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The influence of satisfaction on customer retention in mobile phone market

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ABSTRACT

This study examines the determinants of customer satisfaction and customer loyalty in the Peruvian mobile phone market. Based in a survey to 1259 customers, Multinomial Logit and GSEM estimations show how determinants of customer satisfaction can be assessed when satisfaction is measured through ordered categorical data. The results confirm that in mobile phone market Customer Satisfaction influences strongly on Customer Loyalty, and in turn Loyalty is an important determinant of Customer Retention. In contrast with previous literature, this study identified the differentiated influence of diverse factors on positive and negative customer satisfaction categories. Indeed while results show that quality of service assessments made by customers had a significant impact on both negative and positive customer satisfaction categories; assessments of other service attributes like customer care, information on tariffs and plans and billing clarity, only showed a significant statistical influence on positive categories of customer satisfaction. Similar asymmetrical results were found with regard to other economic, socioeconomic and geographical determinants of customer decisions. As well, an analog effect is also observed in the relationship between customer satisfaction and loyalty, where only positive satisfaction assessments helps to explain the loyalty of users. Finally, results show that while satisfaction can be identified as a powerful cause of CR, switching barriers did not deter more demanding customers to switch to alternative carriers, suggesting that recent pro-competition regulatory reforms implemented in Peru contributed to reduce these barriers to competition in mobile markets.

1. Introduction

There is a broad consensus in that the outstanding expansion of mobile services in emerging countries during the last decade, has delivered important benefits to their citizens in terms of improved connectivity, social integration, access to markets and public services, among many others.[2] This growing trend in mobile services, however, has been accompanied by an increase in the number of complaints as well as of public demands for a more active protection of customer rights in this sector.[3] This seemingly paradoxical result has raised concerns not only from mobile operators who seek to adequate their infrastructure, networks and services to these major demands but also from regulators who are interested to improve public perception on regulatory system. The relevance of these topics in a context of increasing competition, contribute to explain why customer satisfaction (CS), its determinants and their impact on customer retention (CR) rates of mobile operators have become an important topic in the current research agenda.

During the last years, a number of studies addressed the assessment of the determinants of CS in mobile services in emerging economies (see, for instance, Khan (2012), Leelakulthanit and Hongcharu (2011), Vranakis et al. (2012), Haider Ali Shah et al. (2013), Omotayo and Abolaji (2009)). These studies as well as others applied to developed countries (see, for example Turel and Serenko (2006), Martensen et al. (2000), Gerpot et al. (2001), Gijón et al. (2013)) have focused on the influence of different factors considered as determinants of CS. A common objective in these studies was not only to assess the determinants of CS but also to test the relative influence of CS compared to other factors like switching barriers, on loyalty and retention rates of mobile carriers. This topic is of special relevance in countries like Peru that recently adopted regulatory policies oriented to foster competition and to remove barriers to competition.

Despite this increasing interest CS in mobile phone markets, the discussion on how satisfaction and their determinants are measured has been relatively scarce. The widespread use of assessed categorical variables in the measurement of CS or other related variables requires to identify either the quantitative or qualitative nature of this variable and to define a proper statistical treatment. The aim of this study is to

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[1] I would like to express my gratitude to Forrest Morgeson III for their very helpful comments.

[2] For an illustrative analysis of the effects of growth of mobile services on poverty and inequality in developing countries, see James (2016).

[3] See, for instance, Consumers International (2014).

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assess the determinants of CS and their influence on customer switching decisions in Peru. However, in contrast with previous work, this study tests whether determinants of either positive or negative customer satisfaction assessments are the same, and if their impact is uniform or symmetric among different levels of satisfaction. At the same time, the relative impact of negative and positive satisfaction assessments on customer loyalty is assessed. It is important to note that while in developed countries, a strong and robust relationship between CS and CL in mobile phone market has been documented (Gerpot et al., 2001; Lee et al., 2001), in the case of developing world the evidence regarding this association is mixed (Morgeson et al., 2015; Omotayo and Abolaji, 2009; Lőrincz and Nagy, 2010). This study seeks to shed light on the nature of the relationship between CL and CS in a developing country like Peru. Furthermore, differentiating among positive and negative assessment of CS measured through categorical variables permits to provide a more precise picture on what are the factors that actually influence loyalty and CR. This analysis it is also important from a regulatory view whenever permits to assess the potential effectiveness of the recent pro-competition measures implemented in Peruvian market.

The following section presents a brief review on the literature on the determinants of CS and switching costs and their influence on CL and CR. The third section describes the recent evolution of Peruvian mobile phone market and the regulatory measures implemented for promoting competition. The fourth section presents the methodology and results including a brief discussion on the logit family of models and the results. Finally, we include some concluding remarks.

2. Determinants of customer satisfaction and retention

2.1. Determinants of CS

According to Anderson et al. (1994, p54), CS can be defined as an overall evaluation based in the purchase and consumption experience made by the customers of a good or service over time (for a conceptual review see Yi (1989)). CS has been considered by the literature as a result of diverse factors that arises from the consumption experience. For example, the American Customer Satisfaction Index (ACSI, see Fornell et al. (1996)) conceives CS as a consequence of the interaction of Perceived Quality (PQ), Perceived Value (PV) and Customer Expectations on the product or service purchased. PQ is considered an indicator which reflects the direct and immediate perception of customers of one or more key service characteristics perceived by customers and differ from CS which accounts of an overall assessment of consumption experience. PV measures the relationship between the price of the service and PQ. A variation of the ACSI model, consist of the European Customer Satisfaction Index (ECSI, see Eklof (2000)) which among other aspects, adds as a precedent of CS the variable Image (I) which represents the corporate image of the company. Both ACSI and ECSI models sustains that a positive relationship between CS with PV and PQ it is expected.

The above mentioned model has been tested and confirmed for the mobile phone market both in developed (Turel et al. (2006) presents results for Canada) and developing countries (Vranakis et al. (2012) for Greece, Leelakulthanit and Hongcharu (2011) for Tahiland and Kuo et al. (2009) for Taiwan). A comparative study of Morgeson et al. (2015) applied to Barbados, Singapore, Turkey, the United Kingdom, and the United States, finds that in the case of developing countries, PV is relatively more important than PQ in explaining CS while in the case of developed countries this result is inverted.

Other hypothesis regarding variables that determine CS in mobile phone services as customer care, network quality, assessment of prices, personal benefits, billing and informational quality, among others, have been tested by the literature. Table 1 summarizes the main findings from the most recent studies.

