DIFFERENTIATION AND THE RELATIONSHIP BETWEEN PRODUCT MARKET COMPETITION AND PRICE DISCRIMINATION

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Summary

We investigate how the effect of competition on price discrimination varies depending on the level of quality provided by companies in the hospitality industry. Our findings reconcile conflicting results of previous literature on this topic. Namely, we provide strong empirical evidence that competition affects differently the price of single and double rooms of hotels with greater quality versus those with lower quality. In the presence (absence) of differentiation, competition increases (decreases) price discrimination. Our findings are robust to the use of econometric techniques that alleviate endogeneity concerns.

Keywords: Differentiation, competition, price discrimination, hotel industry

1. Introduction

One of the better-established rules in Economics indicates that greater product market competition should decrease price levels. However, such a general idea needs further qualification when we proceed to study the influence of market competition on intra-firm price menus. Market competition may affect asymmetrically the various prices that any given firm commands for its different products or services, and extant theoretical models claim opposite predictions regarding whether low or high prices are going to be more affected by an increase in competition (Stole, 1995; Rochet and Stole, 2002). In fact, the scarce empirical literature on this topic has reported conflicting evidence; Borenstein and Rose (1994) find that product competition affects relatively more the lowest airline fares, while Busse and Rysman (2005) show that competition impacts relatively less the lower priced advertisements in the yellow pages market. More recently, some of the empirical findings have been questioned due to possible omitted-variable bias from cross-sectional studies (Gerardi and Shapiro, 2009).

In this paper we investigate an initial intuition in Busse and Rysman (2002) and provide evidence that the linkage between competition and the firms' possibility to price discriminate critically depends on firm differentiation. Although firm differentiation is a somewhat ambiguous term, we follow a traditional conceptualization and consider differentiation strategies as those product features purposely designed to shift consumer preferences and increase consumers' willingness to pay higher prices, such as product quality (Chamberlin, 1933; Beath and Katsoulacos, 1991). In a nutshell, we find in our study that when firms pursue a differentiation strategy, then higher competition affect proportionally more the lowest prices charged by each firm in line with Borenstein and Rose (1994); on the contrary, when firms are not differentiated, then we find that the highest prices are the ones relatively more squeezed by competition, as shown by Busse and Rysman (2005).

We empirically document this relationship using panel data from the Spanish hospitality industry. This industry is an excellent framework to test this hypothesis for several reasons. First, in this complex market we can observe at the same point in time companies that compete with widely distinct product quality, as reflected by the number of stars that an official agency assigns to each hotel. Second, market competition varies across locations and we can exploit both across time and across location variation of competition. Third, all hotels have a standard pricing policy that distinguishes between single and double use room prices and therefore it allows us to identify the intensity of second degree price discrimination pursued by each hotel. Fourth, the Spanish context represents an ideal laboratory to study competition and pricing policies because of the size and importance of Spain as a touristic destination, which allows us to obtain a rich dataset with a large number of observations in markedly different locations. Finally, Spain is a highly decentralized country in which the relevant regulatory competencies depend on the regional governments, so that we can exploit distinct regulatory regimes to identify exogenous variation in competition.

We start by documenting how our two measures of competition, number of hotels in each location and the resulting Herfindahl index, are indeed negatively correlated with prices for single and double rooms. Next, we move on to see how competition determines the possibility of firms to discriminate the prices they charge for their product offer. Indeed, we show how product competition impacts asymmetrically single and double room prices, thus changing firms' ability to price discriminate. We see that for hotels pursuing a strategy of quality differentiation, an increase in market competition leads to an increase in the distance between single and double

room prices, while the exact opposite happens for hotels with lower quality; this finding constitutes the main result of the paper. These results are confirmed using both interactions and subsample analyses for price levels as well as straightforward measures of price dispersion as dependent variables. Our findings are not altered when we use different levels of industry aggregation to compute our market competition proxies. We obtain robust results in our OLS analysis with location and firm fixed effects as well as in the 2SLS regressions, where we account for possible endogeneity bias.

Our findings are consistent with the theoretical literature that has studied the relation between price discrimination and competition (Holmes, 1989; Stole,1995, Rochet and Stole, 2002). This literature defines the *strong/weak* market as the consumer segment in which the firm would optimally choose a higher/lower price. According to this theoretical literature the link between product competition and price discrimination depends critically on the intensity of brand preferences. More particularly, when consumers that buy the product with the highest price are relatively more brand loyal than those consumers that demand the product with the lowest price, then competitive forces drive down relatively more the lowest prices (Rochet and Stole, 2002). The opposite occurs when the weak market consumers are relatively more brand loyal (Stole, 1995). In our study we find evidence that indeed strong market consumers are more price loyal than weak market consumers when companies choose to pursue strategies designed to enhance consumer willingness to pay through higher quality.

This paper is also related to the work of Gerardi and Shapiro (2009). These authors replicate Borenstein and Rosse (1994) study for a more recent time period and they find a negative relationship between product competition and price dispersion in the airline industry rather than the positive association reported by the former authors, which, according to Gerardi and Shapiro (2009), may suffer from omitted variable bias. In our paper we show that even when correcting for the omitted variable bias, we can still find a positive effect of competition on price dispersion when we consider companies that pursue a differentiation strategy. Overall, our contribution to the IO literature is identifying empirically quality differentiation as a critical determinant to predict when competition will increase price discrimination as in Borenstein and Rose (1994) or decrease it as in Busse and Rysman (2005) and Gerardi and Shapiro (2009).

The rest of the paper is structured as follows: the next section briefly describes the Spanish hotel industry. Section 3 explains how we have built the sample and the variables in our study. Section 4 discusses our identification strategy while Section 5 displays the main set of results and Section 6 adds several robustness tests and Section 7 concludes our paper.

2. The Hotel Industry in Spain

Our data comes from the Spanish hospitality industry. According to the World Tourism Organization, in absolute terms Spain was the fourth largest tourist destination in the world with 53 million international tourists in 2010, right after France, United States, and China. Tourism is the number one industry in Spain contributing to 10.3% of Spain's GDP in 2010, according to the official figure provided by the Instituto Nacional de Estadística (INE). As discussed above, the Spanish hotel industry is a particularly appropriate context to conduct this study because it provides a rich setting across a large number of geographical locations with varying levels of competitive rivalry for which there are publicly available statistics of listed price menus and features for hotel differentiation. More importantly, the hospitality industry is an excellent framework to test our hypothesis because in this market we can find at any given point in time

companies that compete with widely distinct levels of quality across different locations. Namely, some hotels pursue a clearly observable differentiation strategy and focus their effort in selling high quality service to their consumer, while other hotels focus on low prices and basic services as their primary appeal to consumers. The level of quality can be easily observed in the number of stars allocated to the hotel, which is based on objective criteria used by the proper regional official agency.

