Customer Satisfaction of Mobile-Internet-Users: An Empirical Approximation for the Case of Spain

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Abstract: This paper studies the mobile Internet services in Spain. It deals mostly with overall consumer satisfaction as well as with some of its attributes. The study is based on Micro data from a survey conducted by the Spanish Center for Sociological Research (CIS, 2009). The analysis shows that communication quality and cost are the main attributes of the service involved in the overall satisfaction of the individual.

The main model allows us to analyze to what extent different service providers generate different levels of satisfaction of individuals when controlling for other relevant variables. In this regard, statistically significant differences have been found for both overall satisfaction and for satisfaction with any other of its attributes. Taking into account that the dependent variable is somewhat ordinal, the model is estimated by three alternative methods: ordinary least squares (OLS), ordered probit and ordered logit. The three techniques produce fairly similar results.

Keywords: Mobile Internet, ordered probability models, satisfaction, ordinary least squares, ordered probit, ordered logit.

1. INTRODUCTION

The rapid spread of mobile telecommunication services around the world has exceeded all expectations of the experts. Underlying this development is the high penetration rate of mobile phones. In fact, in 2012, the percentage of people with mobile phones worldwide is far greater than that of people with personal computers (79.9 vs. 23.1).

The relevance of this segment of the telecommunications industry was also noted by the last State of the Global Mobile Industry report (Chetan Sharma, 2012), which estimated that total global mobile revenues reached $1.5 trillion, over 2% of Global Gross Domestic Product, in 2012. In particular, mobile Internet accounted for 28% of those revenues.

This paper focuses on mobile Internet services for the case of Spain. In recent years, the mobile internet service has become the main engine of growth of the sector, presenting significant increases in the penetration rate. In fact, between 2010 and 2012 the number of lines with internet access went from 10.9 to 25.9 million.

A recent European Commission report (European Union, 2012) says that Spain ranks number four within European countries for broadband mobile Internet penetration rate (just below Sweden, Finland and Denmark). This position in the ranking is possibly related to the substantial penetration of smartphones. In fact, Spain ranks first in a European survey (ComScore, 2012) conducted in the main European markets: Spain, United Kingdom, Italy, France, and Germany. Specifically, 55.2% of Spain's mobile phone users have a smartphone, while the average European penetration of the smartphone is 47.6%. In close second place is the United Kingdom, with 55%. With lower smartphone penetrations are Italy with 45.3% and France with 44.7%. Of the countries analyzed, Germany had the lowest smartphone penetration with a rate of 41%.

The above figures make clear that this market segment is not negligible; especially because it is constantly growing[1]. Despite the adverse economic situation affecting the country, traffic data, and especially the mobile Internet access service, the market showed a 31% increase in revenues during 2010. Therefore it seems that efforts to learn about the behavior of consumers would be of great interest to service providers, terminal manufacturers, software developers, policy makers and the public at large.

Providers must compete to attract customers and concentrate on providing an adequate service, or they are at risk of losing customers. This risk, which is

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[1]According to the Telecommunications Market Commission (CMT, 2011), the number of mobile Internet lines grew 45 percent between 2006 and 2011. During the same period, the penetration rate for mobile Internet increased from 15.5 to 23.9 percent.

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always present in any market, is particularly high in this case. The figures show that consumers of telecommunications services exercise high rates of portability[2]. This is the reason why many authors have recently addressed the issues of customer loyalty and retention (Eshghi *et al.,* 2007; Gerpott *et al*., 2001; Kim *et al*., 2004).

Therefore providers will be interested in knowing which factors determine an individual's choice of one provider over another. And they will also want to know the level of customer satisfaction with the services provided. It will also be useful to decide whether intervention in the market may be needed to protect consumer rights. The costs and benefits of specific regulation can also be assessed using the results of this work.

Knowledge of the degree of satisfaction with various aspects of the service will let the providers know their weaknesses and help them to act accordingly to achieve customer loyalty.

In this paper some observed regularities in the behavior of mobile Internet consumers are presented, together with the factors that determine their level of satisfaction. The rest of the paper is organized as follows. Section 2 contains a discussion of some of the most relevant papers that explain consumer satisfaction in general and in particular with this type of mobile communications. Section 3, addresses the characterization of the mobile Internet consumer in Spain using data from the survey by the Center for Sociological Research (CIS) of Spain for the first quarter of 2009. Section 4 presents the empirical results; first, the weights of the various indices of consumer satisfaction in the overall satisfaction index are calculated, and then four models are presented to analyze the factors which determine each of the four indices referring to the various aspects of satisfaction. Finally, a discussion and concluding remarks are provided in section 5.

