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Abstract

In this paper we examine the empirical relationship between price discrimination and competition in television advertising. While most empirical papers on the topic document a positive relationship, we find that price discrimination is negatively related to competition (as measured by the number of competing firms), a result that is consistent with conventional wisdom. Our results also show that only incumbent stations (unlike entrants) respond by engaging less in price discrimination when faced with a more competitive environment. Our evidence suggests that incumbents may use price discrimination as a strategic tool to accommodate entry – a strategy that has received scant attention in the existing entry literature.

1 Introduction

Price discrimination occurs whenever there is variation in prices across market segments that cannot be fully explained by differences in marginal costs (Verboven, 2008). Textbook economic theory postulates three necessary conditions for price discrimination to occur: firms must be able to prevent arbitrage, must be able to separate consumers into different groups, and must have market power. Amongst these three conditions, market power has usually received much of the attention, manifested in the emergence of a vast literature studying competition as a source of price discrimination (see Stole, 2007; and Verboven, 2008, for surveys).[1]

Since market power is necessary for price discrimination, conventional wisdom dictates that a reduction in market power (brought about by an increase in competition) would entail less price discrimination. However, that *some* market power is a necessary condition merely implies that having *no* market power makes price discrimination impossible – indeed, with no market power, prices in each market segment would equal marginal costs, and all differences in prices would be fully explained by variation in those marginal costs. On the other hand, it is easy to build examples in which competition (due, e.g., to the entry of new firms) reduces market power in every segment, but does more so in some segment, implying increased price dispersion in spite of reduced market power (see, e.g., Chandra and Lederman, 2015).

It comes as no surprise then that "[t]he extent of price discrimination has often been found to increase as competition intensifies, in contrast to conventional wisdom but consistent with new theoretical insights" (Verboven, 2008: 623). It is now well known from the works of, e.g., Borenstein (1985), Holmes (1989), and Stole (1995), that price discrimination need not be smaller or less prevalent in more competitive markets. As Holmes (1989) shows, prices in each market segment

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[1]For a recent study of price discrimination that focuses on arbitrage possibilities, see Boik (2016).

depend on the industry-demand elasticity (which measures how likely consumers are to stop buying when price goes up) and the cross-price elasticity (which measures how likely they are to go to another firm). For instance, brand loyalty among high-willingness-to-pay customers would work in favor of increased price dispersion, and hence more price discrimination (Rochet and Stole, 2002).

Competition may also affect a firm's decision whether to discriminate at all – i.e., the extensive margin. For instance, if price discrimination entails fixed costs, increased competition would reduce the profitability of discrimination if each demand segment becomes too small with respect to those fixed costs (Borzekowski, Thomadsen, and Taragin, 2009). Competition can also increase the prevalence of price discrimination, for example, if it leads firms with small market shares to poach rivals' customers (due to switching costs, as in Taylor, 2003; or to a revealed preference for rivals' products, as in Villas-Boas, 1999); or if firms differ in their attractiveness to consumers (Dogan, Haruvy, and Rao, 2010).

The empirical literature reports instances of both positive and negative effects of competition on the prevalence and intensity of price discrimination. On the one hand, evidence of a positive effect of competition on the intensity of price discrimination appears in Borenstein (1991) in the retail gasoline market; Borenstein and Rose (1994) and Stavins (2001) in the US airline industry; Verboven (1999) in the automobile industry; Nevo and Wolfram (2002) in ready-to-eat breakfast cereals; and Seim and Viard (2011) in cellular services. On the other hand, some studies find a negative effect of competition on the intensive margin of price discrimination; for instance, Busse and Rysman (2005) in Yellow Pages ads; Gerardi and Shapiro (2009) in airlines; Becerra, Santalo, and Silva (2011) in hotels; and Lin and Wang (2015) in parking lots. Notice that these are all industries in which price discrimination is widespread. The issue of the propensity to price-discriminate (the extensive margin) is addressed by Borzekowski, Thomadsen, and Taragin (2009) for mailing lists, and Asplund, Eriksson, and Strand (2008) for newspapers. Both papers find a positive effect of

competition on the use of price discrimination.

The recent literature, both theoretical and empirical, strongly suggests an ambiguous link between competition and price discrimination, which invites an empirical approach to the question. In this paper we thus examine the empirical relationship between the propensity to price-discriminate and competition, focusing on television advertising, for which we are not aware of any existing evidence. We use a data set composed of three annual censuses of Spanish local television stations published in the years 1996, 1999, and 2002. This collection of censuses provides information on the number of local TV stations located in every town in Spain in each of the years 1995, 1998, and 2001, as well as station-specific data for a sample of all stations. The station-specific data include information on whether the station broadcasts its content, whether it sells advertising, and whether it price-discriminates. The Spanish local TV industry is well suited for the empirical exercise at hand, since local markets vary quite a lot in the number of stations. In addition, the 'product' we focus on, a 20-second advertising spot in prime time, is easily comparable across stations and markets.

We find that price discrimination is negatively related to the degree of product-market competition (as measured by the number of competing firms), a result that has generally not been found in empirical papers on the topic, especially those looking at the extensive margin of price discrimination. According to our results, an additional competitor is associated with a reduction of almost 2 percentage points in the propensity to price-discriminate (a substantial effect when compared to a sample mean of 9 percent). This result is robust to the inclusion of various fixed effects and regional time trends, and to sample definition.

The inclusion of fixed effects deals with the most common sources of endogeneity. To further address endogeneity concerns, we exploit regulation-induced shocks to entry barriers and differences in regulation enforcement across regions to obtain a source of exogenous variation in the number

of rival firms in the product market. We pursue two different identification strategies to pin down the causal effect of interest, both making use of political variables as instruments (Bertrand and Kramarz, 2002). Specifically, we instrument our competition variable and a measure of entry barriers with the local share of votes of the more pro-entry political parties. Our finding of a negative effect of competition on price discrimination is robust to these alternative estimation strategies.

Consistent with other papers reporting a negative effect of competition on price discrimination, we find evidence that average prices decrease with competition. Finally, we show somewhat different pricing behavior among incumbents and entrants: only incumbent stations respond by engaging less in price discrimination when faced with a more competitive environment. We also suggest that the evidence is consistent with price discrimination being used as a strategic variable to accommodate entry – a variable that has received scant attention in the existing literature.

