



Do telecommunications prices depend on consumer engagement? [☆]

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ABSTRACT

This paper analyzes how customers' heterogeneous search and switching habits affect the prices paid for telecommunication services in a context in which operators use price discrimination strategies to retain their customers and attract those of their rivals. Drawing on a representative sample of Spanish households (N=3,113), we show that engaged consumers pay 9.4% less than completely unengaged consumers for their telecommunication services, after controlling for the characteristics of the bundle of services contracted. We also find that highly engaged consumers (i.e. those that have called their operator to obtain a better deal and who have switched to a different operator at least once) pay 13.6% less for their services than unengaged consumers, that consumers who have switched operator at least once pay 8.4% less, and that consumers who call their operator to request better conditions for their contracts pay 5.8% less. Finally, we show that the excess price paid by unengaged consumers increases as they contract more sophisticated services, such as premium television content and additional mobile lines.

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1. Introduction

This paper examines consumers' behavior in the telecommunications market and its consequences for their well-being. In recent decades, the intensification of competition has led telecommunications operators to develop strategies aimed at retaining their customers and attracting those of their rivals. By observing consumer characteristics and tracing their actions, operators are able to adopt sophisticated forms of price discrimination to retain their more profitable clients as well as those most likely to switch to other operators (Hung et al., 2006; Ascarza, 2018). Thus, for example, operators can offer personalized prices¹ to selected groups of consumers (Verhoef, 2003; Richards et al., 2016).

The widespread use of behavior-based price discrimination (BBPD) means that consumers who contact their operator to

obtain better contract conditions or that switch operators can obtain substantial reductions in their telecommunications costs (Esteves, 2009). In contrast, *unengaged* consumers may end up paying higher retail prices for similar services. In this paper, we seek to measure the effects of consumer engagement on the prices paid for telecommunication services.

The adoption of this form of price discrimination has raised concerns about the implications for consumers as well as for market competition. The reluctance of consumers to seek for better deals or to switch to operators that commercialize more competitive offers reduces the benefits of retail competition and obliges regulators to develop new measures for enhancing market dynamism. Traditional strategies aimed at increasing competition, such as the regulation of number portability and the creation of price comparison applications, may have a limited impact on consumer welfare if consumers are not sufficiently engaged (Buehler et al., 2006; Genakos et al., 2018).

The objective of this paper is to analyze the effects of consumer engagement in the telecommunications market, that is, the consumer search for, and request of, better prices for their telecommunication services. Clearly, the consumers of telecommunication services are heterogeneous and, as such, maintain very different types of relationship with operators. Some consumers contact their operator at regular intervals seeking better contractual conditions or to inform them that they have received a better offer from a rival. In contrast, others are more passive and never contact their

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¹ Personalized prices are common in other service industries (e.g. home and vehicle insurance, mortgages, electricity, natural gas). Their popularity is attributable to the use of advanced data analytics, which allow firms to predict consumer behavior. Several papers have analyzed the specific case of the electricity sector in this regard (Giulietti et al., 2005; Ek & Söderholm, 2008; Gärling et al., 2008).

operator or do not react to changes in their contractual conditions. Operators, aware of these differences, may offer retention contracts to their active customers and make aggressive offers to their rivals' customers. At the same time, they may increase the prices to their unengaged customers. In this paper, we analyze whether in the Spanish telecommunications market active consumers end up paying lower prices than unengaged consumers for comparable services.

Our analysis draws on data from a representative survey of Spanish households conducted by the Spanish National Markets and Competition Commission (CNMC) at the end of 2018. The survey used information from 3,113 households that had contracted a fixed broadband connection. Interestingly for our purposes, this survey allows us to classify households according to their self-reported search and switching actions. Specifically, we consider four types of consumers: (1) completely *inactive* or *unengaged* consumers; (2) consumers who regularly call their operators seeking a better deal; (3) consumers who have switched to another operator at least once; and, finally, (4) "highly engaged consumers" who regularly interact with their operator and who have switched to a different operator at least once. In what follows, we consider *active* or *engaged* consumers as belonging to types (2), (3) and (4).

A particularly relevant characteristic of the Spanish market is that a large proportion of consumers contract a bundle of fixed and mobile telecommunication services, including broadband services. However, bundling makes it difficult for consumers to compare offers that include a range of services, creates problems of coordination and tends to restrict competition to operators that can offer similar packages of services (Greenstein & Prince, 2014; Díaz-Pinés & Vareda, 2016; García-Mariñoso & Suarez, 2019). One advantage of our dataset is that it allows us to both observe the combination of voice, broadband and television services contracted by households and identify the price paid for the bundle.

The main result of our analysis is that in the Spanish market, after controlling for the characteristics of the bundle of services contracted, active consumers paid 9.4% less than completely unengaged consumers for their respective services. Moreover, when we disaggregate the group of active consumers, we find that the highly engaged consumers paid 13.6% less than unengaged consumers for comparable services, that consumers who had switched operator at least once paid 8.4% less, and that consumers who called their operator to request a better deal paid 5.8% less. These results reflect that consumers who contacted their operators to request a better deal and/or who had switched operators paid lower prices. In addition, notice that with consumer switching costs, one can expect the discount offered by operators to retain a consumer to be smaller than the discount needed to attract a new customer.

Another contribution of our study is the finding that the discounts obtained by active consumers depend on the characteristics of the bundle of services they contract. Thus, active consumers pay around 6.4% less than unengaged consumers when the bundle of services does not include pay TV services, 11.9% less when the bundle contracted includes pay TV, and 14.2% less when the bundle also includes a football subscription. Similar qualitative results are found when we consider the number of mobile lines included in the bundle of services. In this case, we find that engaged consumers pay around 3.6% less than unengaged consumers for each additional mobile line they contract. All in all, these results indicate that consumer engagement is more relevant when additional services are included in the contracted bundle, with relatively higher discounts being obtained by high-spending consumers.