2. SELECTED LITERATURE ON CONSUMER SATISFACTION

The concept of customer satisfaction has attracted much attention in recent years. There are several definitions of consumer satisfaction (Giese and Cote, 2000; Heskett and Sasser, 2010; Hurley and Estelami, 1998). First, satisfaction can be defined as a customer's post-purchase evaluation of a product or service (Oh, 2000; Bolton and Drew, 1991). But satisfaction can also be defined as the fulfillment of the consumer's expectations (Oliver, 1981, 2010). When performance is worse than expected, a low level of satisfaction occurs because of negative disconfirmation (Yi, 1990).

A key motivation for the growing emphasis on customer satisfaction is that higher customer satisfaction can lead to a stronger competitive position, resulting in higher market share and profits (Fornell, 1992), reduced price elasticity, lower business costs, reduced failure costs and reduced costs of attracting new customers. Customer satisfaction is also generally assumed to be a significant determinant of repeated sales, positive word-of-mouth and customer loyalty. Satisfied customers return and buy more, and they tell other people about their experiences (Fornell *et al.,* 1996). Among the studies of the telecom industry, Wang *et al*. (2004) (focusing on the telecommunications industry in China), Lai (2004) (SMS service in Singapore), Kuo *et al*. (2009) (mobile value added services in Taiwan) and Turel and Serenko (2006) (mobile services in Canada) all revealed that service quality positively influences customer satisfaction.

But so far only the reasons inducing the company to assess the impact of different variables on customer satisfaction have been mentioned. However, regulators have also recently become interested in a deeper knowledge of the consumer satisfaction determinants. The improvement of service quality is the focus of telecommunications regulations for both social and economic reasons. From a social perspective, services should be available on reasonable terms. Overall, it is believed that satisfaction better captures the range of services, prices and quality than any other single measure. Consequently, a standard satisfaction measure more adequately addresses user needs and better captures public interest (Turel and Serenko, 2006).

Consumer satisfaction has often been operationalized at both the overall and the attribute level. It is important to maintain the distinction between overall satisfaction and satisfaction with the individual attributes, because attribute-specific satisfaction is not the only antecedent of overall satisfaction. Overall satisfaction is based on the overall experience, not just

[2]According to the Annual Report of the Spanish Telecommunications Market Commission, CMT (2011), in the case of the Internet access service, the percentage of households that changed operator at least once during the period from 2007 to 2010 was 30.3 percent.

the individual attributes. Information satisfaction is defined as a subjective satisfaction judgment of the information used in choosing a product. When the expectations are disconfirmed, a person may become dissatisfied with the information given, as well as with the product itself.

3. THE DATA AND DEMOGRAPHIC PROFILE OF MOBILE-INTERNET USERS IN SPAIN

To carry out the research, the information from the survey by the Center for Sociological Research of Spain (CIS, 2009), Satisfaction of users of telecommunications services, is used. This is a national survey that is conducted through personal interviews[3] with Spanish residents of both sexes aged 18 and older. 5000 interviews were conducted, of which 4953 are valid cases. Of those respondents, 186 declare they have subscribed to mobile Internet services for personal use[4]. The sample is not large but is representative of the entire population and then the conclusions derived from it can be generalized to the Spanish population. Table **1** shows the demographic profile of the respondents.

One of the striking features is the gender imbalance. In fact, in the sample, the number of men is almost twice that of women. This result is quite common in situations where a service is being implemented using a new technology. It often happens that women start using the service later when usage has already become popular and prices have come down. In fact, there is a large body of literature noting the digital divide between men and women and calling for policies towards its elimination (Elnaggar, 2008; Gurumurthy, 2004; Liff and Shepherd, 2004).

It is also noted that age is usually a key factor in the demand for these services. This is a very popular service among young people, whereas older people access the service to a much lesser extent. In fact, people over 55 years rarely use these services (only 5.8% of the users are in this age group and just 1% of the users are over 65 years). One possible cause for this is the challenges they face in using computers and smartphones.

However, as indicated by the results shown in Table **1**, and contrary to what would be expected from a theoretical point of view, formal education level does not seem to be relevant for explaining the use of mobile Internet.