In all the studies described in Table 1, CS is considered as a one dimensional variable and no distinction is made among factors that can influence increases or decreases in CS. However, studies applied to other markets, have found evidence that satisfaction and dissatisfaction can be considered as two different constructs influenced by distinct factors (see for example earlier studies of Swan and Combs (1976) or Maddox (1981)). Indeed, the empirical relevance of some factors or attributes of the services in explaining CS may not be symmetrical in the sense that can influence in the same way either satisfaction or dissatisfaction. For example, customer care can be important for avoiding dissatisfaction but nor for influencing satisfaction. At the same time, quality of service could be important for explaining both satisfaction and dissatisfaction.

These considerations are even more important when the measurement of CS is based in assessed categorical variables, like Likert scales. Section 4 presents two different methodologies that permits to account for determinants of assessed categorical variables.

2.2. CS and the determinants of retention

Even when the relationship between CS and firm's profitability may not always be positive in the short term because of the existence of diminishing returns of improved quality on satisfaction (as argued by Anderson and Sullivan (1993)), studies have documented the existence of a long run positive relationship between CS and company's financial performance (see Anderson et al. (1994)). The central idea is that CS increases loyalty of customers, which reflects in their intention of repurchase or remain consuming the service provided by the same operator; i.e. Customer Retention (CR). This relationship between CS, CR and companies' profits explains the growing interest of marketing researchers on the determinants of CS. As well, CS has also became a key performance indicator for regulators whose policies have been oriented to the removal of switching barriers, the promotion of competition and the improvement of customer perception of the regulatory system.

However, in the short run, companies can find alternative ways to retaining customers. One of the most commonly discussed strategic conducts in telecom markets consist of the creation of switching barriers. For example Kim et al. (2004), finds evidence on the impact of switching barriers in retaining customers in the South Korean mobile market, even with low levels of satisfaction. Switching barriers can be either exogenously or endogenously determined. A notable example of exogenous switching barriers in mobile phone market is the cost of losing the phone number, under the absence of a portability regime (see for example Gerpot et al. (2001)). Endogenous switching barriers are those that can be implemented deliberately by operators through the use of technology (for example, the *sim lock* configuration of mobile terminals), or contracts (through high penalties imposed to contract termination), among others.

Some studies applied to mobile phone markets in developing countries (see Omotayo and Abolaji (2009) and Lőrincz and Nagy (2010)) confirm the importance of switching barriers as well as CS (through their impact on CL) as determinants of CR.[4] The main policy implication of these studies is that there exists a scope of fostering competition in mobile phone service market through the elimination or reduction of switching barriers. Peru recent experience shows a good example of such regulatory reforms.

3. Recent developments in the Peruvian mobile market

As in other emerging economies, Peruvian mobile market has experienced a drastic growth during the last decade, passing from 8.8

[4] These studies' conclusions differ from Morgeson et al. (2015) results who found a systematically lower relationship between CS and CL in developing as opposed to developed markets. They attributed it to an "income effect," where exogenous variables often impact the ability to remain loyal even in situations of high satisfaction.

Table 1
Evidence on determinants of CS in mobile phone market.

		PQ [1/·]	PV	Company image	Expectations	Customer care	Emotional value	Assessment of prices	Personal benefits	Billing	Information quality
Turel et al. (2006)	Canada	√	√		√						
Vranakis et al. (2012)	Greece	√	√	√							
Kuo et al. (2009)	Taiwan	√	√			√					
Leelakulthanit and Hongcharu (2011)	Tahiland	√		√		√	√				
Gerpot et al. (2001)	Germany	√						√	√		
Kim et al. (2004)	South Korea	√				√					
Gijón et al. (2013)	Spain	√				√		√		√	√
Zhao et al. (2012)	China	√ [2/□]				√ [4/□]					
Abdolreza et al. (2008)	India	√		√ [3/·]		√ [5/·]					

[1/]Includes network quality or service quality; [2/·] Relational quality; [3/·] Reputation; [4/·] Interaction quality; [5/·] Outcome quality
.

to 34.2 million of phone lines between 2008 and 2015, which represents an increase in service density from 74.9 to 113.3. This growth has been accompanied by an important increase in geographic coverage and in investment in mobile infrastructure. As in other countries (see for example, Wayne Fu (2004)), mobile carriers' growth strategies were based in part in the development of scale economies through their internal growth and the use of 'private networks', offering more attractive plans and conditions to on-net services than off-net ones.

This increasing trend in Peruvian mobile market is explained not only by the notable growth experienced by the economy (which averaged more than 5% per year during the last decade) but also by the adoption of some important regulatory measures. At first, between 1996 and 2011, the system "calling party pays" which assigned mobile carriers the right to set prices from fixed to mobile calls was introduced, providing high incentives for expanding mobile services. Another important measures were the gradual removal of mobile terminals import tariffs from 2002 to 2007 and the temporary swapping regime of canon for spectrum *versus* service expansion targets between 2006 and 2008.

However, the mobile service expansion path was not accompanied by major increases in competition. Indeed, until 2014, Peruvian market was one of the most concentrated of the region, with the two biggest carriers (Movistar and Claro) representing more than the 90% of the total phone service lines.

Since the 2014 some policy measures were adopted with the aim of removing a number of switching barriers identified by the regulation. At first, mobile portability regime initially introduced in 2010, was relaunched in July 2014, with simpler procedures and shorter terms (including the automatic approval in 24 h). This implied an increase of the number of monthly portability operations from less than 5 thousand (before July 2014) to 130 thousand at the end of 2015. Another important barriers identified were related with technological and contractual practices. Technological barriers, related to *sim lock* configuration of mobile terminals, were considered one of the factors that increased switching costs between carriers. Thus, since 2014, OSIPTEL (the Peruvian regulator of telecommunications) decided to obligate operators and retailers to sell unlocked terminals. Contractual switching barriers identified by the regulator consisted of the application of drastic penalties to contract termination in postpaid plans. In order to reduce the effect of this contractual practice, OSIPTEL decided to set a ceiling to contractual termination penalties, calculated as a function of the pending amount of debt for the price of the mobile equipment acquired. This measure has been complemented by a sharp reduction of interconnection charges (on average 60%) in the first semester of 2015, which reduced substantially the cost of *offnet* calls.

The implementation of these regulatory measures and the entry of two new carriers (Entel and Bitel) fostered importantly the competition in this market which showed an increase of market share of new entrants from 5% in 2013 to 17% in mid 2016.