3. Sample and Variable Construction

We used the Official Hotel Guide published by the INE to build a panel of hotels for the five-year period 2004-2008. This Official Hotel Guide gathers annual information about the entire population of hotels in Spain, including its name, category (1-5 stars), chain membership, location (city and address), number of rooms, and prices for double and single rooms. Hotels send this information to the public Spanish agency Instituto de Estudios Turísticos, which is in charge of the promotion of tourism in Spain, both domestically and internationally. Hotels have a strong incentive to share this information accurately because this Guide is widely available to the general public, who often use it for planning their trips and choosing a hotel. Data from this guide has often been used by researchers in the Spanish hotel industry (Fernández and Marín, 1998; Uriel and Ferri, 2004). Our final sample consists of data for 4,441 hotels for 5 years across 1,698 locations, though missing data reduces sample size for some analyses.

Variables

- Room prices. Hotels report two key prices, i.e., for single and double rooms, which are used in our main models. We also estimate the relative difference between single and double rooms as a direct measure of price discrimination, defined as the double room price minus the single room price divided by the price of the double room price. It should be noted that the average number of rooms for the hotels in the sample is 81.64, but the hotels' guest capacity is 157.01 on average. About 96% of the hotel rooms in our sample can host two people, but they can be rented by single individuals usually at a discount; thus, the price difference between single and double rooms refers primarily to the number of customers using the room rather than intrinsic differences in rooms.

We compute the independent variables about differentiation strategy and market competition in the following manner:

- Category. The number of stars (coded 1 though 5) of the hotel is reported by the Official Guide. As a measure of vertical differentiation, this variable captures objectively the level of quality of the hotel based on industry regulations, which is officially assessed by the proper regional agency and displayed prominently by the hotel (Fernández and Marín,1998; Mazzeo, 2002).

- Local competition. We used two variables that capture the degree of direct competition that a hotel has to face in its local market. First, **Number of Competitors** is a straightforward measure of the number of hotels in the same category (i.e., same number of stars) that exist in each one of the 1698 zip codes in the sample. This variable has been widely used in the literature as a proxy of market competition (see, for example, Stavins, 1995; Thomas and Weigelt, 2000 or Busse and Rysman, 2005). Second, we construct the Herfindhal-Hirschman concentration index (**HFI**) using the proportion of hotel rooms over total number of total rooms of the same category in the same zip code area as proxy of market share (Borenstein and Rosse, 1994 or Gerardi and

Shapiro, 2009).Note that both competition variables have variation within zip code because the number of hotels of different categories varies in each location.

We controlled for differences across locations using location fixed effects and, in some models, hotel fixed effects. We also included the following control variables in the analysis to account for key features of the hotels as well as key changes in the locations throughout the 5-year period:

- **Chain.** This is a dummy variable that represents whether the hotel is part of a chain as reported in the Official Guide, such as NH, Hilton, Barceló, and Sol-Meliá. These chains have a common brand umbrella that guarantees some homogeneity in the type of service offered to consumers. Hotel chains that give their units the same name create the opportunity for repeat business, which gives the hotel chain an interest in satisfying the customer. This credible commitment of good service through the creation of a brand may increase the willingness to pay for travelers (Ingram, 1996), which should be controlled for.

- **Number of Rooms.** We control for hotel size using the total number of rooms for each hotel. Hotel size may be expected to affect pricing policy, e.g., as a result of economies of scale.

- **Golf**. To account for possible changes in the type of customers that are attracted to each location, we controlled for the number of golf courses in the location. According to the Real Federación Española de Golf, there were a total of 380 golf courses across Spain in December 2008, which appeal to more affluent customers.

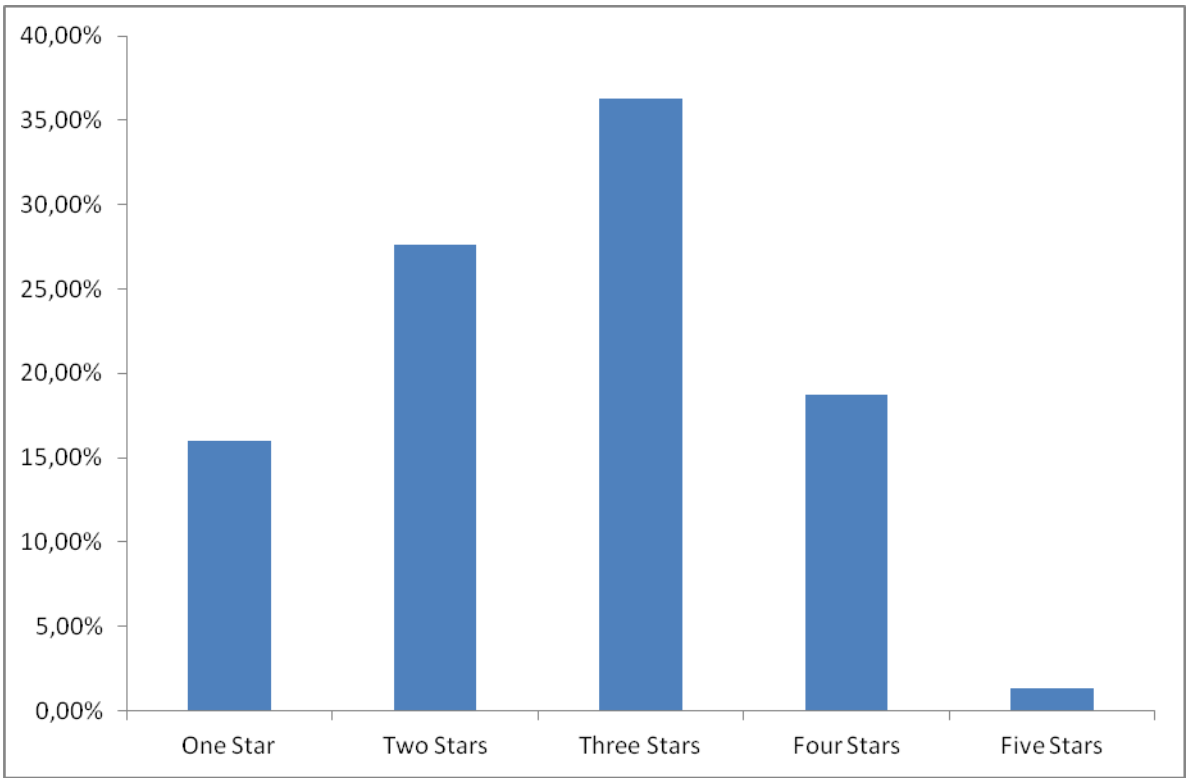
- **Conventions**. We also control for the total number of hotels that provide meeting rooms for business customers and conventions in each location, as an indicator of the area's attractiveness for business managers and professional travelers.