Focusing now on the market structure, it is worth noting that there is a high degree of concentration in this market. In this regard the case of Spain does not deviate from a fact established worldwide for this market. This is referred to as the Rule of Three[5]. According to this rule, while the percentage market share of each individual firm might vary, on average the top 3 companies control around 93% of the market in any given nation. It doesn't matter if the market is characterized as controlled regulation as in China, Korea, and Japan or if it is an open market such as the United States, United Kingdom, and India. Eventually, the top 3 operators control the majority of the market. There are niches that others occupy but they are largely irrelevant to the overall structure and functioning of the mobile market. Recently, Uslay *et al.* (2010) have provided empirical support for the Rule of Three using a diverse sample of more than 160 industries in the United States.

In the case of Spain the market concentration is slightly above the values just mentioned. Consumers have the possibility of choosing between five operators: Movistar, Vodafone, Orange, Yoigo and, finally, Virtual Mobile Operator (VMO) which is a conglomerate of mobile virtual network operators. In this regard, it is worth noting that in addition to the concentration in the market for service providers of mobile internet, there is also a large concentration in service providers of mobile telephony in general. Thus, the concentration is not specific of mobile Internet market. This can be viewed in Table **2**.

In 2009 there was a dominant firm, Movistar, which served 47.3 percent of the mobile Internet customers. And the three leading operators (Movistar, Vodafone and Orange) jointly served 96.2 percent of the market.

After analyzing the choice of provider by the consumer, it is interesting to see if there are regularities in the choice of supplier according to different criteria. Knowledge of these regularities, if any, can be very

[3]And those are precisely some of the strengths of this work. While several other studies refer to subsets of the population (students, for example) and are carried out through indirect methods (email, phone calls), the survey is designed to be nationally representative and is conducted through personal interviews.

[4]It is important to say that there are more persons using mobile internet but for other purposes (business, for example). In fact, according to data from CMT, in 2009 there were 1.5 million lines for private or personal use versus 1.8 million for business use.

[5]The rule of three in Business and Economics is a rule of thumb suggesting that there are always three major competitors in any free market within any one industry. This was put forward by Henderson (1976), and has been tested by Sheth and Sisodia (2002).

Table 1: Demographic Profile of Respondents

		Whole Sample		Mobile Phone		Mobile Internet	
		Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
GENDER	Female	2,530	51.08	2,107	49.59	64	34.4
	Male	2,423	48.92	2,142	50.41	122	65.6
AGE	18-24	482	9.73	462	10.87	28	15.1
	25-34	1,021	20.61	1008	23.72	69	37.1
	35-44	1,001	20.21	955	22.48	55	29.6
	45-54	805	16.25	735	17.30	23	12.4
	55-64	641	12.94	534	12.57	9	4.8
	65-74	566	11.43	368	8.66	1	0.5
	> 75	437	8.82	187	4.40	1	0.5
LEVEL OF STUDIES	No Studies	268	5.43	113	2.67	---	---
	Primary	2,715	55.00	2226	52.60	68	36.6
	High School	1,096	22.20	1059	25.02	55	29.6
	College	857	17.36	834	19.71	63	33.9
MAIN ACTIVITY	Employed	2,309	46.68	2,218	52.26	140	75.3
	Retired/Pensioner	1,082	21.88	681	16.05	7	3.8
	Unemployed	776	15.69	731	17.22	27	14.5
	Student	206	4.16	198	4.67	10	5.4
	Others	573	11.59	416	9.80	2	1.1
OCCUPATION	Permanent worker	2,797	57.04	2,423	57.57	105	56.5
	Temporary worker	1,198	24.43	1,062	25.23	44	23.7
	Entrepreneur	230	4.69	206	4.89	17	9.1
	Self-employed	634	12.93	483	11.48	18	9.7
	Others	45	0.92	35	0.83	2	1.0
CITIZENSHIP	Spanish	4,463	90.45	3,778	89.31	163	87.6
	Dual (Spanish+Other)	93	1.88	92	2.17	4	2.2
	Foreign	378	7.66	360	8.51	19	10.2
COUNTRY OF BIRTH	Spain	4,442	89.83	3,760	88.66	162	87.1
	Other	503	10.17	481	11.34	24	12.9
TOTAL		4953	100	4249	100	186	100

Table 2: Market Structure (Mobile Phone and Mobile Internet)

	Mobile Phone		Mobile Internet	
Service provider	**N. of Customers**	**Market share**	**N. of Customers**	**Market share**
Movistar	2020	48.0	88	47.3
Vodafone	1276	30.3	69	37.1
Orange	786	18.7	22	11.8
Yoigo	71	1.7	2	1.1
Virtual Mobile Operators	53	1.3	4	2.2
TOTAL	4206	100.0	186	100.0

Table 3: Internet Consumer Preference for Service Provider by Age Group. Percentages

Service providers	18 -24	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	>75	All ages
Movistar	35.7	37.7	63.6	50.0	44.4	100.0	100.0	47.3
Vodafone	46.4	44.9	23.6	36.4	44.4	0.0	0.0	37.1
Orange	14.3	14.5	9.1	9.1	11.1	0.0	0.0	11.8
Yoigo	0.0	0.0	3.6	0.0	0.0	0.0	0.0	1.1
Virtual Mobile Operators	3.6	2.9	0.0	4.5	0.0	0.0	0.0	2.2

Source: Prepared by authors based on the CIS survey, 2009.

useful for the companies when designing their market strategies.