Measuring the impact of CS on CR can be an indirect mode of assessing the results of regulator's efforts in reducing the impact of switching barriers on customer decisions. Indeed, the influence of CS on retention will depend, among others, on the degree of effectiveness of recent regulation against switching barriers. Furthermore, testing the determinants of CS and in turn their impact on retention is of high interest not only from a private marketing optic but also from a public policy perspective.

4. Data, methodology and results

4.1. Sample characteristics

Data was collected from a survey to 1259 users, performed by CCR for the Peruvian Regulator, OSIPTEL. The coverage of the data includes 18–70 year-old customers located in the three natural regions of Peru: coast, highlands and jungle. Questionnaires included requests of qualifications to users on a five level scale basis, a Likert scale (Likert, 1932). Thus, for instance, Overall Satisfaction ($OSat_i$) with mobile service is measured asking users the following question: 'In general terms, how satisfied do you feel with the service provided by your mobile phone operator?'. The possible answers were Very Unsatisfied, Unsatisfied, Neutral, Satisfied and Very Satisfied. The scale used initially for scores assigned to each answer went from 1 to 5 (where 1 was assigned to Very Unsatisfied and 5 to Very Unsatisfied).[5] The distribution of responses was concentrated in "Satisfied" being the frequencies of the responses among each of these categories 2%, 6%, 18%, 70% and 4%, respectively.

Appendix A shows some general characteristics of the sample. A first observation is that $OSat_i$ varies from 62 to 79 points among subgroups of the sample. However, mean differences *t*-tests among educational, socioeconomic level,[6] location and age subgroups were found statistically significant. Regarding the patterns showed by $OSat_i$ by age subgroups, users from 51 to 60 and 61–70, showed a relatively higher level of overall satisfaction than other subgroups. With respect

[5] In order to facilitate the results interpretation, these scores were formerly converted to a centesimal scale.

[6] Socioeconomic classification is based mainly on indicators of housing, education, property, use of durable goods, and access to health of families. Order of the scale is decreasing from "a" to "e" levels. See Appendix 3.

to users grouped by socioeconomic level, average of $OSat_i$ is higher for group "a". Ordered by educational level, users with basic incomplete education exhibit slightly higher overall satisfaction levels. Characterized by type of plan and access to services, averages show a relatively higher level of overall satisfaction of users with prepaid plans and with access to Internet. As well, grouped by geographic location, Highland customers show on average a significantly lower level of $OSat_i$ than Jungle or Coast users.

The questionnaire also considered separately the evaluation of customer satisfaction with four important attributes of mobile phone service: Quality of Service ($SQoS_i$), Quality of Customer Care ($SQoC_i$), Billing Clarity (SBC_i) and Information on Tariffs and Promotions ($SITP_i$). Each score was obtained from the simple average of a number of questions made to users, using the same Likert scale (see Appendix B). *SQoS* relates with qualifications of customers regarding quality attributes of service like quality of voice services, speed of Internet, delays in receiving SMS messages, among others. *SQoC* relates with customer perceptions on time delays in attention (either by phone or in operator's offices) or the effectiveness and easiness of customer procedures. As well, SBC refers to the clarity of information included in the receipt and the timeliness of its delivery. Finally, SITP is referred to information provided by the operator regarding the clarity of the information regarding the tariffs and promotions and customer's perceptions on the level of compliance with these contractual specifications.

As can be seen in Appendix A, average satisfaction levels on billing clarity and information about tariffs tend to be higher than satisfaction with level of service and customer care. This conclusion is robust to different age, socioeconomic, geographic, educational groups or mobile service characteristics. The same trend shown in $OSat_i$, is observed in relative levels of satisfaction within these groups. Results also show, that as in other studies, lower education, income and age all tend to have higher satisfaction levels and the reverse.

4.2. Measuring determinants of CS

Determinants of overall CS were divided into four groups of variables. A first group of determinants is related to satisfaction obtained from service attributes (SA_i) like quality of service, customer care, billing clarity and information about tariffs and plans. A second group is related with the characteristics of the mobile service ($CServ_i$), for example, if the modality is postpaid or prepaid plan or if the service includes Internet or not. A third group is related with customer characteristics ($CChar_i$) like age, socioeconomic level, education, geographic origin or the degree of knowledge about consumer rights. Finally, a fourth group is referred to the mobile operator who provides the service to the customer, distinguishing between incumbent companies (Claro and Movistar) from new entrants (Bitel and Entel). Thus the model is as follows:

$$\mathrm{OSat_i} = f(\mathrm{SA_i},\ \mathrm{CServ_i},\ \mathrm{CChar_i},\ \mathrm{Dentrant_i}) \quad (1)$$

where SA_i=($SQoS_i$, $SQoC_i$, SBC_i, $SITP_i$); $CServ_i$=($Plan_i$, $DInternet_i$); and, $CChar_i$=(Age_i, $Educ_i$, $Socio_i$, $Coast_i$, $Highland_i$, $Know_i$). $Plan_i$ and $DInternet_i$ are dummies in which 1 means having a postpaid plan and Internet, respectively, or zero otherwise. Age_i is the age of the respondent customer. As well, $Socio_i$ is a categorical vector that includes the five socioeconomic levels (growing from "a" to "f", where "f" equals to 0 and "a" to 5). $Coast_i$ and $Highland_i$are dummies that indicate the geographic location of the customer (coast and highland being jungle the default). Finally, $Know_i$ reflects the result of a questionnaire made to customers related to their rights as consumers. The questionnaire consisted of eleven statements on which customers must assert if it is "True" or "False" (Appendix C shows the structure of the questionnaire).[7] $Dentrant_i$ is a dummy variable that assumes a value of 1 when the user belongs to new mobile operators (Entel or Bitel) and zero otherwise.

Empirical literature which addressed the issue of measuring the determinants of CS of mobile users has employed diverse estimation approaches. A common empirical approach used consists of Multiple Regression Analysis (MRA). For example, Gijón et al. (2013) used MRA through Ordinary Least Squares (OLS) and Ordered Logit (OL) for measuring the determinants of CS of mobile phone customers in Spain. Similarly, Leelakulthanit and Hongcharu (2011) used MRA-OLS for testing several determinants of CS mobile markets in Thailand.