TABLE 1 Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Single (€)	22205	79.94	54.62	9.35	620.00
Double (€)	22205	108.82	66.99	15.70	766.00
Price (€)	44410	94.38	62.80	9.35	766.00
Difference (%)	22205	27.74	12.30	.00	71.11
Lplayers	22205	1.14	1.07	.00	3.89
HFI	22205	.53	.36	.03	1.00
Category	22205	2.62	1.01	1.00	5.00
Log of rooms	22205	3.85	1.06	1.10	7.04
Chain	22205	.24	.43	0.00	1.00
Golf courses	19180	.42	1.03	0.00	9.00
Convention hotels	19180	5.21	5.99	0.00	30.00

Table 1 shows descriptive statistics for these variables. The average price of a single room is 79.94 euros and 108.92 euros for a double room, which results in an average discount of around 28% for single room use. Figure 1 shows the distribution of hotel category in our sample. Three stars is the most common category that comprises around 36% of the hotels in our sample. On the contrary, five star hotels represent only around 1.3% of our observations.

Figure 1: Distribution of hotels by category



4. Identification Strategy

In the context of firms that sell a menu of differentiated products, price discrimination is usually defined as the existence of price variation that cannot be explained by cost differences. For example, publishing companies sell the same content of books in both hard cover and paperback format with a large difference in price. The literature considers this as an example of price discrimination because this price divergence is not driven by cost discrepancies (Clerides, 2002). In this regard there is some mild controversy about how to properly translate this definition into the empirical work. Some authors define price discrimination to exist when absolute differences between price-cost markups are unequal while others look at percentage differences (Clerides, 2004).

We believe that hotel pricing for single and double use of the same room is indeed an example of price discrimination. As we discussed earlier, about 96% of the rooms in our sample can be rented for single or double use, but the room itself does not change. The key significant

difference is for the customer to share the physical space in the room with another person. Though it could be argued that a room shared by two customers may have somewhat higher costs of cleaning and replacing basic amenities like coffee, soap, or toilet paper, this slightly greater cost of service cannot explain the average relative price difference of 28% between single and double use of a room. Moreover, the difference between single and double room prices across hotels does not seem to be explained by cost differences because, as we explain in the following section, the price difference is smaller for those hotels of higher quality, precisely those hotels in which the cost of serving one more person should be the highest.

When choosing the price menu for single and double use of the same room, hotels engage in indirect price discrimination. Two people thinking in booking a room in a given hotel x, may choose to book two single-use rooms or just one double-use depending on the relative prices and their unobservable preferences for extra room space. If so, we can model the utility of any given couple as in Rochet and Stole (2002):

$$v_S = t(q)S - 2p_S - x(q)$$
$$v_d = t(q)S/2 - p_D - x(q)$$

Where v_S and v_D represent respectively the utility of booking two rooms for individual use and one room with double use; *t*(q) denotes the unobserved couple preference for space that depends on the hotel quality *q*; *S* is the space available for the couple if they rent two rooms, p_S and $p_D$represent prices for single and double use of the room and *x* represents an unobserved taste of the couple for the hotel x. With this specification, what we investigate in the empirical sections is whether the extra incentive to pay for more space is positively or negatively associated to the levels of individual hotel loyalty for distinct levels of hotel quality. In other words we are testing whether *cov(t(q), x(q))>0* for hotels with high *q* as it happens in Rochet and Stole (2002) or *cov(t(q), x(q))<0* for hotels of the lowest quality as in Stole (1995).

However, our empirical strategy needs to address the fact that we do not observe the marginal costs of production, though we do not expect these marginal costs of single and double rooms to vary significantly. For this analysis, we follow Busse and Rysman (2005) and we estimate the asymmetric effect on both price types of variations in market competition. Hence our identification strategy relies on the assumption that variation of competition does not affect marginal costs of servicing distinct types of hotel rooms.

More precisely we estimate a linear functional form:

$$p_{ikLt} = L + \beta_{it}k + \delta Competition_{it} + \mu Differentiation_{it} + \alpha_i + e_t + \varepsilon_{ikt} \quad (1)$$

Where p_{ikt} is the price of hiring a room of type *k* in hotel *i* that operates in location *L* at year *t*; *k* is the type of room (single-use or double-use); $Competition_{it}$ is measured using the number of hotels of the same category operating in the same location as well as the corresponding Herfindahl-Hirschman Index. $Differentiation_{it}$ is computed by the number of stars of the hotel. Finally, e_t represents time effects common across all hotels and α_i are hotel characteristics invariant across time. We assume that ε_{ikt} is i.i.d. and independent of the rest of the left hand side variables.

We are interested in estimating whether market competition affects asymmetrically the price of single-use versus double-use of the room and how this asymmetric response depends on the hotel differentiation strategy. More specifically we hypothesize:

$$\beta_{it} = \gamma_0 + \gamma_1 Competition_{it} + \gamma_2 Differentiation_{it} + \\ + \gamma_3 Competition_{it} Differentiation_{it} + v_{it} \quad (2)$$

If we substitute (2) into (1) we get:

$$p_{ikt} = L + \gamma_0 k + \gamma_1 Competition_{it} k + \\ + \gamma_2 Differentiation_{it} k + \gamma_3 Competition_{it} Differentiation_{it} k + \delta Competition_{it} + \\ \mu Differentiation_{it} + \alpha_i + e_t + v_{it} k + \varepsilon_{ikt} \quad (3)$$

We further assume that v_{it} is independent of type of room, *k*, and the Competition variables. Below we will estimate (3) using time fixed effects to account for e_t and location fixed effects to avoid biases coming from *L*. Therefore the remaining error term will be composed by $\theta_{ikt} = \alpha_i + v_{it} k + \varepsilon_{ikt}$. This error term indicates both the presence of heteroskedasticity (higher variance for those observations belonging to the same hotel and/or sharing the same room type) and autocorrelation of observations belonging to the same hotel since $\sigma_\theta^2 = \sigma_i^2 + k^2 \sigma_v^2 + \sigma_\varepsilon^2$ and $E[\theta_{ikt} \theta_{ikt-1}] = \sigma_i^2$.