Table **3** shows preferences of mobile Internet users for provider depending on the respondent's age. This table indicates that Vodafone is the most popular supplier among young people (between the ages of 18 to 34). However, consumers above the age of 35 prefer to book the service with Movistar.

The results of Table **4** suggest that the choice of service provider depends largely on which characteristic is most appreciated by mobile internet consumers. For example, individuals who decide primarily on the basis of price mostly choose Vodafone (46.6%). However, Movistar is the preferred choice among individuals who decide either by terminal, reputation or coverage.

4. EMPIRICAL RESULTS

The empirical modeling of consumer satisfaction starts using ordinary least squares techniques and continues with ordered probability models. There is a long-standing controversy over the appropriateness of each method when the dependent variable is not unambiguously cardinal. There are articles that compare the results of both methods and recommend using ordered logit or probit models. This is the case of the paper by Peel *et al*. (1998) applied to the case of consumer satisfaction when buying a car. However, being aware of the existence of such literature that recommends ordered probability models, linear regression models estimated by least squares are used in the first place. Since the index of satisfaction takes integer values between 1 and 10, the use of OLS-type estimators is appropriate at least as an exploratory technique. Moreover, the interpretation of OLS post-estimates, standard errors and regression diagnostics is straightforward. To ensure the validity of estimation and inference based on OLS, it is assumed that the differences in satisfaction between, say, 1 and 2 are approximately the same as the differences in satisfaction between 9 and 10.

Moreover, it is common to find that the estimates obtained by using linear regression models and those obtained by ordered logit or probit models coincide in sign and often in the level of significance, too (Peel *et al*., 1998; Papke, 1998). That is why the results obtained with the ordered probability models are also presented. They are in line with these common findings.

The survey includes 6 measures of consumer satisfaction with mobile Internet services. One of them is the overall satisfaction with the service and the rest are about satisfaction with the following specific attributes: cost, communication quality, adequacy of rates to needs, easiness of acquiring new handsets and complementary services (technical assistance, *customer service,* e.g.). The value of the Cronbach's alpha[6] reliability coefficient is 0.87 indicating a good internal consistency of the items in the scale (Nunnally and Bernstein, 1994).

Table **5** shows descriptive statistics of the different types of consumer satisfaction considered. For purposes of interpretation, it is important to know that a ten-point[7] measurement scale was used where 1 expresses a very negative point of view and 10 a very positive one. The largest average value of satisfaction is for the easiness of acquiring new equipment, which has been rated with 6.54. At the other end, the lowest average satisfaction level is for the cost with 5.09. Perhaps this is related to the operators' strategy for attracting customers, which is mainly based on

[6]Cronbach´s alpha is a coefficient of internal consistency. It is commonly used as an estimate of the reliability of a psychometric test, for a sample of examinees. A high value of alpha is often used as evidence that the items measure consistently an underlying construct. A value of alpha greater of equal to 0.7 is considered good.

[7]Ten-point scale enables customers to make better distinctions (Fornell *et al*., 1996).

Table 4: Mobile Internet Service Provider by Main Reason for Selection. Percentages

Service providers	Price	Terminal	Reputation	Coverage	Family/Fiends	Other	TOTAL
Movistar	25.9	59.1	71.4	70.0	24.0	57.9	46.6
Vodafone	46.6	31.8	28.6	27.5	64.0	15.8	38.2
Orange	20.7	9.1	0.0	2.5	12.0	15.8	11.8
Yoigo	0.02	0.0	0.0	0.0	0.0	5.3	1.1
Virtual Mobile Operators	0.05	0.0	0.0	0.0	0.0	5.3	2.2

Source: Prepared by authors based on the CIS survey, 2009.