Our baseline model considers consumers' self-reported prices, which can be affected by cognitive biases (e.g. confirmation or anchoring biases). To account for this situation, we present a robustness check in which we use as outcome variable the prices really

paid by consumers. This price information has been directly obtained from the invoices of a large subsample of households. The use of this information allows us to control for any possible biases in the reporting of the prices. The results obtained confirm the conclusions of the baseline model.

Finally, we complement our study by identifying the household characteristics that affect the consumer's likelihood to be active in the market. We find that consumers over 65 years old are more likely to be unengaged. Moreover, we obtain some evidence that households with a very low, low, or medium socio-economic index are more likely to contact their operators to get better deals in comparison to the wealthiest. Finally, we also find evidence that the households with children are more likely to be highly engaged.

Our results have a number of important policy implications for the telecommunications market. Indeed, our analysis suggests that unengaged consumers fail to take full advantage of the benefits of competition. This may be due to their inactivity, lack of awareness or distrust on the market opportunities that might be available to them. This can be especially relevant for some groups of consumers, like the elderly, and suggests the need to design policies aimed at increasing the involvement of these groups.

The rest of the paper is organized as follows. The next section reviews the economic literature related to our study. Section 3 outlines the characteristics of the Spanish market that are of special relevance to our analysis. Section 4 describes the data set and the empirical model. Section 5 presents our main results and Section 6 the robustness check. Section 7 examines the factors influencing consumers' engagement and, finally, Section 8 concludes.

2. Literature review

There is an extensive empirical literature examining the drivers of consumers' switching decisions in telecommunications markets, which focuses on the service characteristics, the consumer characteristics and the presence of decision-making biases. However, the number of empirical papers examining the effects of consumer search and switching behavior on the prices of telecommunication services is much more limited. In what follows, we briefly review the streams of the literature that are connected to our paper.

The empirical literature has identified different drivers of consumer switching in telecommunication markets, such as: (i) *consumer satisfaction* with the services received (Gerpott et al., 2001; Kim et al., 2004; Gerpott & Meinert, 2018; García-Mariñoso & Suarez, 2019; Uner et al., 2020); (ii) *contractual characteristics*, like the length of the contract and the use of cancellation charges (Kim et al., 2004; Kim & Yoon, 2004; Gerpott et al., 2001) or the bundling of services (Burnett, 2014; Lee, 2017; Lunn & Lyons, 2018; García-Mariñoso & Suárez, 2019); and (iii) *consumer characteristics* like age or income (Ahn et al., 2006; Eshghi et al., 2007; Seo et al., 2008; Lunn, 2013; Capponi et al., 2021). Our paper is related to this last type of analysis, as in Section 7 we study how households' characteristics affect their engagement in the market.

Consumer switching behavior also appears to be related to "*decision-making biases*", including contextualization mistakes, difficulties in taking decisions, and consumer procrastination (Lunn, 2013). Lunn and Lyons (2018), using a sample of fixed-line broadband, mobile telephony and landline telephony customers from a 2015 survey conducted by ComReg, the Irish National Regulatory Authority, find that long-standing subscribers who have never changed operator are exceptionally resistant to switching. Moreover, bill shocks and high-expected gains are strongly associated with consumer intentions to switch. Harold et al. (2020), drawing on cross-sectional data from the European Commission's Consumer Market Monitoring Survey for the period 2010–2013, analyze consumer switching attitudes in 27 EU countries across 14 switching markets and find that limited comparability across sup-

pliers, consumer trust, and satisfaction with suppliers are key determinants of switching. Interestingly, among the factors considered, consumer complaints were found to have the greatest effect on consumer switching.

Our study is also related to the theoretical literature examining the use of BBPD strategies by telecommunication firms.² This literature has shown that price discrimination strategies that account for differences in the consumers' willingness to pay for a service are profitable in the case of the monopolies, as these are better able to extract consumer surplus. However, they can result in smaller profits in oligopolistic markets, where the "competition effect" may offset the "surplus extraction effect" of price discrimination (Thisse & Vives, 1988; Tirole, 1988; Esteves, 2009). In the case of BBPD, the results are more ambiguous (Shaffer & Zhang, 2000; Pazgal & Soberman, 2008; Colombo, 2018; Umezawa, 2022). For example, Colombo (2018) provides a model where price discrimination may yield either higher or lower profits than uniform pricing. However, when discriminating consumers according to both their purchase history and price sensitivity, BBPD is more profitable for firms than uniform pricing if consumers are sufficiently heterogeneous.

Several recent papers have studied the application of BBPD in the telecommunication markets. Esteves (2014) analyzes the "losing provider led" process, in which a consumer wishing to switch to another telecommunications operator has to contact her existing provider first. She develops a two-stage model in which consumer preferences are disclosed after the first period, and in the second period operators offer price discounts to those customers who signal their intention to switch to a competitor. The paper shows that BBPD benefits consumers and the overall surplus but reduces industry profits. Capponi et al. (2021) consider the "gaining provider led" process, in which operators are informed about a consumer's decision to switch after the contract has been signed. In this model, consumers are heterogeneous in their usage intensity, which is used by firms to predict the switching risk. Moreover, the fraction of consumers aware of a poaching offer is supposed to be smaller among high-spending customers than for low-spending customers. The paper shows that operators make retention offers to consumers whose type is neither too low nor too high. The authors then empirically validate the predictions of their model, considering the characteristics of a set of Italian pre-pay card users that received an anti-switching offer by a leading mobile telecommunications operator in the period 2012–2013.

These two studies are very useful for understanding how operators design their retention offers, but they assume a different portability regulation than the one adopted in Spain. Under Spanish legislation, when a consumer wishes to switch to a new operator the latter is responsible for initiating the portability process. In addition, the losing provider has the opportunity to make a retention offer. Such a difference suggests that in Spain an operator's offer to attract a new consumer is likely to be more aggressive, as it has to anticipate its rival's counter-offer to retain that consumer.³ In contrast, the prices charged to those consumers that show no interest in switching are likely to be higher in the Spanish model, as operators always have the opportunity to make them a retention offer if, eventually, they should request portability.