For these reasons in our regressions below we use different econometric specifications that ensure that our results are not driven by any misspecification in our empirical analysis. More precisely, we run two distinct sets of regressions. One set of regressions will display clustered standard errors at the hotel level, also controlling for location fixed effects. This will make sure that autocorrelation and heteroskedasticity of observations belonging to the same hotel are not influencing the statistical significance of our coefficients. In additional analyses we also include hotel fixed effects that control for any differences across hotels. When we use this more demanding specification, we cannot include location fixed effects because hotels do not physically change location, though hotels can close down and their management open up a new one in another place. In this specification we use robust standard errors and bootstrapping to ensure that our standard errors are not affected by any type of heteroskedasticity.

Finally, it could be the case that – contrary to our identification assumptions- the term ε_{ikt} is not independent of the level of competition faced by hotel *i* at time *t*. This would be the case if unobserved shifts in demand across time for a given location would drive at the same time higher prices and a larger number of competitors. In the empirical analysis below we show how this endogeneity bias does not seem to be important since we report negative correlations between our competition proxies and price levels. However, we alleviate further endogeneity concerns by reporting estimations using instrumental variables. We estimate two-stage least square regressions using as instrumental variables the local regulations for each category regarding room size, bath and elevator. These local regulations make harder or easier to acquire a given number of stars and, therefore, they constitute good instruments for the number of competitors in a given location and category.

5. Estimation and Results

Differentiation and Prices

We start by exploring the interplay between quality differentiation and hotel prices. Table 2 shows average price levels for single and double rooms for hotels with different number of stars. Obviously, hotels with higher quality also demand higher room prices. The price of a double-occupancy room for a hotel with one star is around €58, but the price for a five-star hotel

jumps to €318. More interestingly, the difference between single and double room prices gets reduced for higher levels of differentiation; the difference between both prices is around 30% for hotels with one star and only 19% for five-star hotels. Close to 10% of five-star hotels in our sample have a single use room price identical to the double use price, yet this only happens for 2% of hotels with one star. Overall, we take these figures as informal evidence that these observed price differences are lower when -presumably- cost differences should be higher, this is, when the hotel has a higher quality service. Thus, we believe that differences in the marginal cost of providing the service do not explain the gap between single use and double use of the same room and there is indeed substantial price discrimination in the hotel industry in the prices charged for single vs. double occupancy of rooms.

TABLE 2 Mean prices and differences by category

Category	Number of Hotel/Years	Single (€)	Double (€)	Difference (%)	Hotels with same price (%)
1 star	3550	40.75	58.44	30.46	1.90
2 stars	6141	51.70	72.61	29.22	1.59
3 stars	8060	82.48	113.36	27.65	2.15
4 stars	4160	137.89	181.67	24.01	4.53
5 stars	294	253.11	318.45	18.89	9.69
Overall	22205	79.94	108.82	27.74	2.50

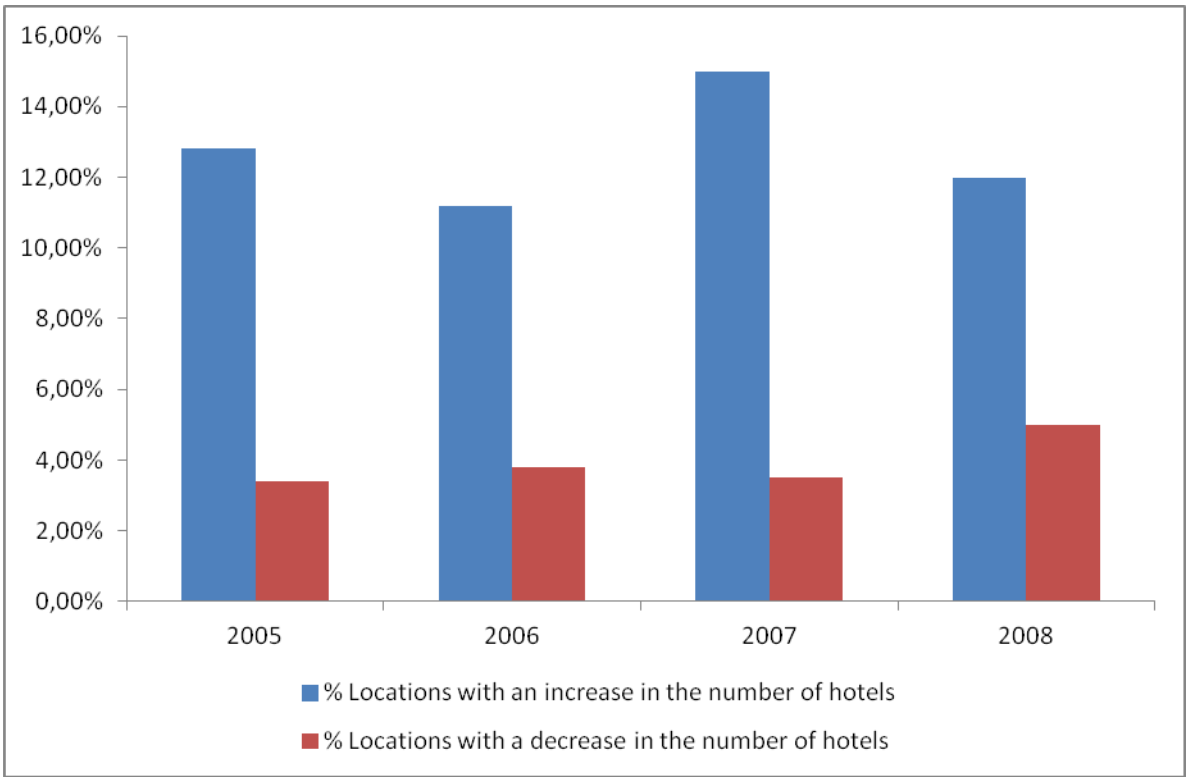
Difference (%) is the price of a double room minus the single room price divided by the price of a double room.

Hotels with same price (%) is the percentage of hotels that charge the same price for the single or double occupancy of a room.

Competition and Prices

Figure 2 shows how the degree of competition that the hotels in our sample face varies across time. Any given year there is around 11-15% of our locations, measured by zip code, with an increase in the number of hotels and between 3.4% and 5% of locations that experience a decrease in the number of competitors. In the empirical analysis below we exploit this source of variability in market competition to estimate the effect of competition on hotel pricing policies. In addition to this variation of competition across time, we also exploit within location variability because our measures of market competition take into account competitors in the same location and category.