However one of the most prominent trends has been the use of Structural Equation Models (SEM). SEM approach encompasses several methods and statistical techniques. Gerpot et al. (2001) for example used Generally Weighted Least Squares for implementing the Confirmatory Factor Analysis (CFA) for the testing the relationship between CS, CR and CL of mobile phone users in Germany. Vranakis et al. (2012) employed also CFA for inquiring on the relationships between categories like perceived value, service quality, signal quality, CS and CL in mobile phone market in Greece. Turel et al. (2006) used Partial Least Squares (PLS) for investigating relationship among perceived quality, expectations, perceived value, CS and customer complaints. Kuo et al. (2009) employs both Exploratory Factor Analysis (EFA) and CFA for testing the relation between service quality, perceived value, customer satisfaction and post-purchase intention in mobile phone market in Taiwan. As well, Martensen et al. (2000) uses PLS for testing the European Customer Satisfaction Index (ECSI) model in Denmark.

Given that in the present study, the endogenous variable ($OSat_i$) consist of a five scale ordered responses (from very unsatisfied to very satisfied), its distribution is neither continuous nor Normal distributed. Based in this consideration, Peel et al. (1998) argued on the superiority of the OL or Ordered Probit Models (OP) over the OLS. OL technique consists of estimating the endogenous variable ($OSat_i$) considering that customer responses reflects the value of a latent variable (CS) which actually is continue. The OL model estimates the critical intermediate value of this latent variable, which represents the threshold of one response to the next superior or inferior category level. Table 2 presents estimates of (1) using OL and OLS methods. In this table the coefficients z_i are the estimated parameters associated to OL thresholds between categories.

As can be seen, although in general terms, parameters sign and degree of significance coincides among OL and OLS, the value of parameters differs importantly. Tests Chi Square and F of both regressions show that the estimated parameters are jointly significant at 1%. As can be seen, all parameters associated with satisfaction of attributes were found statistically significant being satisfaction with quality of service ($SQoS_i$) the parameter with the highest value. Considering the OL model a 1 point of increase $SQoS_i$ has an impact of 0.08 in the log odds of being in a higher level of $OSat_i$. In the case of the characteristics of the service, both estimates provides statistical evidence that having postpaid plan has a negative effect on $OSat_i$, which can be explained by the fact that users of these type of plans may be more demanding on quality and other relevant attributes of the service. The same arguments helps to explain why customer spending has a negative impact on $OSat_i$; indeed, these estimated parameter signs show that the higher the spending in the service the lesser the level of overall satisfaction. In contrast, customers with access to mobile Internet tend to be more satisfied than those which have no access, showing that in this case from the perspective of the consumer, "*more (services) is better*". As well, OL and OLS estimates show that geography is a factor that influences CS, demonstrating that coast and highland customers tend to be less satisfied than those located in the jungle region. Finally, according OL and OLS estimates neither the customer knowledge of consumer rights nor socioeconomic level variables, were found significant.

The broad use of OL models for estimating ordered categorical variables has been subject to some criticism. Anderson (1984) argued

[7] The result of the questionnaire was converted to a centesimal scale.

Table 2
Ordered logit and ordinary least squares estimates for customer satisfaction.

	$OSat_i$			
	Ordered Logit		Ordinary Least Squares	
	Coeffs	SE	Coeffs	SE
$SQoS_i$	0.08	[0.01]***	0.41	[0.03]***
$SQoC_i$	0.02	[0.01]***	0.11	[0.02]***
SBC_i	0.03	[0.01]***	0.15	[0.03]***
$SITP_i$	0.03	[0.01]***	0.20	[0.04]***
$Plan_i$	−0.31	[0.16]**	−2.04	[0.77]***
$Spend_i$	−0.01	[0.00]**	−0.04	[0.02]**
$DInternet_i$	0.51	[0.17]***	2.58	[0.76]***
$Dentrant_i$	0.89	[0.33]***	2.55	[1.27]***
$Socio_i$	0.14	[0.08]*	0.49	[0.36]
$Coast_i$	−1.00	[0.40]**	−4.97	[1.92]***
$Highland_i$	−0.95	[0.42]**	−5.60	[2.09]***
$Know_i$	−0.01	[0.00]*	−0.03	[0.02]
Age $_i$	0.00	[0.01]	0.00	[0.02]
Constant			15.51	[3.50]***
z1	4.81	[0.70]		
z2	6.89	[0.73]		
z3	9.14	[0.77]		
z4	14.63	[0.84]		
N	1259		1259	
LogLikehood	−861.62			
Chi Squared	419.63***			
F			64.6***	
R			0.40	
Pseudo R	0.25			

***Significant at 1%, **Significant at 5% and *Significant at 10%. S.E.: Standard Errors

that in the case of categorical variables, the election of the model is an empirical issue which depends on two important concepts: dimensionality and distinguishability. The first one relates with the number of combinations of independent or explanatory variables necessary to explain the dependent categorical variable; while the second, refers to the power that a combination of independent variables for differentiating between two or more categories.

As mentioned above, in the present case, $OSat_i$ is an "assessed" categorical variable,[8] with five level of categories. In order to test dimensionality, is our interest to evaluate if the influence of explanatory variables is the same and uniform for each category of assessment. An interesting question is if the factors that influences on negative assessments are the same than those which affects positive assessments; i.e. if causal relationship found by OL and OLS are symmetric or asymmetric among different categories. As well, it is possible that an explanatory variable show statistical significance for only a subset of categories of the dependent variable.

Multinomial models provide a method to assess dimensionality in cases in which the dependent variable is categorical.

Table 3 shows the results of a Multinomial Logit model (ML) for $OSat_i$. In order to observe if the determinants of CS identified though OL method are symmetric or not among categories we chose as the default category the response "neutral". The coefficients represent the influence of explanatory variables on the log odds of experiencing a higher level of $OSat_i$, with respect to the default category. For example, an increase in one unit of $SQoS_i$ has a negative effect (−0.08) on the log odds of being Very Unsatisfied with respect of being Neutral. As well, having access to Internet has an effect of 0.77 on the log odds of being satisfied *versus* being neutral.

Wald test (Chi Square) of joint significance shows that the model is significant at 1%.[9] In all cases the signs shown are as expected and consistent with results of OL and OLS estimations. As can be seen, in the case of $SQoS_i$ the impact of this variable is significant over all categories of satisfaction. In other cases, like the variable $Dentrant_i$, the effect is not significant over all categories but is symmetric in the sense that significance is seen only in Very Unsatisfied and Very Satisfied as well. Other results obtained are asymmetric. Explanatory variables related to the other three service attributes (customer care, billing clarity and information on tariffs and plans), show high levels of significance for positive satisfaction levels, but no significance for negative levels. Similarly, having access to Internet ($DInternet_i$) shows a higher degree of significance for Very Satisfied and Satisfied in the log odds with respect to Neutral. As well, an increase in spending has a negative effect on log odds of being Satisfied versus Neutral. In contrast, consistently with OL and OLS results,$Coast_i$ and $Highland_i$ have a positive statistical significant impact in the log odds of being Unsatisfied and Very Unsatisfied *versus* Neutral; but only one of those variables ($Highland_i$) has a statistical effect on log odds of being Very Satisfied versus neutral. Similar results can be observed in the case of most informed customers (variable $Know_i$) whose log odds of being Very Unsatisfied were found significant. In sum, nine out of eleven explanatory variables that were found statistically significant showed an asymmetric impact on categorical levels of CS. It is interesting to notice that in five cases the asymmetry concentrates in positive satisfaction categories (Satisfied and Very Satisfied, relative to neutral) while in four cases, in negative categories.