The remainder of the paper is organized as follows. Section 2 provides some background on the Spanish local TV industry between 1995 and 2002, and presents our data and methodology. In Section 3 we show and discuss our findings. Finally, Section 4 discusses the implications of our findings and concludes.

2   The Spanish Local Television Industry

2.1   Institutional details

The history of local television in Spain in the period considered in this paper can be divided in three phases: (i) no regulation (1980-94), (ii) regulation by law (1994-95), and (iii) de facto deregulation (1996-2002) (Badillo, 2005). Until the mid-1980s, Spain had just two TV stations, TVE and TVE2. The former was the main station and the latter served as a window to minority

content and local news broadcast from small satellite stations that had little independence in their programming decisions. The new democratic regime in Spain consolidated during the mid-1980s and, as a consequence, the central government granted its regional counterparts the right to develop regional stations. Still, the law did not recognize local TV stations as legal entities – which did not prevent a number of local stations from emerging in the late 1980s as a result of the joint efforts of local civil associations.

The growth in the number and importance of local stations during those initial years exacerbated the need for a legal framework that would regulate their activities. As a result of different lobbying pressures, the government of the (left-winged) Partido Socialista Obrero Español (PSOE) approved the law of local TV stations in December 1995 (Law 41/1995, BOE 309, 27-12-1995), to be implemented in 1996 – effectively ending the no-regulation period. This law aimed at regulating the composition, commercial activities, ownership and competitive structure of the Spanish local TV station sector. In particular, the 1995 law limited the number of stations to two per city (regardless of population), banned TV networks, and restricted local TV stations' ownership and control to local governments and nonprofit organizations. Within the limits of the law, spectrum would be assigned just at the request of regional authorities ("comunidades autónomas"). Given the nature of the 1995 law and the discussions surrounding its passing, one can safely assume the new regulation was unrelated to pricing decisions – indeed, neither the law nor any of the proposals that circulated contained any disposition concerning price discrimination.

The PSOE model for the local television industry would be progressively dismantled in the following years, as the right-winged Partido Popular (PP) rose to power. In March of 1996, the PSOE unexpectedly lost the national election to the PP, which had a very different perspective on how the local TV market should be regulated, if at all – a perspective shared by the Coalición Canaria (CC), a smaller, center-right party. Shortly after winning the election, the PP (which had

no majority in Congress) unsuccessfully tried to pass a new law that would lift the restrictions on number of stations and private ownership and management introduced by the 1995 law. Rather than insisting on a new law, the PP government took the alternative route of not implementing the PSOE law – what Badillo (2005) has termed an "invisible deregulation." Meanwhile, several regional governments decided to pass complementary regulations reflecting their different views on how the industry should be regulated – but without much success.

We see evidence of a lack of enforcement of the PSOE law in the relatively low levels of sanctioning activity by the PP administration. According to data from the Asociación de Investigación de Medios de Comunicación (AIMC hereafter) – which most likely underestimates true entry because AIMC only records the date of entry of those stations that respond to its census – 508 stations were created between 1995 and 2002, all of which were, *stricto sensu*, illegal. The level of sanctioning by the authorities in that period did not match this level of entry: only 115 new files were opened between 1997 and 2002 (with a significant decrease toward the end of the period; see Badillo, 2003, for details). Badillo (2003, 2005a,b, 2011) and Bustamante (2002) provide abundant anecdotal evidence on this differential enforcement of the PSOE law.[2]

The 2000 election speeded up the (*de facto*) deregulation of local TV stations, because the PP gained full control of Congress and decided to push forward the (*de jure*) deregulation that the previous legislature had stopped. The PP took to Congress a revision of the law approved in 1995, which allowed the number of stations to be proportional to the number of inhabitants per city, no longer required local stations to be government owned or managed, allowed stations to be for-profit organizations, and lifted the ban on network formation. The new law was only passed in December

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[2]Coming by more systematic evidence is difficult because information on files opened and sanctions is only available from 1997, and even for this period, public records do not contain information on sanctions at the station or region level.

of 2002 (Law 53/2002, BOE 313, 12-31-2002), but its main dispositions had been progressively implemented (and affected stations' entry decisions) since the PP took office. We observe further evidence of this *de facto* deregulation in the emergence of vertical networks such as Localia and Vocento already in 2001 and 2002, even though the 1995 law clearly prevented stations from being part of any network (horizontal or vertical). The complete undoing of the PSOE model of Law 41/1995 was achieved in 2004 with the digitization plan for local television approved by the PP government.

2.2 Data and Methodology

The main data set used in this paper is composed by the Spanish censuses of local TV stations collected in 1995, 1998, and 2001 by the Asociación de Investigación de Medios de Comunicación (AIMC) and published in 1996, 1999, and 2002. These censuses collected information on the names and number of local TV stations per city and province for the years 1995, 1998, and 2001.[3] According to the data, 881 stations were operating in 1995, 740 stations in 1998, and 898 in 2001. To create these censuses, the AIMC sent questionnaires to each of the existing stations in each year and published the responses.[4] 183 stations responded in 1995, whereas 457 and 645 responded in 1998 and 2001.[5] In the questionnaire, station managers answered questions regarding the station operations, coverage area, weekly and daily schedules, association memberships, advertising,

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[3]AIMC data do not include stations with sporadic and random emission of television content but rather established entities that transmit on a regular basis.

[4]The questionnaires were sent by mail to every station. After some time, non-responding stations were contacted by telephone.