² This literature is connected to the recent research on list prices, in which firms quote a list price in their ads, but then some consumers might receive a discount when they visit the stores (Banks and Moorthy, 1999; Gill and Thanassoulis, 2016; Anderson et al. 2021).

³ According to Esteves (2014), "When retention strategies are allowed, forward looking firms anticipate the effect of first period market share on second period profits and price more aggressively in the first-period. Thus, first period equilibrium price under BBPD with retention strategies is below its non-discrimination counterpart. This contrasts with first period price above the non-discrimination level if BBPD is used and retention activity is forbidden".

3. Spain's telecommunications market

The Spanish telecommunications market was liberalized in 1998, and since 2012 operators have been commercializing their services in bundles that include fixed and mobile broadband. In 2018, the year we consider in our study, almost all fixed broadband lines were sold bundled with a fixed voice service, 83.4% were bundled with mobile communications (mobile voice and mobile broadband) and 51.4% were bundled with an IPTV service, which offered a variety of television contents which could include premium offers such as major sports events and first window cinema.⁴ Moreover, the fixed and mobile telephony services included in these bundles had a flat or semi-flat tariff so that consumer expenditure did not depend on the number of calls or the number of minutes demanded.

The Spanish operators offered these bundles either by using their own network infrastructure or by resorting to regulated wholesale offers, which in 2018 accounted for 27.8% of the 15.1 million fixed broadband lines subscribed. Since 2014, Spanish operators had intensified the rollout of fiber to the home (FTTH) networks and had come to rely less on wholesale offers. Competition between FTTH and coaxial cable (HFC) resulted in an increase in the broadband speeds subscribed by consumers (Calzada et al., 2018). In 2018, xDSL services were mostly supplied with speeds under 30 Mbps, whilst FTTH and HFC services stood well above this threshold. Thus, for example, 26.8% of FTTH lines exceeded 500 Mbps and 66.7% of HFC lines were between 100 Mbps and 500 Mbps.

In 2018, the three largest Spanish operators (Movistar, Vodafone, and Orange) marketed their offers nationally and supplied 87.3% of the fixed broadband lines and 78.4% of the mobile lines. The largest operator was Movistar, which supplied 39.7% of the fixed broadband lines. A further two smaller operators (MasMovil and Euskatel) supplied an additional 10.5%.

Given the prevalence of bundling in the Spanish market, when a consumer switched fixed broadband provider, this was usually accompanied by a change in their fixed voice and mobile services provider. In 2018, competition in the market was thriving and portability reached record figures: 2.3 million fixed lines (12 of every 100 lines) and 7.5 million mobile lines (14 of every 100 lines) were ported during the year (Fig. 1).

As discussed, the switching of fixed broadband provider would normally entail a *fixed number portability*, a process that according to the regulation could take at most six working days. The regulation also established that *mobile number portability* should take at most one day. In both cases, the customer had to contact the new operator, who in turn would inform the customer's previous provider about the change, thus triggering the portability process. Importantly, both the porter (gaining) and the ported (losing) operators learnt about a consumer's decision to switch operator before a new contract had been signed, which gave the ported operator a short window of time to make a retention offer. The consumer was not liable to any administrative costs when cancelling a fixed or mobile number portability process that had been initiated. According to the CNMC, in 2018, 6.6% of residential consumers with a mobile service cancelled a mobile portability request that they had initiated.⁵

Finally, it should be noted that in the period examined operators offered a wide array of fixed broadband contracts, which varied not only in the prices and the services included in the bundle but also with the distribution channel in which they were com-

⁴ These data are for the residential and business market. For more information, see the web site of the CNMC: <http://data.cnmc.es/datagraph/>.

⁵ For more information, see the web site of the CNMC: <http://data.cnmc.es/datagraph/>. No information is available for fixed broadband portability cancellations.

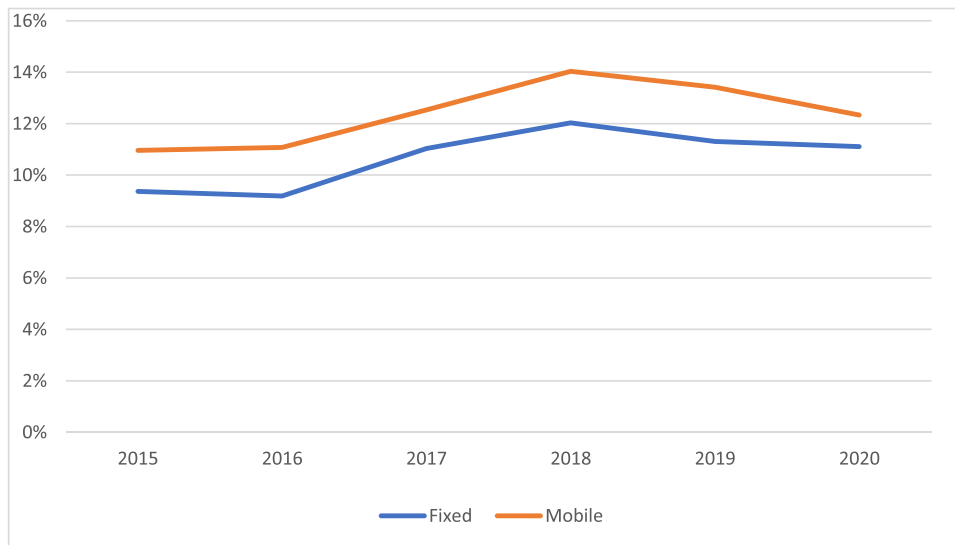


Fig. 1. Ported fixed and mobile lines over total active lines (%).

mercialized. Operators' offers were posted on their websites, where they also announced exclusive promotions to new consumers. At the same time, operators advised consumers on exclusive offers over the phone. For example, it was common for operators to offer retention offers to consumers who wanted to switch providers or who had initiated a portability process. These retention practices were at the origin of several conflicts between operators. In 2018, after the intervention of the national regulator, the operators agreed to adopt a code of good practices and to follow specific procedural rules for the commercialization of mobile phone services⁶. Another interesting aspect is that some of the new contracts included discounts or promotions that required consumers to accept termination penalties. Consumers who wanted to terminate their contract before a certain period (usually less than one year) had to pay a penalty to the operator.