4.3. The influence of CS on retention

As mentioned in previous sections, the main channel through which satisfaction can contribute to retain customers is loyalty. The approach generally used by the literature to test the relationship between CS and loyalty, consist of asking customers about their willingness to switch of product or company in the future, and explore whether the arguments used by respondents in favor to switch or not; are effectively related with satisfaction with the service or to other reasons related to the presence of contractual, legal, economical or technological barriers.

Here, a different approach has been used. In this study, it was asked the customers if during the last year they switched or not of mobile operator during the last year. The result obtained was a positive response from a 7.3% of the sample. Based in this result, a dummy, $Retention_i$, which takes a value of 1 if customer did not switch and 0 otherwise, was created. In those cases in which customers declared that did not switch of operator, it was asked about the reasons of not having switched of operator during the last year. The results obtained are summarized in Table 4.[10]

Based in responses 1, 2, 5 and 6, a dummy variable, $loyalty_i$, which takes a value of 1 if any of these alternatives was responded and 0 otherwise, was created. In order to test the influence of the CS at the different levels of satisfaction on loyalty we can use the probabilities estimated in Table 3 for the four different levels of SC denoted: $PVUnsat_i$, $PUnsat_i$, $PSat_i$, $PVSat_i$, respectively. Given that, as mentioned before, there are a 7.3% of respondents that are not included in this group who did not switch of operator during the last year, estimations of loyalty must be controlled by sample selection. Dubin

[8] Assessed categorical variables, like $OSat_i$ are extensively used by other disciplines as biomedical or social sciences, in which responses to be modeled corresponds to ordered qualifications like "worse", "same" and "better". Other different type of ordered categorical variables is the so called "grouped continuous" which consist for example in "age groups", "income groups", among others.

[9] Both OL and ML models were estimated using Huber Sandwich robust standard errors. A comparative Likelihood Ratio test between OL and ML can be performed considering as the first as the restricted (L_1) and the second the unrestricted (L_0) model. The result obtained, with 39 degrees of freedom, which is 66.79 is significant at 1%. However, this result should be interpreted with caution since the L_1 model it is not nested in L_0.

[10] Respondents could report more than one alternative of those mentioned in Table 3. Other responses included in Subtotal were '*for work reasons*', '*because of habit and routine*', '*lack of information*', '*lack of time*', '*not losing my phone number*', '*not specify*'.

Table 3
Multinomial model estimates for customer satisfaction ($OSat_i$).

	Very Unsatisfied		Unsatisfied		Satisfied		Very Satisfied	
	Coeffs	S.E.	Coeffs	S.E.	Coeffs	S.E.	Coeffs	S.E.
$SQoS_i$	−0.08	[0.03]**	−0.03	[0.01]**	0.07	[0.01]***	0.14	[0.03]***
$SQoC_i$	−0.01	[0.02]	−0.02	[0.01]***	0.02	[0.01]***	0.03	[0.01]**
SBC_i	0.00	[0.02]	0.01	[0.01]	0.04	[0.01]***	0.08	[0.02]***
$SITP_i$	0.03	[0.02]	−0.01	[0.01]	0.05	[0.01]***	0.10	[0.03]***
$Plan_i$	1.41	[0.61]**	0.18	[0.32]	−0.21	[0.21]	−0.73	[0.43]*
$Spend_i$	0.00	[0.01]	0.01	[0.01]	−0.01	[0.01]**	−0.01	[0.01]
$DInternet_i$	0.24	[0.73]	0.30	[0.35]	0.77	[0.22]***	1.30	[0.46]***
$Dentrant_i$	−12.64	[0.77]	−0.27	[1.09]	0.30	[0.43]	1.46	[0.54]***
$Socio_i$	0.06	[0.25]	−0.30	[0.16]*	0.17	[0.10]*	−0.04	[0.18]
$Coast_i$	12.41	[0.89]***	14.47	[0.50]***	−0.92	[0.54]*	−1.60	[0.89]*
$Highland_i$	13.31	[1.01]***	14.46	[0.57]***	−0.56	[0.57]	−2.06	[1.00]**
$Know_i$	0.02	[0.01]**	0.00	[0.01]	−0.01	[0.00]	−0.01	[0.01]
Age_i	0.02	[0.02]	0.00	[0.01]	0.00	[0.01]	0.01	[0.01]
Constant	−15.59	[2.46]***	−11.95	[1.11]**	−10.47	[1.07]***	−26.96	[3.58]***
Log pseudolikelihood	−828.2	*Wald test*	7509***	*Pseudo R2*	0.28	*N*	1259	

***Significant at 1%, **Significant at 5% and *Significant at 10%. S.E.: Standard Errors

Table 4.
Why you did not decide to switch of operator?.

Answer	**%**
1. Because I am satisfied with the service	43.3%
2. No better alternatives	9.6%
3. I cannot switch because I have a fixed term contract	2.6%
4. The majority of my relatives are customers of the same operator	38.6%
5. Other companies have limited coverage	2.4%
6. Because my operator has a good quality of signal	0.1%
Others	**3.4%**
Total	**100.0%**

and Rivers (1990) adapt selection bias techniques introduced by Heckman (1979) to the estimation of binary dependent variables like loyalty, using *Probit* regression models.

Table 5 shows the results of a Probit Model (PM) on the influence of different levels of $OSat_i$, on $Loyalty_i$. Wald Tests shows that the estimation is statistically significant at 1%. As can be observed only positive levels of estimated $OSat_i$ ($PSat_i$, $PVSat_i$) were found statistically significant, and signs of coefficients are positive as expected, revealing the asymmetric effect of positive *versus* negative CS evaluations on loyalty. Is important to notice that this result confirms the results found in other studies applied to developing countries like Omotayo and Abolaji (2009) and Lőrincz and Nagy (2010) and contrasts with the comparative studies applied to mobile phone services like Morgeson et al. (2015), that finds that the relationship among CS and CL in developing countries is weaker than in the case of developed countries.