[5]The low response rate in 1995 raises the concern of potential nonrandom sample selection. Although not shown here, we have regressed a dummy variable that takes a value of 1 if a station answers the questionnaire on a set of city characteristics (including electoral results), and found no statistically significant relationship between these variables – suggesting that sample selection is unlikely to be affecting our results. These results are available upon request.

subscription fees, and broadcasting.[6]

The AIMC questionnaire also asked managers about the price of a 20-second advertising spot in prime time (*Advertising prices*).[7] For the purposes of this paper, we use the fact that stations sometimes report a range of prices, with price depending on certain characteristics of the customer (such as whether it is a private or government organization) or on quantity (e.g., on the number of advertising spots bought). Price discounts reported in the questionnaire range between 25 and 50 percent in the advertising market, and between 10 and 25 percent in the content market. Very few stations price-discriminate on the content side of the market (3 stations, 6 observations); some in low-competition markets, some in high-competition markets. With so few observations, it is hard to know whether this is systematic or mere coincidence.[8] We thus focus in this study on price discrimination in advertising space, and use as the main dependent variable in this study a dummy variable (*Price discrimination*) that takes value 1 if a station sells advertising and price-discriminates, and 0 if the station sells advertising and reports to set a uniform price.

With this definition of *Price discrimination*, we do not distinguish between second- and third-degree price discrimination in our empirical exercises. The wording of the AIMC questionnaire, asking for "the price" (in singular) of a 20-second ad, could induce measurement error in our dependent variable if some stations offering multiple prices simply reported an average price, a list price or the most commonly charged price (causing us to classify the observation alongside

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[6] The original questionnaire can be found in the Appendix.

[7] Advertising in local television has been growing markedly from less than 5 million euros in 1995 to almost 40 million in 2001, according to Infoadex, the largest database on advertising in Spain (http://www.infoadex.es/estudios.html). At the beginning of our sample period, advertisers where mostly local, but the industry was soon able to attract regional advertisers and, more recently, large national and international advertisers (like Procter & Gamble and Unilever).

[8] Additionally, since some observations correspond to the same stations in different years, using them would imply inflated significance.

non-discriminators when we should not). As long as this choice is not made strategically (say, to obfuscate prices – see Ellison and Ellison, 2009), this possibility implies that our results are best interpreted as lower bounds on the true effect of competition on price discrimination.

As in Busse and Rysman (2005) and Lin and Wang (2015), the industry we study is characterized by the fact that differences in costs are negligible, and not affected by the extent of competition. Therefore, differences in prices can be attributed to price discrimination. In some specifications we use *Advertising prices* as the dependent variable. If a station reports a range of prices, we use the average of the highest and lowest prices reported.

To estimate the impact of product-market competition on the propensity to price-discriminate in the Spanish local TV industry, we begin by running traditional ordinary least squares (OLS) regressions of the propensity to price-discriminate (*Price discrimination*) on the number of stations located in a station's coverage area (*No. stations*), as reported in the AIMC censuses. We make full use of the panel structure of our data to deal with several sources of unobserved heterogeneity by including time, region, and station fixed effects, as discussed in Section 3.1.

Despite our efforts to address endogeneity through our use of the panel dimension of the dataset, these results are best interpreted as conditional correlations. A traditional concern in this kind of study is that firms in more profitable markets could be more likely to price discriminate, and more profitable markets may induce more firm entry – which would bias our estimates. While this is not the case here, since we find that stations in less competitive markets are also more likely to price discriminate, some concerns still remain. Our use of the number of stations located in a station's coverage area as our competition measure might induce some measurement error in our main explanatory variable, because this measure misses stations that broadcast to the coverage area but are not located in the area. Moreover, specific, unobservable, time-varying shocks to the local television industry might affect both price discrimination and the number of firms. For example,

if markets with more variation in their preference for local content also allow for more market segmentation, we are likely to observe stations in markets with more competition choosing very different levels of price discrimination, and therefore find no correlation between the propensity to discriminate and competition across markets, because of the underlying variation in the demand for local content.

To address these concerns, we exploit the institutional environment described in Section 2.1 to pursue two different identification strategies to pin down the causal effect of interest. In both, we run IV regressions using political variables as instruments (Bertrand and Kramarz, 2002). Given that enforcement of the PSOE 1995 law depended strongly on the political party of the regional authorities supposed to implement it, it seems likely that enforcement was lighter where the PP and the CC captured a large share of votes. Therefore, we first use the share of votes of the PP and the CC (*PP+CC share of votes*) at the regional level in the previous national election to instrument *No. stations* in each period.[9] The source of the electoral data is the data set "Consulta de Resultados Electorales" of the Subsecretaria de la Direccion General de Politica Interior at Ministerio del Interior in the Spanish Government's website.[10] We include the electoral outcomes by region ("comunidad autónoma") from the June 1993, March 1996, and March 2000 Spanish national elections.

For our second IV strategy, we exploit the fact that the 1995 PSOE law raised entry barriers in the local TV industry by limiting the number of stations to two per city. The stringency of this restriction, in principle, depended on whether a given city had more than two stations in 1995

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[9]To the extent that electoral outcomes measure people's preferences, this could have a direct impact on firm's pricing strategies. To minimize this concern, we use the national elections instead of local elections because people are more likely to vote according to their political values, and independently from the regulation of the local TV industry itself, in the former (see Schivardi and Viviano, 2011).

[10]http://www.infoelectoral.mir.es/min/.

prior to the law. We implement a differences-in-differences approach, and compare the change in price discrimination in stations located in cities with more than two stations prior to the law to the change in price discrimination in stations located elsewhere. We separate these cities by means of a dummy variable, *Over 2?*, that takes a value of 1 if the city had more than two stations in 1995. We also build a dummy *Post law?* that takes a value of 1 for 1998 and 2001 observations and 0 for 1995 observations. Since the number of firms in 1995 could be endogenous, we use the share of votes of the PP and the CC at the regional level in the June 1993 national election (*PP+CC 1993 share*), i.e. more than two years before the law was passed, as an instrument and interact it with the post-law dummy to implement our strategy.

Table 1 provides summary statistics of the variables used in our empirical analysis. Information in this table shows that 81 percent of the stations sell advertising space, but only 9 percent practice some form of price discrimination. Although these numbers may seem low, they are not surprising as local TV stations face the strongest competition of all television layers as they compete for advertisers with local outlets such as radio stations, newspapers and magazines. The average station faces 5.6 rivals in its coverage area and charges 11,687 pesetas (about 70 euros) for a 20-second advertising spot in prime time. Additionally, 80 percent of the stations responding to the questionnaire are privately owned, roughly 60 percent of them belong to a network, and 80 percent broadcast their content.

