (-5.15)	-.61 (-3.63)
+16 dummies for	F(16,3105)=	F(16,3506)=	F(16,3250)=	F(16,2253)=	F(16,2684)=

A.C. F (p-value)	10.12 (0.0000)	5.46 (0.0000)	8.81 (0.0000)	8.64 (0.0000)	10.60 (0.0000)
Constant	7.64 (28.33)	7.75 (30.33)	7.11 (29.47)	5.47 (11.07)	6.46 (22.44)
Number of Outliers	2	33	16	27	24
F (p-value)	13.90 (0.0000)	120.27 (0.0000)	65.40 (0.0000)	40.39 (0.0000)	24.16 (0.0000)
White test, χ^2 (p-value)	92.24 (0.0000)	95.05 (0.0000)	96.17 (0.0000)	123.36 (0.0000)	63.04 (0.0000)
Degrees of freedom	33	33	32	36	31
R ²	0.1371	0.2743	0.1523	0.1900	0.1912
n	3009	3360	3136	2186	2603

Notes: Using heteroskedasticity consistent covariance matrix estimator (Eicker-White)