Figure 2: Variations of numbers of hotels across locations



The basic relationship between competition and prices can be seen in Tables 3A and 3B. These tables display the results of estimating a set of regressions in which the dependent variable is either the price of a room for single use or the price for a double-use room. We run these regressions both pooling the data of the five years in our sample and using year-by-year cross-sections. Without exception, all the coefficients associated with our main proxy of market competition (Number of competitors in the same zip and HFI) are statistically significant and display the expected sign, although competition seems to impact somewhat more the price for double rooms than the price for single rooms. For example, using the coefficients of model (6) in Tables 3A and 3B, we can estimate that an increase of two standard deviations in the natural logarithm of number of competitors (Lplayers) would imply an average decrease in prices of around €12 for single use and €15 for the double use of the room. To avoid flooding the paper with tables, we provide the results for our second measure of competition (HFI) only for the entire 2004-08 period, but the coefficient is always positive and significant in every single year for both single and double rooms.

TABLE 3A Price regressions for single use rooms

Price Single Room	**2004** Model 1	**2005** Model 2	**2006** Model 3	**2007** Model 4	**2008** Model 5	**2004-08** Model 6	Model 7
Constant	11.02**	7.70*	1.39	1.60	-1.29	-5.72	-
	(4.30)	(4.58)	(4.35)	(4.94)	(5.13)	(4.37)	15.02***
							(4.90)
Lplayers	-5.05***	-5.86***	-5.56***	-7.66***	-6.20	-5.47***	
	(1.38)	(1.50)	(1.43)	(1.62)	(1.68)	(1.42)	
Category	27.47***	28.15***	28.12***	31.44***	33.00***	29.42***	29.59***
	(.95)	(1.01)	(.97)	(1.10)	(1.15)	(1.03)	(1.05)
Lrooms	-1.62	-.46	1.21	1.47	1.10	.60	.33
	(1.16)	(1.22)	(1.18)	(1.33)	(1.39)	(1.18)	(1.18)
Chain	14.95***	13.99***	15.16***	16.83***	19.73***	15.86***	15.82***
	(1.86)	(1.92)	(1.90)	(2.14)	(2.18)	(1.81)	(1.82)
Golf						-.02	-.11
						(.48)	(.48)
Convention						.68***	.61**
						(.26)	(.25)
HFI							8.01**
							(3.55)
Location d.	1608	1578	1639	1640	1642	1698	1698
Year d.						4	4
AdjR^2	.62	.60	.60	.60	.60	.73	.73
N	3671	3695	3930	3933	3951	19180	19180

Dependent variable: Single room price.
***, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Location dummies assigned to 5-digit zip areas.
Observations clustered by location in yearly analysis and by hotel in panel analysis.

TABLE 3B Price regressions for double use rooms

Price Double Room	**2004** Model 1	**2005** Model 2	**2006** Model 3	**2007** Model 4	**2008** Model 5	**2004-08** Model 6	Model 7
Constant	17.42***	14.99***	6.84	9.47	6.20	-2.67	-14.23**
	(5.30)	(5.57)	(5.39)	(6.12)	(6.31)	(4.83)	(5.70)
Lplayers	-6.79***	-8.31***	-7.18***	-8.92***	-7.32***	-7.02***	
	(1.70)	(1.82)	(1.72)	(2.01)	(2.06)	(1.90)	
Category	33.39***	35.67***	35.58***	39.59***	41.47***	36.83***	37.05***
	(1.17)	(1.82)	(1.21)	(1.37)	(1.41)	(1.35)	(1.38)
Lrooms	-.15	.57	2.26	1.98	1.56	1.53	1.17
	(1.43)	(1.49)	(1.47)	(1.66)	(1.71)	(1.39)	(1.39)
Chain	19.01***	16.70***	18.12***	20.85***	24.97***	19.55***	19.49***
	(2.29)	(2.34)	(2.36)	(2.65)	(2.68)	(2.35)	(2.36)
Golf						.38	.26
						(.72)	(.72)
Convention						.95***	.87***
						(.33)	(.33)
HFI							9.70**
							(4.07)
Location du.	1608	1578	1639	1640	1642	1698	1698
Year du.						4	4
AdjR^2	.62	.60	.59	.59	.60	.73	.72
N	3671	3695	3930	3933	3951	19180	19180

Dependent variable: Double room price.
***, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Location dummies assigned to 5-digit zip areas.
Observations clustered by location in yearly analysis and by hotel in panel analysis.

Main analysis

We now turn to the main goal of the paper, i.e., how the linkage between market competition and price discrimination varies depending on the degree of firm differentiation. Before resorting to fully fledged econometric techniques, we start analyzing the data by looking at simple correlations. Table 4 shows some preliminary evidence that the relationship between competition and price differences depends on the quality of hotels. The zero-order correlation between competition (Lplayers and HFI) is substantially smaller and the opposite sign for one and two star hotels than for four and five star hotels. This informal evidence suggests that competition is indeed negatively associated with price differences between single and double rooms for hotels with lower quality, but it is positively associated for hotels with higher quality.

TABLE 4 Zero-order correlations between competition and price difference

	Lplayers & Difference	HFI & Difference
1 & 2 stars hotels	-.05***	.04***
4 & 5 stars hotels	.24***	-.20***

We proceed next to estimate (3) to confirm this preliminary evidence. Table 5 displays the results for our two measures of competition and clustering the observations that belong to the same hotel in the panel analysis. Models 1 to 3 employ the natural log of the number of competitors (Lplayers) as proxy of market competition while Models 4 to 6 repeat the same regressions but utilizing the Herfindhal-Hirschman concentration index (HFI). In all models the dependent variable is hotel room price, using Type as a dummy variable for single room (Type=0) and double room (Tyep=1). Not surprisingly, hotels of higher category command significant higher prices, while the main effect of competition on hotel prices is negative and significant, based on both Lplayers and HFI. Model 3 of Table 5 shows how the interaction of Lplayers with Type of room exhibits a positive sign. Similarly, Model 6 shows that type of the room and competition has a negative sign when using HFI as proxy of product competition. Both interaction terms, contrary to but smaller than the main effect of competition, indicate that in the absence of differentiation, market competition decreases relatively more room prices for double use than single use prices and, therefore, reduces firm capability to price discriminate. This is consistent with the findings of Busse and Rysman (2005) that show how market competition reduces more the prices of the higher price advertisings in yellow pages.