[TABLE 1 ABOUT HERE]

The last two variables in Table 1 are measured at the region and city levels, respectively. The PP and Coalición Canaria (CC), the more pro-entry parties, received on average around 42 percent of votes in national elections, but there is significant variation across regions and elections. The table also shows that 17 percent of cities had more than two stations in 1995, which would soon put some of those stations in violation of the PSOE law of December 1995.

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The rightmost columns of Table 1 break the sample by year, to preview changes over time in our variables of interest. For instance, the average number of stations in a station's coverage area first decreased and the increased from census to census, beginning with 5.5 in 1996, down to 4.7 in 1999, and reaching 6.2 in 2002. At the same time, the use of price discrimination declined along the period from 12% in 1996 to 7% in 2002. Last, the percentage of votes of the PP and the CC increased steadily, as discussed in Section 2.1.

3   Results

In this section we present and discuss the findings of our empirical exploration. Our main interest is on the effect of competition on price discrimination, but we also examine the effect of competition on price levels and whether entrants and incumbents differ in their pricing responses to competition.

It is useful to begin our investigation by exploring the variation in our data. To inform about the distribution of competition changes and grasp what changes are driving the effect on price discrimination, Table 2 tabulates changes in the number of stations and price discrimination decisions by station and by year in our sample. The top panel in Table 2 groups stations by whether they price discriminated (PD in the table and hereafter) in both 1996 and 1999, only 1996 or only 1999, or none of those years against changes in the number of competing stations. Note that those stations that always PD were more likely to experience increases in competition than decreases in competition, those stations that never PD were more likely to experience decreases in competition, those that PD in 1999 only were more likely to experience a decrease in competition, and those that only PD in 1996 were also more likely to experience a decrease in competition. Overall, a third of the stations that we observe both in 1996 and 1999 (79 in total) did not experience a change in the number of competing stations, slightly less than a third experienced an increase in the number of competing stations, and slightly more than a third experienced a decrease in the

number of competing stations.

[TABLE 2 ABOUT HERE]

The bottom panel in Table 2 groups stations by whether they PD and the change in the number of competing stations between 1999 and 2002. Out of a total of 206 stations, 172 (roughly 83%) stations that never PD were also more likely to experience large increases in the number of competing stations. Those stations that PD in 1999 and stopped in 2002 were also more likely to experience an increase in competition. Those stations that always PD, or did not PD in 1999 and PD in 2002, were equally likely to experience an increase or a decrease in the number of competing stations. Therefore, it overall looks like the increase in competition that occurred as a result of the invisible deregulation in the Spanish local TV industry was associated with a decrease in the unconditional propensity to price discriminate. While this preliminary evidence is interesting, it is important to further control for differences in market and station characteristics, so we now turn to these matters.

3.1   Competition and Price Discrimination

The empirical analysis in this paper aims to uncover the relationship between product-market competition and price discrimination in the Spanish local TV industry. We start our empirical investigation by producing traditional ordinary least squares (OLS) estimates of this relationship in Table 3. Column (1) of this table contains a simple regression of price discrimination on our competition measure (*No. stations*), and shows a small but statistically significant negative effect of competition on the propensity to price discriminate.[11] This result is robust to the inclusion of

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[11] As discussed in Section 2, the 1995 PSOE law gave regional authorities leeway in granting TV licenses. Since regions differed in their views about market structure and entry, errors terms are likely to be correlated within a given region. Therefore, we cluster standard errors at the regional level in every regression that we report. Clustering standard errors at the city level would not affect our results.

covariates in column (2), where –given the regulations of the 1995 law– we control for ownership type (public vs. private; *Private?*) and network membership (*Belongs to network?*). Private stations show a stronger tendency towards price discrimination than their public counterparts, and so do firms belonging to a network (although this last effect is never statistically significant).

[TABLE 3 ABOUT HERE]

In column (3) of Table 3 we add year fixed effects to the specification in column (2). These year dummies account for aggregate time shocks, like policy changes at the national level that might affect the local TV industry. In particular, the year fixed effects will capture the different attitudes towards industry regulation by the central government (the PSOE in 1995, the PP with no majority in 1998, and the PP with a majority in 2001) and the pre- and post-law operating environments. As can be seen from the table, the effect of competition on price discrimination remains essentially unchanged. The same is true in column (4), which exploits the within-region variability in price discrimination to identify the effect of interest, and thus controls for region-specific time-invariant factors, like the region's traditional views towards local television.

Column (5) includes station fixed effects, and hence exploits within-station changes in price discrimination decisions. When we look at the within-station variability, the effect of competition on price discrimination is still very significant and becomes much larger in magnitude. According to the results in column (5), an additional competitor is associated to a reduction of almost 2 percentage points in the propensity to price discriminate (a substantial effect when compared to a sample mean of 9 percent).

The number of competitors a station faces differs systematically across regions, raising the concern that price discrimination may have evolved differentially over time across regions and that our competition measure may in part be capturing such differential trends. To address this concern, we introduce region-specific time trends and therefore we allow the incidence of price discrimination

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to grow at a different average annual rate in each region in column (6). The estimated coefficient on *No. stations* is unchanged in this alternative specification.

In a nutshell, Table 3 shows a robust negative effect of competition on price discrimination. This result is consistent with conventional wisdom when competition erodes a firm's market power – which is more likely, given an industry-demand elasticity, when goods are close substitutes (as is admittedly the case with advertising spots on TV) and the cross-price elasticity is high. Previous studies have reported similar results for other industries with low differentiation such as Yellow Pages ads (Busse and Rysman, 2005), low-quality hotels (Becerra, Santalo, and Silva, 2011), and parking lots (Lin and Wang, 2015).