4. Data and empirical analysis

4.1. Data

Our study draws on data from a survey of Spanish households conducted by the CNMC in 2018. The survey was representative of the Spanish population. The paper uses the information provided by the 3,113 households in the sample that had contracted a fixed broadband connection.

The survey asked households whether they had ever switched fixed broadband providers⁷ and whether they regularly contacted their operator to request a better deal.⁸ The data included information on the services contracted along with fixed broadband: the number of mobile lines included in the bundle, pay TV, and premium football. The households also reported the monthly cost of the bundle (inclusive of VAT), and whether the bundle was contracted from the incumbent operator (Movistar) or not. Finally, socio-demographic information and other characteristics of the household were also collected.

⁶ Information available at https://www.cnmc.es/sites/default/files/editor_contenidos/Telecomunicaciones/Portabilidad/20181220_Codigo%20Buenas%20Pr%C3%A1cticas%20Portabilidad%20M%C3%B3vil-2.pdf

⁷ The question was: "Have you ever switched your fixed broadband provider? Yes / No".

⁸ The question was: "Do you often contact your fixed broadband provider to request better conditions (such as, discounts, a promotion, an improvement of quality), for example when your minimum contract period expires? Yes / No"

The main objective of our analysis is to determine how consumers' engagement affected the price paid for the telecommunication services. To do so, we classify consumers in two groups, according to their behavior: (i) "unengaged consumers", those who did not contact their operators to obtain a better deal and who had never switched provider (28.1% of our sample); and (ii) "engaged consumers", who can be of three types: (1) "highly engaged consumers", those who regularly contacted their operator to get a better deal and who had switched provider at least once (27.2%); (2) consumers who had switched provider at least once, but who did not call their operator to request a better deal (29.3%); and (3) consumers who regularly contacted their operator, but who had never switched provider (15.3%).

Table 1 provides the summary statistics for the variables used in the study. The average price paid by the households for a fixed broadband bundle was 75 euros per month. On average, the contracts included 1.6 mobile lines, while 44.1% of the bundles included pay TV content and, of these, 19.7% offered football content, a service that has a marked impact on the bundle price. Additionally, 64.6% of the households contracted an FTTH or a cable fixed broadband offer. As discussed, these technologies were associated with a better performance of fixed broadband in terms of download and upload speeds and network reliability and, as such, proxy the quality of the fixed broadband service contracted by the household.

The dataset also includes information about various household characteristics: the age of the household member interviewed for the survey; whether there were children in the household and the number of computers in the household, which proxies the intensity of Internet use. Socio-economic status is captured by means of an ordinal variable that is constructed at the household level taking into consideration the number of individuals receiving an income, and the type of employment and educational attainment of the household members. We include this variable in the empirical models as a proxy for household income.⁹

4.2. Empirical analysis

Our empirical model examines the effect of consumer engagement on the prices consumers pay. We expect a greater interaction with operators to lead to a reduction in price, as consumers

⁹ For more information on this index see: <https://www.aimc.es/otros-estudios-trabajos/clasificacion-socioeconomica/>.

Table 1
Summary statistics.

Variable	N	Mean	Std. Dev.	Min	Max
Price (euros per month)	3113	75.09	34.77	21	300
Log Price	3113	4.2224	0.4373	3.0445	5.7038
Engaged categories:					
Highly engaged	3113	0.2724	0.4453	0	1
Has switched	3113	0.2933	0.4553	0	1
Deals with own provider	3113	0.1529	0.3600	0	1
Unengaged	3113	0.2814	0.4498	0	1
Incumbent	3113	0.3553	0.4787	0	1
No pay TV	3113	0.5593	0.4966	0	1
Pay TV categories:					
No football	3113	0.3540	0.4783	0	1
Football subscription	3113	0.0867	0.2815	0	1
# mobile lines in the bundle	3113	1.6482	1.0886	0	5
Fiber/cable connection	3113	0.6463	0.4782	0	1
# computers in household	3113	1.7353	1.0683	0	11
Age:					
34 or less	3133	0.0334	0.1797	0	1
35 to 49	3113	0.3126	0.4636	0	1
50 to 64	3113	0.4269	0.4947	0	1
≥ 65	3113	0.2271	0.4190	0	1
Socio-economic index:					
Very high	3113	0.1995	0.3997	0	1
High	3113	0.1523	0.3593	0	1
Medium	3113	0.2901	0.4539	0	1
Low	3113	0.1458	0.3530	0	1
Very low	3113	0.2123	0.4090	0	1
Children in household	3113	0.2255	0.4180	0	1

can request better deals or switch to a cheaper operator. This is consistent with operators setting prices taking into account consumer behavior, switching costs, and making better offers to new customers than to those who already have a contract with them.

We estimate semi-logarithmic OLS regression models, in which the dependent variable is the logarithm of the *Bundle Price_h* paid by household *h* and we consider three types of explanatory variable: (i) a qualitative variable summarizing household engagement; (ii) the bundle's characteristics, including its components and quality related parameters; and (iii) the household's characteristics. To control for regional differences the model includes fixed effects for the 17 Spanish regions, which are denoted as δ_r . Robust standard errors are employed. Thus, our models can be generally specified as follows:

$$\text{Log Bundle Price}_h = \beta_1 \text{Engagement}_h + \beta_2 \text{Bundle Characteristics}_h + \beta_3 \text{Household Characteristics}_h + \delta_r + \varepsilon_h \tag{1}$$

Under this specification we consider two types of models. First, our main models do not include the household characteristics (i.e., β_3 equates 0). These models allow us to examine the effect of consumer engagement on the price considering only the bundle characteristics and the regional effects which are the genuine controls to establish such effect (Models I-a to IV-a in Table 2). Second, notice that the previous models could suffer from an endogeneity problem if there were household characteristics that affected both the households' engagement and the price paid. To take this into account we re-estimate all the main models but including the household characteristics available in our data as controls (Models I-b to IV-b in Table 2).