TABLE 5 Room price regressions, panel analysis

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-19.19***	-16.50***	-5.13	-29.62***	-33.16***	-19.15***
	(4.37)	(4.36)	(5.04)	(5.06)	(5.08)	(5.63)
Type	29.99***	24.61***	8.43***	29.99***	37.09***	-1.85
	(.37)	(.47)	(1.44)	(.37)	(.70)	(2.25)
Category	33.13***	33.13***	28.74***	33.32***	33.32***	28.74***
	(1.14)	(1.14)	(1.54)	(1.16)	(1.16)	(1.74)
Lrooms	1.07	1.07	1.01	.75	.75	.67
	(1.22)	(1.21)	(1.21)	(1.21)	(1.22)	(1.22)
Chain	17.70***	17.70***	17.69***	17.65***	17.65***	17.64***
	(1.98)	(1.98)	(1.98)	(1.99)	(1.99)	(1.99)
Golf	.18	.18	.14	.08	.08	.04
	(.56)	(.56)	(.57)	(.56)	(.56)	(.56)
Convention	.81***	.81***	.79***	.74***	.74***	.72***
	(.28)	(.28)	(.28)	(.28)	(.28)	(.23)
Lplayers	-6.24***	-8.68***	-6.73***			
	(1.58)	(1.58)	(2.60)			
Type*Lplayers		4.86***	-4.66***			
		(.33)	(1.24)			
Category*Lplayers			-.36			
			(1.00)			
Category*Type			6.55***			13.24***
			(.66)			(.90)
Type*Lplayers*Category			2.74***			
			(.49)			
HFI				8.85**	15.47***	14.79**
				(3.63)	(3.64)	(6.68)
Type*HFI					-13.23***	10.40***
					(1.00)	(3.15)
Category* HFI						-.48
						(2.60)
Type* HFI*Category						-7.05***
						(1.35)
Location Dummies	1698	1698	1698	1698	1698	1698
Year Dummies	4	4	4	4	4	4
$AdjR^2$	.73	.73	.74	.73	.73	.74
N	38360	38360	38360	38360	38360	38360

Dependent variable: Room price.
Type is equal to one when the price corresponds to a double-use of the room.
**, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Location dummies assigned to 5-digit zip areas. Observations are clustered by hotel.

Yet, when we consider the interactions between competition, category, and room type in Models 3 and 6, we see that for higher category hotels, the negative effect of competition on prices is lower for double rooms than for single rooms, thus increasing price differences between single and double rooms. In other words, the Type*Lplayers interaction is moderated by the hotel category, as captured by the three-way interaction term Type*Lplayers*Category. This means that for more differentiated hotels competition increases significantly the ability to price discriminate, which is consistent with the findings of Borenstein and Rose (1994), who report that more competition is associated with higher price dispersion in the airline industry.

As three-way interactions may be difficult to interpret, we show in Table 6 simpler regressions in which the dependent variable is the relative difference between single-use and double-use prices. The two proxies of competition do not have a significant effect on the relative price difference between single and double rooms in Models 1 and 3, but the results from Models 2 and 4 in Table 6 confirm that indeed competition reduces price differences for hotels with lower quality and, in contrast, it increases price differences for hotels of higher category.

TABLE 6 Price difference regressions

	Model 1	Model 2	Model 3	Model 4
Constant	.295***	.333***	.301***	.264***
	(.013)	(.014)	(.013)	(.016)
Lrooms	.008**	.007**	.008**	.007**
	(.003)	(.003)	(.003)	(.003)
Category	-.018***	-.033***	-.018***	-.005
	(.003)	(.003)	(.002)	(.004)
Chain	-.016***	-.016***	-.016***	-.016***
	(.005)	(.005)	(.005)	(.005)
Golf	.001	.001	.001	.001
	(.001)	(.001)	(.001)	(.001)
Convention	-.001	-.001	.001	-.001
	(.001)	(.001)	(.001)	(.001)
Lplayers	.003	-.030***		
	(.003)	(.007)		
Category*Lplayers		.011***		
		(.002)		
HFI			-.006	.069***
			(.009)	(.019)
Category*HFI				-.027***
				(.006)
Location Dummies	1698	1698	1698	1698
Year Dummies	4	4	4	4
R^2	.45	.45	.45	.45
N	19180	19180	19180	19180

Dependent variable: Double room price minus single room price divided by double room price.
**, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Location dummies assigned to 5-digit zip areas. Observations clustered by hotel.

Overall, we interpret all of these results as clear evidence that the extent of differentiation moderates the relationship between competition and price discrimination. For firms that have

low differentiation in quality, as it arguably happens in the yellow pages industry studied by Busse and Rysman (2005), market competition decreases price discrimination, which we observe for hotels with 1 and 2 stars in our sample. In contrast, for firms with higher differentiation in quality (i.e., higher category hotels), market competition increases price discrimination, as Borenstein and Rose (1994) found in the airline industry, where differentiation was critical, especially before the growth of the low-cost carriers.

6. Robustness tests

In this section we conduct several robustness tests of our results to distinct econometric specifications and with different definitions of our competition and differentiation variables.

TABLE 7 Room price regressions by year

	2004	2005	2006	2007	2008
Constant	9.11**	3.56	1.57	3.87	5.26
	(3.84)	(4.12)	(3.98)	(4.53)	(4.68)
Type	7.74***	8.37***	7.91***	8.70**	9.08**
	(2.82)	(3.08)	(3.02)	(3.45)	(3.58)
Category	27.74***	30.19***	28.13***	31.11***	31.13***
	(1.08)	(1.17)	(1.13)	(1.29)	(1.34)
Lrooms	-.87	.12	1.71**	1.68*	1.22
	(.80)	(.85)	(.83)	(.94)	(.98)
Chain	16.97***	15.35***	16.63***	18.82***	22.37***
	(1.29)	(1.33)	(1.34)	(1.51)	(1.52)
Lplayers	-2.98	-2.10	-5.30**	-8.24***	-10.20***
	(2.40)	(2.50)	(2.43)	(2.75)	(2.81)
Type*Lplayers	-3.58	-3.68	-4.64*	-4.82*	-5.81*
	(2.48)	(2.60)	(2.54)	(2.89)	(2.97)
Category*Lplayers	-1.48*	-2.27***	.89	-.61	.60
	(.77)	(.80)	(.77)	(.87)	(.88)
Category*Type	6.28***	6.35***	6.43***	6.92***	6.95***
	(1.00)	(1.09)	(1.08)	(1.23)	(1.27)
Type*Lplayers*Category	2.13***	2.28***	2.66***	2.91***	3.31***
	(.83)	(.87)	(.84)	(.95)	(.97)
Location Dummies	1608	1578	1639	1640	1642
$AdjR^2$	.72	.71	.70	.70	.70
N	7342	7390	7860	7866	7902

Dependent variable: Room price.
Type is equal to one when the price corresponds to a double-use of the room.