Table 5.
Sample selection model: influence of CS on $Loyalty_i$.

$Loyalty_i$		
	Coeffs	S.E.
$PVUnsat_i$	−0.88	[0.88]
PUnsati	0.74	[0.80]
$PSat_i$	1.47	[0.35]***
$PVSat_i$	3.82	[0.89]***
Constant	−0.75	[0.29]
Selection equation: $retention_i$		
	Coeffs	S.E.
$Dinternet_i$	0.19	[0.12]*
$Dentrant_i$	−1.41	[0.16]***
$OSat_i$	0.01	[0.00]***
Constant	0.73	[0.28]**
ρ	−0.86	[0.29]
Wald Test	120.57***	
LogLikehood	−976.42***	
LR Test (ρ=0)	6.96***	

***Significant at 1%, **Significant at 5% and *Significant at 10%. S.E.: Standard Errors

As well, Table 5 shows the results of a selection equation for $Retention_i$. Explanatory variables $OSat_i$, $Dentrant_i$ were found significant. As expected, the sign of the parameter of $OSat_i$ is positive while in the case of $Dentrant_i$ the negative sign reflects that a significant proportion of customers switched from incumbent to entrant operators.

Parameter ρ which shows that the correlation degree between the excluded sample (those customers who switch of operator) and the endogenous variable ($Loyalty_i$) is negative and significant at 1%, as the Likelihood Ratio test shows. This result reflects that if more demanding customers who switched from operator were included in the principal equation, the estimated impact of predicted satisfaction in $Loyalty_i$ will be lower. This result may reflect the fact that while satisfaction can be identified as a powerful cause of CR, switching barriers did not deter unsatisfied (or more demanding) customers' decision of switching to alternative carriers.

4.4. Integrating the results: a generalized structural model

Structural Equation Modelling (SEM) permits to establish explicitly causal relationships between different constructs imposing an order of precedence and hierarchy among them. Until now the specifications used assumed a direct causality from different groups of dependent variables either on $OSat_i$ or $Loyalty_i$. The Generalized Structural Equation Modelling (GSEM) permits to combine in an integrated estimation diverse econometric specifications including OLS, binomial and multinomial logit estimations showing different causal relationships. In our case, explanatory variables of $OSat_i$ were divided between customer attributes and service attributes with aim of finding a causality chain that goes from customer to service attributes, and from service attributes to satisfaction levels. Our vector of customer attributes is composed of six variables (Age_i, $Know_i$, $Socio_i$, $Educ_i$, $Coast_i$, $Highland_i$) while the service attributes is composed of three variables ($Plan_i$, $DInternet_i$, $DEntrant_i$). Service attributes in turn influences on CS with different characteristics of the service, represented by the vector (QoS_i, $SITP_i$, $SQoC_i$, $SITP_i$). Finally, this vector of satisfaction with characteristics of the service can influence on Loyalty.

Since variables $Plan_i$, $DInternet_i$, $Dentrant_i$ and $Loyalty_i$ are dichotomic GSEM allows to use a binomial logit estimation. As well, since $OSat_i$ is a multilevel assessed variable GSEM permits to estimate

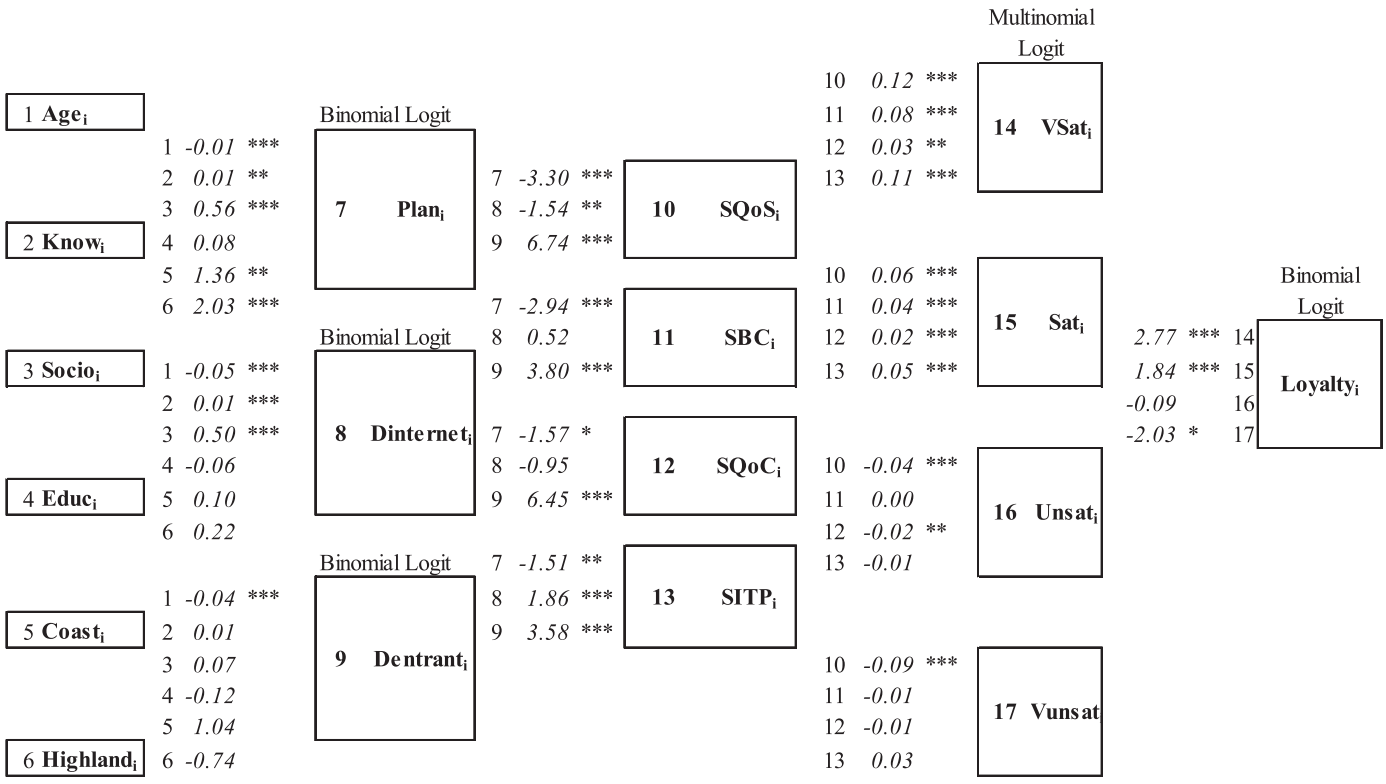

Fig. 1. GSEM estimation.

its determinants using a Multinomial Logit Model. Consistently with the estimation made in last section five qualifications were included (Very Satisfied, Satisfied, Neutral, Unsatisfied, Very Unsatisfied) using Neutral as the default. Fig. 1 shows the results.