The main objective of our analysis is to determine whether consumers that are pro-active pay less than unengaged consumers for their telecommunication services. To do so, we use the consumer engagement classification described in Section 4.1 as a qualitative variable. Our hypothesis is that the higher the level of consumer engagement, the lower is the price that consumers pay for their bundle of services.

Our second objective is to determine whether consumers' engagement generates a greater reduction of prices when consumers contract expensive offers that include sophisticated/high margin

services than when they contract simpler offers. We expect that engagement activities generate better results (greater discounts) when consumers contract bundles that include pay TV or several mobile lines. To test this assumption, we consider two additional models in which (1) we interact the dummy variable *Engaged* with the variables *Pay TV* (Models III-a and III-b in Table 2); and (2) we interact the variable *Engaged* with *Number of Mobile Lines* (Models IV-a and IV-b in Table 2). We expect operators to offer better contractual conditions to consumers that contact them or who threaten to leave if they are subscribed to sophisticated services. Note that simpler offers – typically a bundle of fixed broadband and voice – are less differentiated and more exposed to competition than bundles that include pay TV and/or several mobile lines. Simpler, less-differentiated bundles may be associated with smaller margins and operators might have fewer incentives to retain the consumers that contract these services.

5. Results

Table 2 shows the results of our analyses of the impact of consumer engagement on the prices households pay for telecommunication services.¹⁰ To facilitate the interpretation of these results, the table reports the exponential of the β coefficients. As most of the independent variables in the models are dummy variables, this transformation means the figures can be interpreted as the percentage change in the bundle price.¹¹

Model I-a shows the estimates when using the binary variable *Engaged* as the independent variable. This variable has a significant and decreasing effect on price of 9.4%, after controlling for the characteristics of the bundle of services. Model II-a repeats the analysis but now characterizes consumers by their level of engagement. Specifically, we find that the coefficients for the three

¹⁰ All columns report the maximum variance inflation factor (VIF) of the explanatory variables. Multicollinearity can exaggerate estimates of the variance parameter and distort its statistical significance. We conclude that this is not the case in all models as the VIF values reported are below 10, an accepted reference in the literature.

¹¹ Formally, we consider the transformation $100 \cdot (\exp(\beta) - 1)$. See Halvorsen & Palmquist (1980).

Table 2
OLS regression results for the log of bundle price.

Variables	Model I-a	Model I-b	Model II-a	Model II-b	Model III-a	Model III-b	Model IV-a	Model IV-b
Engaged (reference: unengaged)	0.9064*** (0.0127)	0.9094*** (0.0128)			0.9357*** (0.0179)	0.9370*** (0.0179)	0.9505* (0.0252)	0.9513* (0.0251)
Engaged (reference: unengaged)								
Highly engaged			0.8637*** (0.0158)	0.8674*** (0.0159)				
Has switched			0.9161*** (0.0149)	0.9180*** (0.0150)				
Deals with own provider			0.9417*** (0.0182)	0.9442*** (0.0182)				
Engaged * # mobile lines							0.9695** (0.0129)	0.9711** (0.0129)
Engaged * Pay TV								
No Football					0.9413** (0.0263)	0.9461** (0.0262)		
Football subscription					0.9172** (0.0401)	0.9164** (0.0397)		
Incumbent	1.2328*** (0.0173)	1.2233*** (0.0173)	1.2181*** (0.0173)	1.2095*** (0.0172)	1.2341*** (0.0174)	1.2245*** (0.0173)	1.2304*** (0.0173)	1.2211*** (0.0172)
Pay TV (reference: no pay TV)								
No football	1.2473*** (0.0174)	1.2516*** (0.0174)	1.2415*** (0.0173)	1.2456*** (0.0172)	1.3025*** (0.0295)	1.3022*** (0.0293)	1.2454*** (0.0174)	1.2497*** (0.0174)
Football subscription	1.4727*** (0.0350)	1.4655*** (0.0348)	1.4717*** (0.0347)	1.4647*** (0.0345)	1.5638*** (0.0513)	1.5570*** (0.0504)	1.4713*** (0.0349)	1.4643*** (0.0347)
# mobile lines in the bundle	1.1438*** (0.0076)	1.1438*** (0.0077)	1.1459*** (0.0076)	1.1455*** (0.0077)	1.1433*** (0.0076)	1.1433*** (0.0077)	1.1708*** (0.0131)	1.1693*** (0.0132)
Fiber/cable connection	1.0082 (0.0132)	1.0091 (0.0133)	1.0094 (0.0132)	1.0100 (0.0133)	1.0100 (0.0132)	1.0098 (0.0132)	1.0083 (0.0132)	1.0092 (0.0132)
# computers in household	1.0161** (0.0072)	1.0155** (0.0074)	1.0177** (0.0072)	1.0168** (0.0074)	1.0157** (0.0071)	1.0151** (0.0074)	1.016** (0.0071)	1.0155** (0.0073)
Age (reference: 34 or less)								
35 to 49		1.0558 (0.0433)		1.0563 (0.0432)		1.0552 (0.0433)		1.0544 (0.0431)
50 to 64		1.1200*** (0.0448)		1.1204*** (0.0447)		1.1187*** (0.0448)		1.1175*** (0.0447)
≥ 65		1.1420*** (0.0467)		1.1398*** (0.0466)		1.1413*** (0.0467)		1.1407*** (0.0466)
Socio-economic index (reference: Very High)								
High		0.9822 (0.0203)		0.9834 (0.0203)		0.9824 (0.0203)		0.9830 (0.0203)
Medium		1.0169 (0.0189)		1.0159 (0.0188)		1.0160 (0.0188)		1.0179 (0.0189)
Low		0.9881 (0.0214)		0.9885 (0.0213)		0.9872 (0.0214)		0.9890 (0.0214)
Very low		0.9645* (0.0195)		0.9630* (0.0195)		0.9641* (0.0195)		0.9657* (0.0195)
Children in household (reference: no children)		1.0241 (0.0195)		1.0268 (0.0195)		1.0235 (0.0194)		1.0248 (0.0195)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3113	3113	3113	3113	3113	3113	3113	3113
F test	86.89***	67.47***	80.84***	64.02***	84.3***	66.89***	86.72***	67.79***
Max VIF	1.71	8.04	1.74	8.04	4.19	8.05	6.67	8.05
R ²	0.3865	0.3934	0.3908	0.3975	0.3877	0.3945	0.3876	0.3944