***, **, * denote significant coefficient at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Location dummies assigned to 5-digit zip areas.
Observations clustered by location.

First, given the use of location fixed effects, our results above were found using two different sources of variability of our competition variable: variability of local competition across time and within location variation of competition, because the number of the same category competitors differs within a given location. We explore whether our results are robust to consider exclusively only one type of variability. For this, we first repeat the estimation of (3) using 5 cross-sections corresponding to each year in our sample. In this analysis the only source of variation in competition is within location. Table 7 reports the estimation of these cross-section regressions using Lplayers as proxy of competition (results for HFI are analogous). Though there are some minor differences across years, the triple interaction coefficients remain significant and negative each year. Thus, the results are qualitatively the same as in Table 5, which we interpret as evidence that our conclusions are not exclusively driven by across time variation of competition, particularly for the triple interaction.

Next, we take the opposite approach and we investigate whether our findings may be driven by within location variation of competition. For this purpose we construct competition variables that do not have within location variation. This is the same source of variation that Busse and Rysman (2005) employ to identify their results. More explicitly, we compute the number of competitors and HFI per zip code regardless of their category. Note that with these variables and location fixed effects the only variation of competition that identifies our results would be across time. Models (1) and (2) in Table 8 display the results of estimating our main set of regressions with the modified competition variables. Once more, we find qualitatively the same results as above, most critically for the triple interaction.

We also investigate how our results may vary if we change geographic boundaries to define hotel competitors. For this analysis, we use four-digit ZIP code rather than five-digit to identify all variables associated with geographical scope. The results of running the regressions with this enlarged market competition variables are shown in Models 3 and 4 in Table 8, where we find similar results to those we obtained before.

Finally, in all our specifications we use clustered standard errors at the hotel level to properly estimate standard errors. Yet this does not preclude that the existence of unobserved hotel characteristics correlated at the same time with prices, differentiation, and competition could be driving the results. It may be the case that an unobserved variable induces a given location to become particularly appealing for consumers of certain category hotels. If this is the case, consumers may be willing to pay a higher price for hotels of that category in that location and at the same time more hotels of that same category would be attracted to the location, driven by higher expected profitability. Therefore, this type of endogeneity bias would prompt a positive association between our product competition variables and price levels. With this possibility in mind, we estimate (3) using hotel fixed effects. The results are displayed in Table 9. Models 1 and 3 show the results with standard errors clustered by hotel while in Models 2 and 4 we report bootstrapped standard errors.

TABLE 8: Room price regressions with alternative definitions of competition and location

	Model 1	Model 2	Model 3	Model 4
Constant	14.35**	-21.60***	.48	-29.19***
	(6.93)	(5.21)	(5.14)	(4.81)
Type	9.59***	1.95	7.98***	.98
	(2.01)	(1.79)	(1.45)	(1.86)
Category	20.95***	31.44***	27.12***	30.34***
	(2.01)	(1.50)	(1.64)	(1.42)
Lrooms	.42	.80	1.21	.93
	(1.23)	(1.22)	(1.09)	(1.11)
Chain	17.66***	17.53***	18.01***	17.96***
	(1.99)	(1.99)	(1.85)	(1.85)
Golf	-.05	-.02	.82**	.81**
	(.56)	(.56)	(.33)	(.33)
Convention	.67**	.65**	.66***	.61***
	(.27)	(.28)	(.13)	
Lplayers	-10.41***		-12.46***	
	(2.70)		(2.36)	
Type*Lplayers	-2.47**		-2.67**	
	(1.03)		(.89)	
Category*Lplayers	2.95***		1.35	
	(.85)		(.86)	
Category*Type	5.27***	11.43***	6.49***	11.64**
	(.93)	(.75)	(.68)	(.76)
Type*Lplayers*Category	1.98***		1.85***	
	(.44)		(.36)	
HFI		51.51***		30.34***
		(9.97)		(6.66)
Type*HFI		8.21**		7.45***
		(4.01)		(2.76)
Category* HFI		-17.58***		-3.07
		(3.87)		(2.58)
Type* HFI*Category		-6.86***		-5.64***
		(1.83)		(1.21)
Location Dummies	1698	1698	1109	1109
Year Dummies	4	4	4	4
$AdjR^2$	.74	.74	.70	.70
N	38360	38360	38360	38360

Dependent variable: Room price.
Type is equal to one when the price corresponds to a double-use of the room.
**, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Location dummies assigned to 5-digit zip areas in Models 1 & 2 and 4-digit in Models 3 & 4.
In Models 1 & 2 competitions proxies, Lplayers and HFI, are computed based on the hotels in each five-digit ZIP code regardless of their category.
In Models 3 & 4 all variables affected by location scope (Lplayers, HFI, Golf, and Convention) are computed based on 4-digit zip areas.
Observations clustered by hotel.

Again, we find similar results as those reported above for both proxies of competition, Lplayers and HFI, especially for the three-way interaction that constitutes the main focus of our analysis. These results confirm our finding that the relationship between market competition and price dispersion is critically moderated by the hotel category.

TABLE 9 Room price regressions with hotel fixed effects

	Model 1	Model 2	Model 3	Model 4
Constant	45.01***	45.01***	28.24	28.24
	(16.09)	(16.62)	(18.05)	(16.07)
Type	8.43***	8.43***	-1.84	-1.84
	(1.49)	(1.36)	(2.32)	(1.98)
Category	7.81***	7.81***	13.35***	13.35***
	(3.02)	(2.78)	(3.08)	(2.87)
Lrooms	2.40	2.40	2.21	2.21
	(3.84)	(4.04)	(3.83)	(3.34)
Chain	2.52	2.52	2.57	2.57
	(1.72)	(1.67)	(1.72)	(1.57)
Golf	-.25	-.25	-.15	-.15
	(.51)	(.47)	(.51)	(.42)
Convention	.27	.27	.32	.32
	(.20)	(.17)	(.20)	(.23)
Lplayers	-9.58**	-9.58***		
	(3.90)	(3.42)		
Type*Lplayers	-4.66***	-4.66***		
	(1.28)	(1.12)		
Category*Lplayers	3.12**	3.12**		
	(1.40)	(1.23)		
Category*Type	6.55***	6.55***	13.24***	13.24***
	(.68)	(.61)	(.93)	(.76)
Type*Lplayers*Category	2.74***	2.74***		
	(.50)	(.43)		
HFI			15.17*	15.17**
			(7.98)	(7.65)
Type*HFI			10.40***	10.40***
			(3.25)	(2.21)
Category* HFI			-4.73	-4.73
			(3.07)	(2.99)
Type* HFI*Category			-7.05***	-7.05***
			(1.40)	(.94)
Hotel Dummies	4054	4054	4054	4054
Year Dummies	4	4	4	4
$AdjR^2$	.92	.92	.92	.92
N	38360	38360	38360	38360

Dependent variable: Room price.
Type is equal to one when the price corresponds to a double-use of the room.
**, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Hotel fixed effects for all models.
Clustered standard errors by hotel for models 1 and 3. Bootstrapped standard errors for models 2 and 4.