Table 5: Descriptive Statistics of Selected Variables

Variable	Obs.	Average	Std. Dev.
Satisfaction overall	138	6.66	2.16
Satisfaction cost	141	5.09	2.48
Satisfaction communication quality	142	6.10	2.24
Satisfaction adequacy rates	133	5.83	2.30
Satisfaction easiness of acquiring new handsets	123	6.54	2.10
Satisfaction complementary services	117	6.50	2.07

Note: the measurement scales range between a minimum of 1 and a maximum of 10.
Source: Prepared by authors based on the CIS survey, 2009.

facilitating the acquisition of terminals by consumers while somewhat neglecting the prices in their competitive strategies.

In view of the information provided in Table **5**, note that, in general, the average levels of satisfaction with the service are not high. That may have to do with the fact that this is an expanding market and service providers know they will capture new customers and are less concerned about keeping the ones they already have. It should be noted also that the overall level of satisfaction reported by the consumer is higher than the reported satisfaction for each of the attributes considered.

It is also important to test if there are differences in overall satisfaction between service providers. Table **6** compares the three most important providers (VMO and Yoigo are excluded because of scarcity of data). Vodafone customers are the most satisfied (7.06) with the mobile Internet service, followed by Movistar (6.42) and, finally, Orange (5.88).

After this brief description of the levels of satisfaction (overall, by service attributes and by suppliers), the results that constitute the core of this paper are presented next.

4.1. Model of Overall Satisfaction Versus Specific Attributes

To analyze the contribution of each attribute to overall satisfaction, a linear model that relates the overall satisfaction to each of its 5 components is used.

Table 6: General Satisfaction by Service Provider

Service providers	Obs.	Average	Std. Dev.
Movistar	65	6.42	2.25
Vodafone	53	7.06	2.02
Orange	16	5.88	2.00
Virtual Mobile Operators	3	8.33	1.53
Yoigo	---	---	---

Note: the measurement scales range between a minimum of 1 and a maximum of 10.
Source: Prepared by authors based on the CIS survey, 2009.

It is reasonable to hypothesize that total satisfaction will be related to each of the components. However, the importance of each of the components is not known *a priori*. Table **7** shows the estimates for the components of satisfaction, assuming that they are linearly related to overall satisfaction. Since all of them are measured in the same units, the coefficients and their standard errors can be directly compared. The dependent variable is the overall consumer satisfaction and the explanatory variables are the consumer satisfaction levels with respect to costs, quality of communications and complementary services, respectively. The rest of the attributes have been omitted because their coefficients are not statistically significant. The equation has been estimated by OLS and the diagnostic tests do not detect misspecification.

Table 7: Importance of the Components of Overall Satisfaction

Satisfaction Components	Overall
Cost	0.12* (1.63)
Communication quality	0.56*** (6.92)
Adequacy of rates Easiness of acquiring new handsets Complementary services	--- --- ---
Constant	2.62*** (5.49)
N. Obs.	119
R^2	0.40

Note: t-values in parenthesis below each coefficient. * Significant at p<0.1, **Significant at p<0.05, ***Significant at p <0 .01.

Table **7** shows the model of overall satisfaction. Notice that the main aspects of service that appear to affect overall consumer satisfaction are costs and communication quality[8]. The results suggest that in order to increase the overall consumer satisfaction, attention must be devoted to the improvement of communication quality. In fact, around fifty percent of overall satisfaction is determined by this attribute. But there is also another attribute (cost) that, although less important, must also be taken into account.

Collinearity between regressors may be a problem frequently found in satisfaction research because attributes are often highly correlated with each other and may cause insignificance of each individual attribute. Table **8** shows the correlation matrix that allows us to rule out such problems.

Multicollinearity problems were also ruled out by using two different procedures. First, regressions for each explanatory variable against all others plus a constant were estimated. The R-square obtained in the five auxiliary regressions were as follows: 0.38, 0.50, 0.59, 0.39, 0.52 (all of them smaller than 0.9, which is the conventional cut off point). On the basis of these values, the presence of damaging approximate multicollinearity is ruled out.

The variance inflation factor (VIF) was also used to assess multicollinearity. VIF scores ranged between 1.58 and 2.38. While some approximate multicollinearity does exist, VIF scores of less than 10 suggest that it will not significantly influence the stability of the parameter estimates (Belsley *et al*., 1980).

Until now, the assumption of a linear relationship between overall satisfaction and all the attributes has been used. However, quality management theories (Kano *et al*., 1984; Levitt, 1986; Gale and Wood, 1994; Lowenstein, 1995) indicate that some service attributes may have a nonlinear relationship with satisfaction. In view of this literature, a different approach is also used in this work.