3.2   Robustness checks

To further explore the robustness of our results in Table 3, we run four additional checks in Table 4. Our sample includes many stations that we observe only once, and hence contribute nothing to the within-station variability of price discrimination. In column (1) of Table 4 we have reproduced the specification with station fixed effects of column (6) in Table 3, but we have limited our sample to those stations that we observe at least twice. The coefficient associated to *No. stations* is very similar in both magnitude and statistical significance.[12]

[TABLE 4 ABOUT HERE]

The TV industry is typically considered to be two-sided, and price discrimination in these settings is made not just with an eye on how much value a station might capture from customers on one side of the market, but also on how it changes what the station might then capture from customers on the other side (see, e.g., Liu and Serfes, 2013; Rysman, 2009; and Weyl, 2010). Even though only three stations report to simultaneously price-discriminate on both sides of the market,

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[12]The same result obtains if we only consider the 63 stations that always respond to the questionnaire.

there might still remain some concern that omitting the cross-groups external effect between viewers and advertisers could lead to biased estimates. We minimize this concern by excluding these three stations (6 observations in total) in column (2), and by restricting the analysis in column (3) to stations that broadcast their content – stations that could be regarded as having made an irrevocable commitment not to price-discriminate on the content side (as broadcasters they are, indeed, charging a uniform price of zero). The negative effect of competition still shows up in these specifications and is statistically significant and similar in magnitude to the effects previously found.

Finally, we estimate a logit model with our same binary dependent variable as an alternative to all the specifications in Table 3. We show in column (4) of Table 4 that our main result is robust and we find a significant negative effect of competition on price discrimination when using a logit specification.[13]

3.3   Addressing endogeneity further

To further address the endogeneity concerns discussed in Section 2.2, we look for sources of exogenous variation in competitive conditions in the changes in the regulatory environment of local television. We begin by instrumenting *No. stations* with the share of votes of the PP and the CC (*PP+CC share of votes*) at the regional level in the previous national election.[14] Column (A) in

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[13]While we have run all the models in Table 3 as logit models and qualitatively found similar results, for the sake of brevity we only report the results from the most complete specification in Table 4. All unreported results are available upon request.

[14]Local TV stations also compete for advertisers with other outlets such as radio, newspapers, and national and regional TV stations. A concern here is that TV stations might be more likely to enter a market with less competition from other outlets, and that those markets might at the same time provide more opportunity for price discrimination. Given that the changes in the regulatory environment that we use as instruments only concerned local TV stations, our IV strategy should deal with this problem.

Table 5 shows a robust first stage, with a positive effect of *PP+CC share of votes* on the number of stations, as expected. In particular, a 10-percentage point increase in the vote share of the PP and the CC results in almost two additional rivals. Column (1) presents the second-stage estimates, and shows a negative and statistically significant effect of competition on price discrimination, lending further support to our OLS results.[15]

[TABLE 5 ABOUT HERE]

Next, we implement a differences-in-differences approach, comparing the change in price discrimination in stations located in cities with more than two stations prior to the law to the change in price discrimination in stations located elsewhere, using the share of votes of the PP and the CC at the regional level in the June 1993 national election (interacted with *Post law?*) to instrument *Over2?*Post law?*.[16] Consistent with our expectations, column (B) shows a positive effect of the share of votes of the PP and the CC on the probability of observing more than two stations in a given city prior to the law. In column (2) we show the second stage. The causal effect of interest is the coefficient on the interaction *Over2?*Post law?.* We find a positive and statistically significant coefficient, which we ascribe to a negative effect of competition on price discrimination; indeed, price discrimination increases more in stations located in cities where the PSOE law should have restricted competition the most.[17]

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[15] The opportunity cost of a 20-second ad would be the same across all stations at a given time, but not necessarily across different days or weeks or time of the day. This could result in intertemporal price discrimination. The IV strategy should rule this out as an explanation.

[16] To save space, we have not reported the results of the differences-in-differences approach without the instrumental variable (which are available upon request). The estimated coefficient is less than one hundredth of the one reported in Table 5, and largely nonsignificant (p-value of .897).

[17] Note that the specifications in Table 5 do not use station fixed effects. Since stations do not change location, those stations located in towns with more than two stations are likely to lack variation in the *Over 2?* dummy. Similarly, our instrument, *PP+CC 1993 share of votes* does not vary over time. Therefore, because we mainly rely

3.4 Competition and Prices

So far we have documented a negative relationship between price discrimination and competition. However, this finding does not reveal much about the level of prices. A basic insight in economics is that competition will reduce prices. Even if competition reduces some prices more than others (and may lead to increased price dispersion), as long as it reduces all prices it will reduce the average price.[18] For example, Busse and Rysman (2005) and Becerra, Santalo, and Silva (2011), mentioned earlier in our discussion of the price discrimination literature, find that competition actually reduces all prices.

On the other hand, instances of price-increasing competition (Chen and Riordan, 2008) have been reported in Perloff, Suslow, and Seguin (2005) in the anti-ulcer drug market; Ward et al. (2002) in the food industry; and Thomadsen (2007) in fast food. An explanation is provided in Rosenthal (1980): if we assume each station faces a loyal group of advertisers and a group willing to switch station; with an increased number of stations competing for the switching group, each individual station would be tempted to exploit the loyal advertisers through a higher (uniform) price. Another potential explanation comes from agglomeration theory: if entry of new stations makes watching television more attractive to potential viewers, stations could also face increased demand for advertising space that is likely to manifest itself through the ability to charge higher prices (McCann and Vroom, 2010).[19]

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on variation across stations, and not within stations over time, we cannot introduce station fixed effects in Table 5.

[18]Even if prices increase in some markets and decrease in others, Holmes (1989) argues that there is a sense in which reduced price discrimination reduces the "average" price, because the reduction in price in the strong market compared to the uniform price is large relative to the increase in the weak-market price.

[19]Entry of new stations could also provide demand-related legitimation to the local TV industry – another demand-side externality that would strengthen the tendency to increase prices in response to enhanced competition. For further discussion and references, check McCann and Vroom (2010).

Table 6 presents evidence of a negative effect of competition on prices in the Spanish local TV industry, consistent with conventional economic theory and previous empirical findings. In Table 6, we re-run the specifications in column (6) of Table 3 (column [1] in Table 6) and both of our IV strategies in Table 5 (columns [2] and [3] in Table 6) replacing *Price discrimination* with *Advertising prices* as the dependent variable.

[TABLE 6 ABOUT HERE]

We find a statistically significant reduction in advertising prices in response to a larger number of competing firms in columns (2) and (3). The inclusion of station fixed effects leaves almost no variation to be explained by our competition variable (R-squared of 93 percent) in the OLS regression, which becomes statistically not different from zero in the specification in column (1).