Exponentials of coefficients are shown and in parentheses their robust standard errors

- * Significance at 10% level.
- ** Significance at 5% level.
- *** Significance at 1% level.

types of engaged consumer are all statistically significant and that in each case these consumers pay less than unengaged consumers. Moreover, the results present an interesting gradient: highly engaged consumers (those that have called their operators to obtain a better deal and that at some point have switched to another operator) paid 13.6% less for their telecommunication services than unengaged consumers; consumers who have switched suppliers paid 8.4% less; and consumers that have requested better deals to their own provider paid 5.8% less. These differences in consumer prices may reflect the expected costs consumers incur when they deal with the telecommunications operators. Indeed, when operators design their offers for existing and new consumers, we would expect them to take into consideration that consumer transaction costs are lower when negotiating with their own operators than when they have to investigate and call other operators, compare

the prices of various offers, and initiate a portability process. As a result, operators would be obliged to offer lower prices to new consumers to compensate for their higher transaction costs.

Models III-a and IV-a extend Model I-a by introducing interactions of the variable *Engaged* with the components of the bundle contracted by the household. Model III-a considers the interaction of *Engaged* with *Pay TV*, further differentiating between contracts that include a football subscription and those that do not. We find that, among consumers that do not contract pay TV services, engaged consumers paid 6.4% less than unengaged consumers. When the contract includes pay TV services, engaged consumers paid 11.9% less than unengaged consumers, obtaining an additional 5.5% reduction in price. When the TV subscription also includes access to premium football, they paid 14.2% less than unengaged consumers, obtaining an additional 7.8% reduction in price. These re-

Table 3
OLS regression results for the log of bundle price (bill harvesting subsample).

Variables	Model I-a	Model I-b	Model II-a	Model II-b	Model III-a	Model III-b	Model IV-a	Model IV-b
Engaged (reference: unengaged)	0.8886*** (0.0214)	0.8942*** (0.0218)			0.936** (0.0296)	0.9425* (0.0303)	0.9352 (0.0467)	0.9333 (0.0471)
Engaged (reference: unengaged)								
Highly engaged			0.8082*** (0.0261)	0.8153*** (0.0266)				
Has switched			0.9260*** (0.0267)	0.9304** (0.0269)				
Deals with own provider			0.9253** (0.0278)	0.9295** (0.0282)				
Engaged * # mobile lines							0.9716 (0.0243)	0.9762 (0.0249)
Engaged * Pay TV								
No Football					0.9051** (0.0432)	0.9047** (0.0432)		
Football subscription					0.8698** (0.0580)	0.868** (0.0578)		
Incumbent	1.1898*** (0.0307)	1.1869*** (0.0304)	1.1580*** (0.0307)	1.1566*** (0.0305)	1.1880*** (0.0305)	1.1851*** (0.0302)	1.1891*** (0.0307)	1.1865*** (0.0304)
Pay TV (reference: no pay TV)								
No football	1.2091*** (0.0302)	1.2093*** (0.0302)	1.2045*** (0.0298)	1.2044*** (0.0298)	1.2993*** (0.0504)	1.2998*** (0.0508)	1.2086*** (0.0302)	1.2087*** (0.0303)
Football subscription	1.6095*** (0.0616)	1.6057*** (0.0614)	1.6268*** (0.0617)	1.6227*** (0.0615)	1.7749*** (0.0853)	1.7731*** (0.0852)	1.6083*** (0.0618)	1.6048*** (0.0616)
# mobile lines in the bundle	1.1202*** (0.0140)	1.1200*** (0.0143)	1.1232*** (0.0140)	1.1229*** (0.0143)	1.1198*** (0.0139)	1.1197*** (0.0143)	1.145*** (0.0238)	1.1409*** (0.0243)
Fiber/cable connection	0.9878 (0.0222)	0.9846 (0.0224)	0.9876 (0.0222)	0.9841 (0.0223)	0.9897 (0.0223)	0.9866 (0.0224)	0.9875 (0.0223)	0.9844 (0.0224)
# computers in household	1.0253** (0.0128)	1.0239* (0.0133)	1.0285** (0.0127)	1.0271** (0.0131)	1.0248** (0.0128)	1.0235* (0.0133)	1.0252** (0.0127)	1.0241* (0.0133)
Socio-demographic variables	No	Yes	No	Yes	No	Yes	No	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1287	1287	1287	1287	1287	1287	1287	1287
F test	28.76***	22.70***	28.07***	22.35***	30.37***	24.27***	28.80***	22.74***
Max VIF ^a	1.66	12.31	1.91	12.34	4.21	12.31	8.10	12.32
R ²	0.3079	0.3165	0.3227	0.3304	0.3108	0.3194	0.3086	0.3170

Exponentials of coefficients are shown and in parentheses their robust standard errors

* Significance at 10% level.