The idea is as follows: certain attributes have a dramatic negative impact on satisfaction when they are not delivered, but have a minimal positive impact when they are improved from an acceptable level (Conklin *et al*., 2004). These kinds of attributes are called key dissatisfiers. The first task is to find each attribute's share in explaining dissatisfaction in the overall measure. And then the enhancers, or drivers, that can lead to very high levels of customer satisfaction (delight).

Later in order to find the key dissatisfiers, an attribute by attribute analysis is performed. For each attribute the following expression is computed:

$$\text{Success} = \text{Reach} - \text{Noise} = P(F/D) - P(F/D')$$

Where Success is the conditional probability of failure among those who are dissatisfied (D) and non-dissatisfied (D´). With this definition of success, attributes with higher values are the most likely candidates and are called key dissatisfiers.

[8]Communication quality means quality of the network for data transmission (not just for the voice).

Table 8: Correlation Matrix

	Cost	Communication quality	Adequacy rates	Easiness acquiring new handsets	Complementary services
Cost	1.0000				
Communication quality	0.4905	1.0000			
Adequacy of rates	0.5943	0.6511	1.0000		
Easiness of acquiring handsets	0.2994	0.4458	0.4945	1.0000	
Complementary services	0.4612	0.6279	0.6352	0.6112	1.0000

F corresponds to the event called Failure (value of the variable from 1 to 5).

F´ stands for Non-Failure (value of the index of satisfaction between 6 and 10).

D corresponds to Dissatisfaction (satisfaction from 1 to 5).

D´ denotes the events of Non-Dissatisfaction (satisfaction from 6 to 10)

Reach = P(F/D)= conditional probability of Failure among those Dissatisfied.

Noise= P(F/D´)= conditional probabilities of Failure among those Non-Dissatisfied.

The results of the Key Dissatisfiers analysis are shown in Table **9**. The attributes are arranged by success value in descending order of priority. Total sample size is 138 respondents, with 35 of them dissatisfied (overall satisfaction less than or equal to 5 on a scale of 1 to 10), so the overall dissatisfaction rate equals 25.4%.

In this case it turns out that Communication quality is the most important attribute in predicting Overall satisfaction. This item has 45 respondents who were dissatisfied, and 21 of them were dissatisfied on the Overall Satisfaction measure. The remaining 24 who were dissatisfied with the quality of communication were Non-Dissatisfied on the overall measure. The *Reach* value for this attribute is 60% and the *Noise* is only 23%, yielding a Success value of 37%.

Next in order of importance as a candidate for key dissatisfier is the cost of the service, with a success value of 31%. Adequacy of rates to needs would be in third place, then complementary services and, finally, the easiness of acquisition of new terminals. Therefore, to be efficient, service providers should focus their attention on the quality of communication to improve overall satisfaction.

Using a similar procedure, the attributes that are most important for a consumer to feel very satisfied (delight) are analyzed. The steps mentioned above for choosing the best dissatisfiers are performed, except that the data are taken from the top levels (9 and 10) of all scales for defining enhancers. The results are summarized in Table **10**.

The sample size is 93 respondents not failed by the first key dissatisfier, and 21 of them are delighted overall, so the delight rate equals 22.58%. The attributes are presented in descending order, now based on their success at predicting delight. Here, the first attribute is also communication quality. Cost and complementary services must also be taken into account by service providers if they want to improve consumer satisfaction.

Table 9: Candidates for Key Dissatisfiers

Attribute	Overall dissatisfaction	Overall satisfaction	Failure among dissatisfiers	Failure among non-dissatisfiers	Reach	Noise	Success
Communication quality	35	103	21	24	0.60	0.23	0.37
Cost	35	103	26	45	0.74	0.44	0.31
Adequacy of rates	35	103	19	27	0.54	0.26	0.28
Complementary services	35	103	14	14	0.40	0.14	0.26
Easiness of acquiring terminals	35	103	14	22	0.40	0.21	0.19

Table 10: Candidates for Key Enhancers

Attribute	Overall dissatisfaction	Overall satisfaction	Failure among dissatisfiers	Failure among non-dissatisfiers	Reach	Noise	Success
Communication quality	72	21	56	9	0.78	0.43	0.35
Cost	72	21	57	13	0.79	0.62	0.17
Complementary services	72	21	44	10	0.61	0.48	0.13
Adequacy of rates	72	21	53	13	0.74	0.62	0.12
Easiness of acquiring terminals	72	21	48	12	0.67	0.57	0.10

We use satisfaction levels 9 and 10 of the dependent and the explanatory variables.