3.5 Pricing Behavior of Incumbents and Entrants

To further analyze the pricing behavior of firms in this industry, we separate entrants from incumbents.[20] We classify an observation as belonging to an entrant if the station entered within the three years prior to the census to which the observation belongs. Otherwise, we regard the observation as corresponding to an incumbent. It might be argued that a station that has been broadcasting for almost three years is hardly an entrant. We offer two lines of defense here. First, since we only observe the behavior of incumbent firms every three years, their pricing decisions in a given census year will at least partly be picking up the incumbent's response to all entry that has occurred in the three-year period between censuses. Second, more stringent definitions of an entrant would reduce the number of entrant observations and work against finding a significant

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[20]Summary statistics of incumbents and entrants in our sample are available upon request. If anything, incumbents are less likely to sell advertising spots, to broadcast their content and to be located in a city with more than two stations, are more likely to belong to a network, they face a lower number of competing stations in their coverage area, and are located in regions with lower vote shares of PP+CC.

response to competition in entrants' pricing choices, because of reduced power.[21]

Table 7 shows results from regressions of our price discrimination dummy on competition, including controls, year fixed and region fixed effects, as well as region-specific time trends.[22] Columns (1) to (3) show that incumbent stations engage less in price discrimination when facing a larger number of competitors.[23] The effects are statistically significant (except in column [3], where it is marginally nonsignificant) and similar in magnitude to those found in Tables 3 and 5. Entrants, on the other hand, show no statistical or economically significant effect of competition on price discrimination, as displayed in columns (4) to (6), where all the coefficients are much smaller than for incumbents.

[TABLE 7 ABOUT HERE]

Since the regressions in Table 7 exploit the within-region variability in price discrimination, the reaction of incumbent stations to competition need not be due to actual entry of new firms. Re-running the specification in column (1) with station fixed effects (not reported) shows a negative effect of competition on the propensity to price-discriminate by incumbents, which is similar in magnitude to the estimates in Tables 3 and 4 – although the effect is imprecisely estimated. This (admittedly weak) evidence suggests that price discrimination is used by incumbents as a strategic variable to accommodate entry – a variable that has received scant attention in the literature, which has focused more on dimensions such as advertising, patenting, brand proliferation, exclusive dealing, price cuts, and diversification, among others.[24]

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[21]Nevertheless, we tried defining an entrant as a firm that has been on air less than two years, and less than one year, and our results (available upon request) are qualitatively unchanged.

[22]Since a station is an entrant only once, we cannot run entrant regressions with station fixed effects. To provide a level playing field for the comparison, we have also run the incumbent regressions with region fixed effects.

[23]First stages have been omitted to avoid cluttering and are available upon request.

[24]See, for instance, Anand and Girotra (2007), Bunch and Smiley (1992), Kadiyali (1996), Kalra et al. (1998), Koski and Majumdra (2002), Robinson (1988), and Wright (2008).

To sketch out the argument for uniform pricing as an entry-accommodation strategy, consider two firms (an incumbent I and an entrant E) selling differentiated goods to different market segments or consumer groups. If firms have different rankings of consumer groups by their demand elasticities at a given rival's price (what Corts, 1998, termed "best-response asymmetry"), then price discrimination makes firms tough (or aggressive) when setting prices in the product market, and the strategic complementarity in price-discrimination decisions leads to all-out competition (Corts, 1998) and lower profits for both. Assume now that, prior to firm E's entry decision (and the ensuing simultaneous price setting), firm I can make a (credible) commitment not to price discriminate in the price-setting stage. By committing to uniform prices, firm I effectively commits to being soft and accommodates entry by avoiding an aggressive response from firm E – a "puppy dog" strategy (Fudenberg and Tirole, 1984) that provides a rationalization of the results in Table 7.

4   Conclusions

The recent literature on price discrimination under imperfect competition stresses that the link between competition and price discrimination is ambiguous – suggesting an empirical approach to the question. In this paper, we have empirically examined the impact of competition on the propensity to price-discriminate in the context of television advertising, using the Spanish local TV industry as our laboratory. Contrary to most previous findings in the literature, but consistent with conventional wisdom, we document a negative causal effect of competition on the use price discrimination. We have also found that competition decreases average prices.

Our results also suggest that price discrimination is yet another strategic dimension that should be considered when analyzing incumbent firms' responses to entry: incumbent stations in our sample react to the entry of new stations by reducing price discrimination. Delving deeper into

these strategic considerations is an interesting avenue for future research.

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CENSO DE TELEVISIONES LOCALES

1. Nombre de la emisora:_____

2. Dirección (Calle, Número, Municipio, Código Postal, Provincia): _____

    _____

3. Año de comienzo de las emisiones: _____

4. Nombre del director/a: _____

5. Teléfono1: _____   Teléfono2:_____

6. Fax: _____

7. E-mail: _____

8. Disponen de página Web   Sí / No

    En caso afirmativo, indique la dirección completa: _____

9. Asociaciones/Redes a las que pertenece: _____

    _____

10. Propiedad de la cadena (Privada, Municipal, Mixta, Etc.):_____

11. Días de emisión: _____

12. Horario de emisión: _____

13. Área de cobertura: _____

14. Sistema de difusión (Terrestre, Cable, MMDS): _____

    En caso de difusión por cable,   Importe cuota mensual: _____

    Nombre del servicio o red de cable: _____

    En caso de difusión terrestre,   Potencia de salida en Watios: _____

    Canal Radioeléctrico: _____

15. Emiten publicidad   Sí / No   Do you sell advertising spots? Yes / No

    En caso afirmativo, precio de un spot de 20 segundos en prime-time: _____

16. Porcentaje que la producción propia supone sobre el total de tiempo de emisión (cifra aproximada):

    _____   If Yes, price of a 20-second spot in prime-time

17. Observaciones:_____

    _____

Por último, agradeceríamos nos informase de otras televisiones locales que están funcionando en el mismo ámbito geográfico que la suya o en las zonas adyacentes: _____