** Significance at 5% level.

*** Significance at 1% level.

^a For Models I-b to IV-b the maximum VIF values were larger than 10, the usual maximum threshold accepted in the literature. In all the four models was the variable Age the cause of this. Hence, we re-fitted the four models excluding the variable Age. The results were very similar to the presented and this time the Max VIF was below 10 in the four models.

sults indicate that being engaged benefited more those consumers that contracted value added services, possibly because operators were willing to offer greater discounts for these bundles.

Model IV-a repeats the analysis, but now we interact the variable *Engaged* with the *Number of mobile lines*. We find that engaged consumers paid 13.5% more for each additional mobile line included in the bundle; however, unengaged consumers paid 17.1% more, that is, 3.6 percentage points more. Thus, the discount that engaged consumers obtained in their bill depended on the number of mobile lines they contracted. To sum up, the results of Models III-a and IV-a show that active consumers with a high expenditure obtained better offers from telecommunications operators.

In what follows, we review the results of the control variables. The variable *Incumbent* shows that the offers commercialized by Movistar were around 23% more expensive than those offered by other operators. Moreover, the offers that included pay TV services were around 25% more expensive than those without this service, and those that included football were 47% more expensive. The number of mobile lines contracted also has a relevant impact on expenditure. Specifically, we find that each additional mobile line increased consumer expenditure by 14%. The effect of a fiber or cable connection on the bundle price was not statistically significant. This result is unsurprising given that in 2018 the fiber offers and the xDSL offers had the same price. Eventually, the variable *Number of computers* in the household proxies the quality of the

broadband service subscribed by the household. We obtain that for each additional computer households' expenditure increased by 1.6%. This result would appear to reflect the additional bandwidth required in households with a large number of computers connected to the Internet.

Finally, Models I-b, II-b, III-b and IV-b in Table 2 include as additional control variables the available household characteristics. Our estimates for these models are very similar to those of the models without these controls. This reinforces our findings and suggests that these household characteristics are not confounders for the effects of engagement identified in the main models, implying that, to this extent, these models are not affected by endogeneity.

6. Robustness check

The main outcome variable of this study is the bundle price, which was self-reported by the households interviewed in the survey. This information may be subject to interviewee cognitive biases that could affect our estimates and question our main finding that active consumers enjoy better prices than the unengaged ones. For example, active consumers could be systematically over-optimistic about the results of their actions and could have reported lower prices than those that they really paid.

In order to deal with this potential problem, we re-estimate all the models examined in Section 5 considering as outcome variable

Table 4
Binary logit and multinomial logit models for engaged (reference: unengaged).

Variables	Binary logit (OR)	Multinomial logit (RRR)		
		Highly engaged	Has switched	Deals with own provider
Age (reference: 34 or less)				
35 to 49	1.0314 (0.2598)	1.0256 (0.3022)	1.0008 (0.2882)	1.1080 (0.3946)
50 to 64	0.8789 (0.2151)	0.8961 (0.2560)	0.7973 (0.2247)	1.0205 (0.3520)
≥ 65	0.4760*** (0.1190)	0.3471*** (0.1038)	0.5339** (0.1543)	0.5936 (0.2095)
Socio-economic index (reference: Very High)				
High	0.8894 (0.1245)	1.0060 (0.1681)	0.7631* (0.1242)	0.9985 (0.2112)
Medium	0.9988 (0.1212)	1.0153 (0.1492)	0.83510 (0.1167)	1.4319** (0.2540)
Low	1.1717 (0.1728)	1.2950 (0.2263)	0.96740 (0.1635)	1.4910* (0.3163)
Very low	0.8735 (0.1125)	0.8842 (0.1409)	0.6622*** (0.1000)	1.4594** (0.2721)
Children in household (reference: no children)	1.2025 (0.1516)	1.3790** (0.1994)	1.1193 (0.1626)	1.0485 (0.1839)
Regional dummies	Yes		Yes	
N	3113		3113	
Wald test	123.99***		206.18***	
Pseudo R ²	0.0354		0.0268	

Odds ratios (OR) and relative-risk ratios (RRR) are shown and in parentheses their robust standard errors

- * Significance at 10% level
- ** Significance at 5% level
- *** Significance at 1% level.

the prices obtained from the households' invoices for the month of December 2018. These are the real prices paid by consumers and cannot be affected by misreporting or cognitive biases. Unfortunately, this information is only available for 1,287 of the interviewed households, i.e., 41.3% of the original sample.

Table 5 in the Appendix presents the summary statistics of the subsample of households considered for this analysis. Quite importantly, the descriptive statistics of all variables are quite alike to those obtained from the full sample, which implies that the subsample is balanced both in terms of the explained and explanatory variables. For example, the average price of broadband offers in the bill harvesting exercise is 77.97 euros per month, quite similar to the average price of 75.09 in Table 1. Moreover, the percentage of unengaged households in both datasets are also quite alike, 28.05% in the bill harvesting sample and 28.14% in the original sample.

Table 3 reports the results of the robustness check estimations for the bill harvesting subsample. As one can observe, the results of this analysis are in line with those presented in Section 5, which confirms the validity of our findings. The only exception is the effect of the interaction between the number of mobiles lines and engagement, which are no longer statistically significant (Models IV-a and IV-b).

7. Determinants of the consumers' engagement

This section complements our main analysis by studying the factors determining consumers' engagement in the telecommunications market. With this objective, we adopt two strategies¹². First, we fit a logit model in which the dependent variable is

¹² There is an extensive literature analyzing consumer inertia in various markets, including electricity (Wilson & Waddams-Price 2010; Giulietti et al., 2005; Hortacsu et al., 2017; Ndebele et al. 2019) and mobile services (Goettler & Clay, 2011; Miravete and Palacios-Huerta, 2013; Grubb & Osborne, 2015; Uner et al., 2020). These papers report that costly information acquisition and market complexity generate switching costs that make it difficult for consumers to compare offers and so change to other firms. Customer inertia may emerge because switching operators is a lengthy, convoluted task, or because tariffs are complex and making comparisons is far from straightforward.

the binary variable *Engaged* and where we consider as explanatory variables the available households' characteristics (age, socio-economic index, and the presence of children in the household). Second, we estimate a multinomial logit model in which the dependent variable is the categorical version of the variable *Engaged* with the four categories described in Section 4.1 (unengaged, consumers that have switched to another operator at least once, consumers who regularly contacted their operator, and highly engaged consumers that did both). In this case, we use unengaged consumers as the reference category and the same households' characteristics as explanatory variables.