These results are similar to those found assuming a linear relationship between overall satisfaction and the attributes. Therefore both approaches reinforce each other.

4.2. Models of Main Determinants of Satisfaction

Now that the aspects most valued by Spanish mobile Internet customers have been identified, the next steps are:

a. An analysis of how customers assess each of the operators, which is the pure operator effect, factoring out the influence of other possible explanatory variables to isolate the pure operator effects.

b. Which factors are influential in the valuation of the mobile carriers by their customers are also investigated, that is, what is the effect of the control variables, including geographical location, age, gender, education, expenditure, etc.

To perform this analysis a general linear model and ordered probability models are used alternatively.

a). General Linear Model Estimated by OLS

Table **11** contains the results of the OLS estimation of the four different models of satisfaction (M1 through M4)[9]. The dependent variable of each of the four models is in the second row of the table, starting with overall satisfaction and up to satisfaction with complementary services, model M4.

The estimates of each of the models are shown in columns M1 to M4. Starting with column M1, the dependent variable is the overall satisfaction. In this case Orange is chosen as the basis for comparison. Consequently, the estimated coefficients for the other two providers need to be interpreted in relation to Orange. According to this, customers are significantly more satisfied with Vodafone than with Orange but no statistical difference was found when comparing with Movistar. In this case, the constant (5.84) may be interpreted as the coefficient of Orange. Its corresponding t-statistic (below in parentheses), with a value of 6.34, detects statistical significance. Satisfaction with Vodafone is 1.21 points above the estimate for Orange and statistically significant. In other words, being a customer of Vodafone makes you essentially 1.21 happier, on a scale from 1 to 10, than being a customer of Orange, and that is controlling for the effects of the other explanatory variables. However, there are no significant differences between Orange and Movistar.

The rest of the explanatory variables included in M1 show that: 1) customers that subscribe a flat rate for their mobile Internet services tend to be more satisfied by 0.73 points than the rest; and 2) people using mobile Internet services both with a mobile and PC tend to be 0.78 points more satisfied than the rest. However, other variables such as gender, age, education and spending are insignificant.

The bottom of the table shows the number of observations, 123, the coefficient of determination, 0.0881, and the F test of joint significance, 2.26, which is significant with a p-value of 0.0529. Heteroskedasticity is also tested for in this model, and homoskedasticity cannot be rejected.

The rest of the equations in the table are specified and estimated using similar techniques to those of model M1.

[9]Two additional models were estimated: Satisfaction with easiness of acquiring new terminals (M5) and Satisfaction with complementary services (M6). However they are omitted because the results obtained were non-significant.

Table 11: Individual Customer Satisfaction

	M1	M2	M3	M4
	Overall satisfaction	**Satisfaction with price**	**Satisfaction with communication quality**	**Satisfaction with adequacy of rates**
Vodafone	1.21 (1.93)	0.94 (2.10)	0.80 (1.98)	1.17 (2.79)
Movistar	0.62 (1.00)	---	---	---
Orange	---	0.71 (1.03)	0.32 (0.53)	-0.04 (-0.07)
Flat rate	0.73 (1.54)	0.92 (1.76)	---	---
Internet use on mobile and PC	0.78 (1.93)	---	---	---
Male	---	---	-0.65 (-1.62)	-0.69 (-1.66)
Age	-0.02 (-1.24)	---	-0.15 (-1.42)	-0.14 (-1.27)
Age-squared	---	---	0.002 (1.33)	0.002 (1.22)
_cons	5.84 (6.34)	3.81 (7.73)	8.87 (4.65)	8.21 (4.19)
n	123	132	139	130
R^2	0.0881	0.0611	0.0713	0.1077
F	2.26 0.0529	2.78 0.0439	2.04 0.0769	2.99 0.0138
White test χ^2	$\chi^2(15)=16.58$ 0.3445	$\chi^2(4)=4.09$ 0.3938	$\chi^2(15)=9.40$ 0.8554	$\chi^2(15)=18.51$ 0.2370
Mín of AGE	---	---	37.5	35.0

Continuing the exploration of the results in Table **11**:

1. Satisfaction with respect to cost (M2) is significantly higher for Vodafone than for Movistar. The estimated coefficient for Movistar is 3.81, whereas the estimated satisfaction for Vodafone is 0.94 points higher (almost 25 percent higher). However, no significant differences were found when comparing Movistar with Orange.

2. The differences in satisfaction between carriers with respect to communications quality (M3) show the lowest value for Movistar, with an estimate of 8.87 points. And the largest value is for Vodafone, with an estimated value of 0.80 points higher. No significant differences between Movistar and Orange are found.