_____

Table 1. Summary Statistics

Variable	Obs	Mean	Std Dev	Min	Max	1996	1999	2002
Discriminates Prices?	1,020	0.09	0.28	0	1	0.12 (0.32)	0.10 (0.30)	0.07 (0.26)
Sells advertising spots?	1,261	0.81	0.39	0	1	0.89 (0.31)	0.77 (0.42)	0.82 (0.39)
Advertising prices	791	11,687	17,288	0	130,000	11,719 (18,899)	11,946 (17,800)	11,487 (16,383)
No. stations in coverage area	1,291	5.56	7.73	1	69	5.46 (6.40)	4.67 (6.68)	6.23 (8.65)
Private?	1,255	0.80	0.40	0	1	0.80 (0.40)	0.79 (0.41)	0.80 (0.40)
Belongs to network?	1,291	0.58	0.49	0	1	0.67 (0.47)	0.52 (0.50)	0.60 (0.49)
Broadcasts?	1,267	0.80	0.40	0	1	0.83 (0.38)	0.76 (0.43)	0.82 (0.38)
PP+CC share of votes	1,287	41.97	12.87	14.68	71.37	34.84 (12.38)	39.23 (12.51)	45.91 (11.87)
More than two stations in city in 1995?	1,291	0.17	0.38	0	1			

Note: Advertising prices are measured in pesetas (1 Euro = 166 pesetas). When summary statistics are broken up by year, mean (above) and standard deviation (below in parentheses) are reported.

Table 2. Changes in the Number of Competing Stations & Price Discrimination Across Years

1996-1999

Change in No Stations

	-3 or Less	-2	-1	0	+1	+2	+3 or More	Total
Always PD	0	0	0	3	1	1	1	6
Never PD	13	4	8	20	7	2	10	64
PD in 1999	1	0	1	1	0	0	1	4
PD in 1996	0	1	1	1	0	0	1	5
Total	14	5	10	25	8	3	13	79

1999-2002

Change in No Stations

	-3 or Less	-2	-1	0	+1	+2	+3 or More	Total
Always PD	1	0	1	5	3	0	4	14
Never PD	3	5	14	67	21	18	44	172
PD in 1999	1	0	1	1	1	0	4	8
PD in 2002	1	0	1	8	1	0	1	12
Total	6	5	17	81	26	18	53	206

Note: This table tabulates the change in the number of competing TV stations in the 1996-1999 and 1999-2002 three-year periods against whether the focal TV station price discriminated advertisers in both, one or none of the two observations.

Table 3. Competition and Price Discrimination - Main Results

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var:	**Price discrimination**					
No. stations	-0.0021**	-0.0025***	-0.0024***	-0.0021***	-0.0184***	-0.0185***
	(0.0008)	(0.0008)	(0.0008)	(0.0007)	(0.0059)	(0.0061)
Private?		0.0742***	0.0739***	0.0623***	0.1105	0.0810
		(0.0200)	(0.0186)	(0.0210)	(0.1448)	(0.1801)
Belongs to network?		0.0081	0.0082	0.0113	0.0721	0.0937
		(0.0164)	(0.0181)	(0.0175)	(0.0611)	(0.0776)
Constant	0.1003***	0.0352*	0.0345*	0.0715	0.0550	0.0240
	(0.0088)	(0.0171)	(0.0165)	(0.0422)	(0.1504)	(0.1948)
Year FE	No	No	Yes	Yes	Yes	Yes
Region FE	No	No	No	Yes	No	No
Station FE	No	No	No	No	Yes	Yes
Regional time trends	No	No	No	No	No	Yes
Observations	1,020	994	994	994	994	994
R-squared	0.0036	0.0123	0.0164	0.0329	0.8035	0.8314

Notes: All models are estimated by OLS. Robust standard errors clustered at the region level are in parentheses. *Price discrimination* is a dummy variable that takes value 1 if the station reports any sort of price discrimination when selling a 20-second spot in prime time. *No. stations* is the numbers of TV stations located in a station's coverage area. *Private?* Is a dummy variable that takes value 1 if the station is privately owned. *Belongs to network?* is a dummy variable that takes value 1 if the station belongs to a (horizontal) local TV station network.
*** p<0.01, ** p<0.05, * p<0.1.

Table 4. Competition and Price Discrimination - Robustness Checks

	(1)	(2)	(3)	(4)
Dep Var:	Price discrimination			
No. stations	-0.0185***	-0.0188***	-0.0130**	-0.6520**
	(0.0046)	(0.0058)	(0.0047)	(0.3017)
Private?	0.1373	0.0837	0.0910	
	(0.1626)	(0.1751)	(0.2326)	
Belongs to network?	0.0930	0.0971	0.0838	2.6273
	(0.0599)	(0.0808)	(0.0994)	(2.8995)
Constant	-0.0289	0.0437	-0.0293	-13.5293***
	(0.1742)	(0.2000)	(0.2114)	(1.5613)
Sample	All stations with 2+ observations	Only stations that never discriminate on the content side of the market	Broadcasting stations	All stations
Model	Linear probability	Linear probability	Linear probability	Logit
Observations	575	988	823	46
R-squared	0.7723	0.8381	0.8668	0.4346

Notes: Models (1) to (3) are estimated by OLS. Model (4) is estimated by ML. Robust standard errors clustered at the region level are in parentheses. All regressions include year and station fixed effects, as well as regional time trends. *Price discrimination* is a dummy variable that takes value 1 if the station reports any sort of price discrimination when selling a 20-second spot in prime time. *No. stations* is the numbers of TV stations located in a station's coverage area. Private? is a dummy variable that takes value 1 if the station is privately owned. Belongs to network? is a dummy variable that takes value 1 if the station belongs to a (horizontal) local TV station network.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5. Competition and Price Discrimination - IV Results