The results of this analysis are shown in shown in Table 4. In short, we obtain that the oldest (65 years old or over) were more likely to be unengaged.¹³ The impact of the socio-economic index was mixed. This variable is not statistically significant in the binary logit model. However, in the case of the multinomial model, we observe that relative to the wealthiest, the households with the lowest socio-economic index were less prone to switch provider. Moreover, we find that households with very low, low and medium socio-economic indexes were more likely to contact their operator to obtain better deals in comparison to the wealthiest.¹⁴ Finally, there is some evidence that households with children were more likely to be highly engaged.

8. Conclusions

This paper has shown that the prices charged by telecommunications operators depend on consumer search, negotiation, and switching habits. Drawing on a representative sample of Spanish households, we have found that unengaged consumers pay more for their services than engaged consumers do, and that this excess price increases when the bundles they contract include premium services such as pay TV. These results imply that consumer engagement generates greater price discounts for pro-active consumers contracting high-margin services.

¹³ Similarly to what Grzybowski (2008) and Burnett (2014) find.

¹⁴ Waddams Price & Zhu (2016) identify a negative relationship between income and switching.

These results have important policy implications, as they show that a sizeable fraction of consumers (about 30% in our sample) could have benefited from seeking a better deal from their operators or from switching to another operator, but for a variety of reasons these consumers opted not to take an active role in the market.¹⁵ Indeed, we would expect that in competitive markets operators would offer lower prices to consumers that look for discounts, compare offers, and that are willing to switch operators to obtain a better service.

The paper has also examined some of the factors that may explain differences in engagement across households. It shows that the elderly are the more likely to be unengaged. This suggests that this group of the population may be less aware or may face some difficulties in understanding market opportunities and in taking actions to benefit from those.

Over the past two decades, regulators and public authorities have developed various instruments to increase price comparability of operators and their respective services, with somewhat disappointing results. The evidence is that the creation of switching websites/apps, and their extensive publicity, may not be effective at increasing switching rates, even during periods of rapidly increasing prices (Brennan, 2007; Defeuille, 2009; Giulietti et al., 2014; Hortaçsu et al., 2017; Genakos et al., 2018).¹⁶ Our results provide new evidence of the relevance of consumer behavior for competition in the telecommunications market and point to the need to promote measures that can foster consumer engagement, especially dedicated to the consumer groups that are less inclined to use them. As García-Mariñoso and Suarez (2019) expound, for years, regulatory agencies have endeavored to make switching sim-

pler and cheap; however, to ensure that policies aimed at increasing consumer empowerment are effective, agencies need first to recognize that consumers are heterogeneous and that targeted actions may well be necessary. It remains to be theoretically and empirically examined whether policies directed to entice consumers' participation, for example by the elderly, may modify the operators pricing strategy and increase the prices paid by some groups of active consumers. However, we ponder that in competitive markets like the Spanish one operators will have little capacity to compensate the reduction of revenues from unengaged consumers with an increase of prices.

Finally, we comment on a number of limitations of our study and avenues for future research. First, our results could be affected by an endogeneity problem if there are unobserved household characteristics that could simultaneously affect both consumers' engagement and prices. However, we have shown that our results are robust when we include in the model the household characteristics that are available in our dataset and that are the ones usually considered in the literature. A second, but similar issue is that although our analysis has controlled for the most important characteristics of the fixed broadband bundle offers, it could be improved with a richer characterization of those. Future studies on the impact of consumers' engagement could focus on specific groups of offers, for example by considering one particular brand and/or a bundle of services, so that differences in the prices paid by households could be unambiguously associated with differences on their engagement activity. Finally, our evidence comes from the Spanish telecommunications market. Future research could analyze how differences in national regulations and commercial practices affect the consumer engagement and the operators' ability to price discriminate.

Data availability

The authors do not have permission to share data.

Appendix

Appendix

Table 5. Summary statistics (bill harvesting subsample).

Variable	N	Mean	Std. Dev.	Min	Max
Price (euros per month)	1287	77.97	36.89	21.09	264.97
Log Price	1287	4.2553	0.4484	3.0488	5.5796
Engaged categories:					
Highly engaged	1287	0.2929	0.4553	0	1
Has switched	1287	0.2603	0.4390	0	1
Deals with own provider	1287	0.1663	0.3725	0	1
Unengaged	1287	0.2805	0.4494	0	1
Incumbent	1287	0.3699	0.4830	0	1
No pay TV	1287	0.5556	0.4971	0	1
Pay TV categories:					
No football	1287	0.3590	0.4799	0	1
Football subscription	1287	0.0855	0.2797	0	1
# mobile lines in the bundle	1287	1.8430	1.0194	0	5
Fiber/cable connection	1287	0.6845	0.4649	0	1
# computers in household	1287	1.8182	1.0565	0	7
Age					
34 or less	1287	0.0218	0.1459	0	1
35 to 49	1287	0.2580	0.4377	0	1
50 to 64	1287	0.4864	0.5000	0	1
≥ 65	1287	0.2339	0.4235	0	1
Socio-economic index					
Very high	1287	0.2152	0.4111	0	1
High	1287	0.1608	0.3675	0	1
Medium	1287	0.2813	0.4498	0	1
Low	1287	0.1414	0.3486	0	1
Very low	1287	0.2012	0.4011	0	1
Children in household	1287	0.2106	0.4079	0	1

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