3. Model 4 shows differences in satisfaction with adequacy of rates to needs and, also in this case, the satisfaction ranking is headed by Vodafone, followed by Movistar.

4. The age variable was included in quadratic form and has proved to be marginally significant in models M3 and M4. From the sign of the estimated coefficients of age and age-squared, a U-shaped relationship between age and the level of satisfaction is detected in both cases. This means that initially the satisfaction decreases with age to some extent and, from there, begins to grow. Hence, if one calculates the point at which the slope of this relationship is zero, that is the age at which the differential equals zero, the minimum, or turning point, of the age-satisfaction relationship can be found, that is, the age at which satisfaction is at its lowest level. The last row of the table shows the age at which the minimum would be reached (37.5 and 35 years, respectively).

Table 12: OLS vs. Ordered Probability Models

	OLS	Ordered logit	Ordered probit
	Overall satisfaction	**Overall satisfaction**	**Overall satisfaction**
Vodafone	1.21 (1.93)	1.08 (2.07)	0.64 (2.11)
Movistar	0.62 (1.00)	0.61 (1.20)	0.35 (1.17)
Orange	---	---	---
Flat rate	0.73 (1.54)	0.92 (1.76)	---
Internet use on mobile and PC	0.78 (1.93)	0.84 (2.16)	0.46 (1.97)
Male	---	---	---
Age	-0.024 (-1.24)	-0.025 (-1.52)	-0.14 (-1.44)
Age-squared	---	---	---
_cons	5.84 (6.34)	---	---
n	123	123	123
(Pseudo) R^2	0.0881	0.023	0.024
Significance	F=2.26 0.0529	$\chi^2(5)$=11.78 0.0379	$\chi^2(5)$=12.14 0.0242

5. The effects of gender on satisfaction are not conclusive. In two of the considered models (M3 and M4), gender becomes a marginally significant variable but this is not the case for the other two models. However, the sign of the effect is always the same, indicating that being male affects satisfaction negatively.

6. Other potentially explanatory variables were included in the models (e.g. level of education and expenditure) and none of them turned out to be statistically significant.

Summarizing, Vodafone is the carrier that gives more satisfaction to its customers.

b). Ordered Probability Models

This section briefly includes the results of estimations made using ordered probability models. Table **12** presents the results of estimating the overall satisfaction by three alternative methods: OLS, ordered probit and ordered logit.

The most important outcome here is that no matter which method is used, the estimated coefficients are robust. In this specific case, they coincide not just in sign and in the level of significance but also in the absolute value of the coefficient.

5. CONCLUSIONS

This paper addresses the issue of satisfaction with mobile Internet services by Spanish consumers using data from a survey conducted by the Spanish Center for Sociological Research in 2009. The quality of the data is one of the strengths of this study.

The main results obtained are:

- From a mere observation of the data, it is clear that the choice of provider depends on individual characteristics. Thus, for example, age significantly influences the choice of the provider. Therefore, knowledge of this information may be useful for providers to design their strategy and determine who their target customers will be.

- The analysis shows that communication quality and cost are the main attributes of the service involved in the overall satisfaction of the individual. The same results are obtained when assuming a linear relationship or by removing that restriction.

- An important part of the work is devoted to an analysis of the impact of the company providing the service on the level of satisfaction. To perform the analysis, some individual

characteristics were used as control variables. Taking into account that the dependent variable is somewhat ordinal, the model is estimated by three alternative methods: OLS, ordered probit and ordered logit. The three techniques produce fairly similar results.

- In the comparison between companies, it appears that consumers are more satisfied with Vodafone than with Orange or Movistar for most of the items. At the same time, no statistically significant differences were found between Orange and Movistar in terms of consumer satisfaction.

- Some of the control variables have not proven to be highly significant. However, it is noteworthy that, although marginally significant, the coefficient of the gender variable would indicate that, ceteris paribus, males are less satisfied than females. Also the effect of age on satisfaction, when statistically significant, consistently presents a U-shaped relationship; that is, satisfaction decreases with age at first, and then increases beyond a certain point.

The results mentioned above are of great interest to the companies providing the service. They can be very helpful to providers to design their strategy and to improve services in the most efficient way in order to increase consumer satisfaction. And this is especially important at the present time, when revenues from these services are among the few that are increasing despite the economic crisis affecting the country.

The results also indicate that regulators, in an attempt to help maximize social welfare, should not only pay special attention to the quality of service, but assure that the rates are clear and meet the users' needs.

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