Dep Var:	(A) No. stations 1st stage	(1) Price discrimination 2nd stage	(B) No. stations 1st stage	(2) Price discrimination 2nd stage
No. stations		-1.8025*** (0.3635)		
Over 2? * Post law?				0.7164** (03475)
Over 2?			0.7696*** (0.0170)	-0.5809* (0.2982)
Post law?			0.5610*** (0.0125)	-1.1127*** (0.2185)
PP+CC share of votes	0.1964*** (0.0417)			
PP+CC 1993 share * Post law?			0.0023*** (0.0005)	
Private?	3.5142** (1.2952)	6.3918*** (1.1657)	0.0162 (0.0109)	0.0443*** (0.0164)
Belongs to network?	-1.008 (1.0065)	-1.7975 (1.4518)	-0.0071 (0.0070)	0.0190 (0.0166)
Constant	-1.7712 (1.5500)	8.1996*** (2.0321)	-0.5500*** (0.0160)	1.0794*** (0.2084)
Observations	992	992	994	994
R-squared	0.4759		0.8728	
F of excluded instruments	22.11		21.24	

Notes: All models are estimated by 2SLS and include year and region fixed effects, as well as regional time trends. Robust standard errors clustered at the region level are in parentheses. *Price discrimination* is a dummy variable that takes value 1 if the station reports any sort of price discrimination when selling a 20-second spot in prime time. *No. stations* is the numbers of TV stations located in a station's coverage area. *Private?* is a dummy variable that takes value 1 if the station is privately owned. *Belongs to network?* is a dummy variable that takes value 1 if the station belongs to a (horizontal) local TV station network. *Over 2?* is dummy variable that takes value 1 if the city where the station is located had more than two stations in 1995. *Post law?* is a dummy that takes value 1 for 1998 and 2001 observations. *PP+CC share of votes* is the share of votes of the PP and the CC at the regional level in the previous national election. *PP+CC 1993 share* is the share of votes of the PP and the CC at the regional level in the June 1993 national election. Columns (A) and (B) are first-stage regressions of (1) and (2) respectively.
*** p<0.01, ** p<0.05, * p<0.1.

Table 6. Competition and Prices

	(1)	(2)	(3)
Dep Var:	**Advertising prices**		
No. stations	-216.37	-1,091.56***	
	(202.72)	(58.06)	
Over 2? * Post law?			28,254.68*
			(16,657.60)
Over 2?			-16,960.20
			(14,231.49)
Post law?			-5,986.89***
			(872.24)
Private?	4,284.53	8,568.03***	3,932.35***
	(8,516.97)	(1,481.67)	(1,276.64)
Belongs to network?	155.67	-3,505.78*	-2,522.88**
	(2,470.17)	(1,964.63)	(1,145.46)
Constant	7,644.81	21,496.72***	12,216.81***
	(7,949.94)	(2,328.85)	(2,078.42)
Fixed effects	Station	Region	Region
Observations	775	773	775
F of excluded instruments		1164.80	20.88

Notes: Model (1) is estimated by OLS. Models (2) and (3) are estimated by 2SLS. Robust standard errors clustered at the region level are in parentheses. All regressions include year and region fixed effects, as well as regional time trends. *Advertising prices* is the price of a 20-second spot in prime time, measured in pesetas (1 Euro = 166 pesetas). No. stations is the numbers of TV stations located in a station's coverage area, and is instrumented with *PP+CC share of votes*, the share of votes of the PP and the CC at the regional level in the previous national election. *Private?* is a dummy variable that takes value 1 if the station is privately owned. *Belongs to network?* is a dummy variable that takes value 1 if the station belongs to a (horizontal) local TV station network. *Over 2?* is dummy variable that takes value 1 if the city where the station is located had more than two stations in 1995. *Post law?* is a dummy that takes value 1 for 1998 and 2001 observations. The interaction *Over 2? * Post law?* is instrumented with the interaction *PP+CC 1993 share * Post law?*, where *PP+CC 1993 share* is the share of votes of the PP and the CC at the regional level in the June 1993 national election.
*** p<0.01, ** p<0.05, * p<0.1.

Table 7. Behavior of Incumbents and Entrants

	Incumbents			Entrants		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var:	Price discrimination					
No. stations	-0.0039***	-0.0430***		0.0016	0.0011	
	(0.0009)	(0.0063)		(0.0018)	(0.0034)	
Over 2? * Post law?			1.145			0.2779
			(0.7736)			(0.1873)
Over 2?			-0.9869			-0.2177
			(0.7343)			(0.1402)
Post law?			0.0775***			-0.0621
			(0.0222)			(0.0689)
Private?	0.0709**	0.1675***	0.0497**	0.0598*	0.0385	0.0392**
	(0.0283)	(0.0500)	(0.0247)	(0.0294)	(0.0384)	(0.0189)
Belongs to Network?	0.0296	0.0238	0.0315	0.0302	0.0335	0.0372
	(0.0228)	(0.0327)	(0.0271)	(0.0388)	(0.0400)	(0.0413)
Constant	0.2189***	-0.0927**	-0.0950**	-0.0081	-0.0192***	0.0079
	(0.0415)	(0.0437)	(0.0480)	(0.0582)	(0.0051)	(0.0494)
Observations	680	680	680	259	257	259
F of excluded instruments		67.06	9.49		14.58	9.36

Notes: Models (1) and (4) are estimated by OLS. Models (2), (3), (5), and (6) are estimated by 2SLS. Robust standard errors clustered at the region level are in parentheses. All regressions include year and region fixed effects, as well as regional time trends. *Price discrimination* is a dummy variable that takes value 1 if the station reports any sort of price discrimination when selling a 20-second spot in prime time. *No. stations* is the numbers of TV stations located in a station's coverage area, and is instrumented with *PP+CC share of votes*, the share of votes of the PP and the CC at the regional level in the previous national election. *Private?* is a dummy variable that takes value 1 if the station is privately owned. *Belongs to network?* is a dummy variable that takes value 1 if the station belongs to a (horizontal) local TV station network. *Over 2?* is dummy variable that takes value 1 if the city where the station is located had more than two stations in 1995. Post law? is a dummy that takes value 1 for 1998 and 2001 observations. The interaction *Over 2? * Post law?* is instrumented with the interaction *PP+CC 1993 share * Post law?*, where *PP+CC 1993 share* is the share ofvotes of the PP and the CC at the regional level in the June 1993 national election. A station is considered an entrant in a given year when it has been on air less than 3 years (the time between observations). Else, it is considered an incumbent.
*** p<0.01, ** p<0.05, * p<0.1.