For clarity purposes, arrows commonly used in SEM specifications were omitted and replaced by the number of each variable at the left side of the dependent. The parameter estimates and their level of significance are at the right of each dependent variable number.

Fig. 1, shows that two customer characteristics influence significantly on customer plan choice: age and socioeconomic level. The first shows that the probability of choosing a postpaid plan decreases the older is the customer, confirming the intuition that younger users are more focused on prepaid plans. As well, the probability of choosing a postpaid plan increases the higher is the socioeconomic level. This is explained by the fact that poorer customers choose options which provide them more control of their budget in communications. Conversely, richer customers tend to prefer plans more intensive in the use of data or voice services paying a monthly rent for them.

Age and Socioeconomic level of the customers as well as Knowledge of customer rights are also relevant for explaining a higher probability of using Internet. As well Age influences positively on the decision of choosing entrant services instead of incumbent's. The first result (a negative sign) shows that the younger customers are those which have a more willingness to use Internet and to switch of operator. As well the probability of choosing Internet is positively correlated with higher levels of knowledge of customer rights.

At a second level, results show that the three service attributes ($Plan_i$, $DInternet_i$, $Dentrant_i$) influence statistically on $SQoS_i$. Negative signs in the first two variables show that postpaid and Internet customers are less satisfied with service quality than prepaid and 'only voice' users. This result can reflect that these customers tend to be more demanding and that offering additional services implies that companies put more efforts in quality of service. The positive sign of the third determinant ($Dentrant_i$) shows that customers who switched to entrants are more satisfied with service quality that those who remain with the same operator. In the case of SBC_i, result show that postpaid customers are relatively less satisfied with the clarity of billing while in the case of entrant customers results reveal that they feel relatively more satisfied with this service characteristics than others. In the case of Customer Care ($SQoC_i$), only being an entrant customer shows to be statistically significant. Finally, regarding the satisfaction with information provided by operators about plans and tariffs ($SITP_i$) the three service characteristics exhibit a significant degree of significance. Again, postpaid customers are relatively less satisfied that prepaid ones, while in the case of Internet (versus non Internet) and entrant (versus incumbent) customers, satisfaction significantly increase the levels of satisfaction with this service attribute.

In a third level, the results show that in general higher satisfaction on different attributes of mobile service increase the probability of being Very Satisfied and Satisfied. However, with the only exception of $SQoS_i$ which statistical significance results are symmetrical in all categories of satisfaction in the rest of attributes the results are asymmetrical. Indeed, while in the case of $SQoC_i$ it can be shown that it is statistically significant on the relative probability of being Unsatisfied (versus Neutral) but with no effect on Very Unsatisfied; in the case of the rest of characteristics SBC_i and $SITP_i$ no significant statistical effect was found on Very Unsatisfied and Unsatisfied. These results are consistent with those shown in Table 3 in previous sections.

At a fourth and final level, results show that $Loyalty_i$ is influenced significantly by positive assessment of satisfaction with the service (Very Satisfied and Satisfied). Negative assessments do not show any statistical effect on $Loyalty_i$. This result confirm the findings shown in the previous section (Table 5).

5. Concluding remarks

Studies applied to mobile phone market implicitly or explicitly assume that determinants of categorical assessments of satisfaction are the same, symmetrical and uniform. This study shows that determinants of CS in mobile phone service in an emerging country, Peru, are not uniform or symmetrical. In particular, results show that while some determinants of CS like quality of service assessments influences both negatively and positively on overall satisfaction, other factors like customer care, billing clarity or information on tariff and plans only influences on positive satisfaction assessments. As well other important factors that influences on positive assessments of CS are having an Internet (*versus* only having a voice plan) and a postpaid plan (*versus* a prepaid plan). Conversely, it was found that some exogenous variables related customer's location, particularly those from coast and highland, had a significant influence only in negative assessments of CS.

Other interesting result obtained is that only positive assessments of CS have a statistical significant effect on loyalty. No evidence was found on the inverse causal effect (i.e. unsatisfaction causes less loyalty). As well, evidence in favor that overall satisfaction influences positively in CR has been found. This significant relationship found between positive assessments of CS and CL confirms the results found in other studies applied to developing countries like Omotayo and Abolaji (2009) and Lőrincz and Nagy (2010) and contrasts with the results of other comparative studies applied to mobile phone services like Morgeson et al. (2015) that finds that the relationship among CS and CL in developing countries is weaker than in the case of developed countries.

From a managerial perspective, our analysis permits to draw some important implications. At first, results show that carriers should put more efforts on improving service attributes delivered to most demanding customers, namely postpaid and Internet ones. The most influential attribute is quality of service, so particular emphasis must be put by carriers in improving characteristics like coverage, Internet speed, voice sharpness, among others. Other attributes like billing clarity and information of tariffs and plans, show that more transparency and the delivery of better information to customers can increase the degree of customer loyalty and retention in this market.

From a regulatory and public policy perspective, results show that reforms recently implemented in Peru towards a more competitive mobile phone market, seems that have begun to show their results. This assertion is based in the fact that while overall satisfaction continues being a factor that favors customer retention, the result that satisfaction of not retained customers (those who switch to other carrier) is even better; shows at least partially that switching barriers are being reduced or are not strong enough to impede users to decide changing to other operators in order to improve their satisfaction levels. The future evolution of portability transactions and market structure during the next years will confirm or not whether the regulatory reforms initiated in 2014 had effectively opened a “no return path” to a more competitive mobile phone market in this country.

Appendix A

See Table A1 here.

Table A1
Characteristics of the sample.

		$OSat_i$	$SQoS_i$	SQoCi	SBC_i	$SITP_i$
Age	**Size Subsample**					
18–30	463	73.99	71.27	68.25	75.73	74.60
31–40	304	71.84	72.43	68.90	75.34	73.27
41–50	246	73.33	72.22	67.46	75.20	73.53
51–60	165	76.72	75.21	71.39	77.40	74.73
61_70	117	75.04	76.09	71.15	76.70	75.68
Socio-Economic Level						
a	38	76.37	75.07	66.75	75.18	76.05
b	276	72.39	71.52	68.59	75.14	74.35
c	595	74.45	73.00	69.46	76.80	74.37
d	268	73.66	72.91	68.06	75.26	73.65
e	118	73.05	72.27	69.54	74.18	73.64
Education						
Basic Incomplete	150	74.66	72.75	70.31	76.71	75.47
Superior Incomplete	578	73.66	72.49	68.34	75.27	73.59
Superior	567	73.72	72.81	69.12	76.19	74.49
Location						
Coast	1070	75.16	74.57	69.79	77.30	75.37
Highland	190	65.26	62.17	63.25	67.70	67.34
Jungle	35	78.86	71.14	72.86	74.67	75.72
Mobile Service						
Pospaid plan	442	71.13	70.20	67.74	74.11	73.73
Prepaid plan	853	75.21	73.94	69.54	76.77	74.46
With internet	741	74.03	71.70	68.45	75.75	74.87
With no internet	554	73.50	73.95	69.53	75.96	73.30
TOTAL	**1295**	**73.80**	**72.66**	**68.91**	**75.84**	**74.20**

Socioeconomic Level

In order to characterize customers, a socioeconomic level indicator was used according the following questionnaire which considers educational level (N1), durable goods and assets availability (N2 and N3), house characteristics (N4 and N6), access to a health insurance system (N5) and access to sanitation services (N7). The source of this method and calculations corresponds to CCR (see http://www.ccrlatam.com/).

N1. What is last grade of education approved by the head of the household?

No education/ initial education	0	Complete technical superior	3	Complete university	5
Incomplete or complete primary/incomplete secondary	1	Incomplete university	4	Post-graduate university	7
Complete secondary/incomplete technical superior	2				

N2. Which of the following goods do you have at home that is well functioning?

	NO	YES
Computer, laptop or tablet	0	2
Washing machine	0	2
Microwave oven	0	2
Refrigerator/Freezer	0	2
SUM POINTS		

N3. Which of the following goods or services do you have at home that is well functioning?

	NO	YES
Car or Van for particular use.	0	5
Home Paid Domestic Service	0	5
SUM POINTS		

N4. What is the predominant material used for building your house's floor?

Soil material / Others (Sand and Not Polished Wood)	0	Wood type planking, asphalt sheet	7
Cement / Wood (planking)/ tapiz	3	Polished wood and others; marble	8
Tile/ others	5		

N5. What health insurance system does the household head belong to?

No insurance/ Integral Health Public Insurance System	0	Army Health Insurance / Police	4
ESSALUD (Social Security Institute)	2	Health Provider Entity (EPS)/ Prvate Health Insurance	6

N6. N4. What is the predominant material used for building your house's external walls?

Mat	0	Stone or sillar Stone with lima or cement	4
Wood/Stone and clay/ Cain and Clay/ Adobe	2	Brick or cement block	6

N7. The bathroom or hygienic system that you have at home is connected to:

No system or no connected to a public network		**System connected to a public network**	
No bathroom	0	Shared bathroom outside the house.	3
Bathroom connected to a well, latrine, sump, river, among others	1	Bathroom inside the house	5

According to the sum of Items N1 to N7, the customer is classified in one of the following categories:

12 points or less	**SEL E**	8	From 29–33 points	**SEL B2**	4
From 13–19 points	**SEL D**	7	From 34–39 points	**SEL B1**	3
From 20–22 points	**SEL C2**	6	From 40–47 points	**SEL A2**	2
From 23–28 points	**SEL C1**	5	48 points or more	**SEL A1**	1

Based in the results, a five scale indicator was built which takes values from 1 to 5, where 1 represents "E" Socio Economic Level (SEL) and 5 represents "A". The variable "$Socio_i$" used in our estimations was based in this indicator.

Appendix B. Questionnaire on satisfaction with phone service attributes

Satisfaction with Quality of Service.

1. How satisfied or unsatisfied do you feel with .... regarding your phone service?
   a. The quality of calls with respect of the presence of noises and echoes
   b. The quality of calls with respect to the continuity (or the presence of interruptions)
   c. The number of attempts to initiate a call
   d. The delays in receiving an SMS message
   e. The quality of indoor signal
   f. The quality of outdoor signal
   g. The speed of Internet
   h. The availability of Internet in the cellphone (or the presence of interruptions)

Satisfaction with quality of customer care

2. How satisfied or unsatisfied do you feel ... regarding your phone service?
   i. The waiting time at operator's offices
   ii. The waiting time in a phone call to operator
   iii. The clarity of information provided
   iv. Effectiveness of the solution offered at operator's office
   v. Effectiveness of the solution offered in a phone call to operator
   vi. The easiness for submitting a claim at operator's office
   vii. The easiness for submitting a claim in a phone call to operator
   viii. The easiness for submitting a claim via the operator's webpage.

Satisfaction with billing clarity

3. How satisfied or unsatisfied do you feel ... regarding your phone service?
   a. The level of detail in the information included the receipt
   b. The clarity of tariff information included in the receipt
   c. The timeliness of the receipt's delivery
   d. The correspondence between the service and the amount of the bill

Satisfaction with information of tariffs and promotions

4. How satisfied or unsatisfied do you feel ... regarding your phone service?
   a. The information regarding the tariffs and promotions
   b. The easiness for understanding the characteristics of tariffs and promotions
   c. The operator's compliance with tariffs and promotions offers
   d. The trust in 'phone contracting' with the operator

Appendix C. Questionnaire on Customer Knowledge about their Consumer Rights

	True	False
The Operator cannot request the payment for service as a requisite of presenting a claim		
A necessary condition for submitting a claim is to be a party in the contract		
The Operator should provide the customer a claim number upon the reception of a claim		
OSIPTEL which is the "Telecommunications Services Regulator", provides information in their webpage about all the approved contract templates		
OSIPTEL which is the "Telecommunications Services Regulator", provides in their webpage information about all the tariffs of telecommunications services offered by operators		
OSIPTEL which is the "Telecommunications Services Regulator", provides in their webpage information about the procedures for submitting a claim.		
Information about the number of mobile phone contracted services can be obtained in the operator's web page upon indicating the ID number.		
Customers can ask the operator a copy of their contract either if it was agreed on a written document or verbally.		
Customers can switch of operator without changing their fixed phone number.		
Customers can switch of operator without changing their mobile phone number.		
Minimum speed for Internet service should be 40% of contracted speed.		

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