Next, we alleviate further endogeneity concerns by estimating (3) using instrumental variable regressions. We want to check that our results are not driven by omitted variable biases, such as shifts in demand preferences that could jointly determine room prices and competition. For this, we exploit the regional regulation of hotel category that characterizes the Spanish hospitality industry. The local requirements to grant a determined number of stars are not uniform across Spanish regions and we use these distinct requirements to construct instrumental variables for our market competitions proxies. More explicitly we utilize the following instruments:

- *Reg_elevator*: The requirement of having an elevator to grant a given hotel category in stars varies across regions. For example, in the local region of Murcia the firm is not regarded as a one star hotel (vs. pension or hostel with lower level of required services) unless the building has an elevator, provided that the hotel has two or more floors. On the contrary, in the region of Navarra, a one-star hotel does not require the presence of an elevator unless the hotel has four floors or more. We exploit this regulatory source of variation in competition levels across geographical regions by creating a variable, *reg_elevator*, whose value is equal to the number of floors that require an elevator according to local regulations for its category.
- *Reg_bath*: Local regulations differ in the minimum prerequisites about percentage of rooms with complete bathrooms to qualify for any number of stars. For example, in the Balearic Islands, three-star hotels are not required to have any percentage of rooms with complete bathrooms. On the contrary, in the Canary Islands, all three-star hotels should have a 100% of rooms with complete bathrooms. This variable captures the percentage of rooms required to have a complete bathroom inside for each category.
- *Reg_room*: Finally, there is regional variation on the requisites about living room size. For instance, while in the region of Madrid five-star hotels are not demanded to have any minimum size, in the Andalusia region a five-star hotel should have a living room whose size is at least equal to 4 square meters per host. We compute this variable as the minimum size of the hotel living room as measured by the required number of square meters per host for each category.

These distinct regulatory requirements influence the costs needed to qualify for any given hotel category. A distinct value of all three regulatory variables should influence the costs of operating a hotel. As a result, they introduce exogenous changes in the number of competitors of a given category and this is why they are excellent instruments for our competition proxies. Their value depends on which of the seventeen Spanish regions the hotel is located as well as the corresponding hotel category (from one to five stars). Table 10 displays descriptive statistics of these instrumental variables.

TABLE 10 Descriptive statistics of instrumental variables

	Mean	Std
Reg_elevator	1.03	.19
Reg_room	2.14	1.08
Reg_bath	98.98	9.89

TABLE 11A Room price regressions with fixed effects, 2SLS, first stage results

	Dependent variables							
Instruments	Lplayers	Type* Lplayers	Categ* Lplayers	Type* Categ* Lplayers	HFI	Type* HFI	Categ* HFI	Type* Categ* HFI
Constant	1.06***	.07	.09	.26	.48***	-.02	-.14	-.09
Type	-.05	1.01***	.24	-.07	-.00	.51***	-.08	-.08
Category	-.25***	-.16***	.24*	-.53***	.12**	.04***	.89***	.15***
Category*Type	-.02	.02	-.10	1.13***	.00	.03	.04	.63***
Lrooms	.00***	.00***	.01***	.00***	.00	.00	-.00***	-.00***
Chain	-.04	-.02	-.09	-.04	.00	.00	-.02	-.01
Golf	.04***	.02***	.14***	.07***	-.03***	-.01***	-.08***	-.04***
Convention	.13***	.06***	.39***	.19***	-.04***	-.02***	-.10***	-.05***
Reg elevator	-.47***	-.08**	-.13	-.28**	.19***	.02**	.07	.08**
Reg elevator*cat	.10***	.08***	-.15	.27***	-.05**	-.02***	.03	-.08***
Reg elevator*type	-.04**	-.34***	-.00	.46	.02**	.16***	-.01	-.10
Reg elevator*cat*type	.01	-.07	-.03*	-.74***	-.00	-.01	.01	.20***
Reg bath	.00	-.00	-.01***	-.00	.00	.00	.00	.00
Reg bath*cat	.00	-.00**	.00***	-.00**	-.00	.00**	-.00**	.00**
Reg bath* type	.00	.00	-.00	-.01	-.00	-.00	.00	.00
Reg bath*cat*type	-.00	.00**	.00*	.01***	.00	-.00*	-.00	-.00***
Reg room	-.04***	-.00	-.10***	-.01	.01***	.00	.02**	.00
Reg room*cat[i]	--	---	---	---	---	---	---	---
Reg room*type	-.04	-.11***	-.06	-.17**	.00	.02	.01	.04
Reg room*cat*type	.01	.02*	.02	.03	-.00	-.00	-.00	-.01
Year Dummies	4	4	4	4	4	4	4	4
AdjR^2	.61	.57	.70	.61	.41	.63	.52	.63
F test of excluded instruments	11.12***	24.92***	9.80***	24.57***	5.43***	21.34***	4.62***	21.12***
AP test[ii]	4.26***	2.70***	3.65***	3.27***	2.26**	1.70*	1.97**	2.70***
N	38360	38360	38360	38360	38360	38360	38360	38360

Type is equal to one when the price corresponds to a double-use of the room.
**, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Observations clustered by hotel.
[i] Omitted because of collinearity.
[ii] Angrist-Pischke multivariate F test of excluded instruments

Table 11A displays the results of the first stage regressions of the 2SLS in which the dependent variables are our competition proxies as well as their interactions with hotel differentiation and room type. Table 11B reports the corresponding estimates of the second stage regression in which again we find that market competition seems to reduce (increase) the ability of low (high) category hotels to price discriminate. Note that the F tests of excluded instruments

and the Angrist-Pischke multivariate tests reported in Table 11A indicate that none of the estimates of endogenous variables suffer from a weak instrument bias (Stock, Wright and Yogo, 2002) when we use log of players as proxy of market competition. When we employ the Herfindahl Index we can also reject the presence of weak instrument biases, although in this case the Angrist-Pischke test is only marginally significant for the coefficient that estimates γ_1 in (3).

TABLE 11B Room 2SLS price regressions, second stage

	Model 1	Model 2	Model 3	Model 4
Constant	23.88**	23.88***	-25.40	-25.40*
	(11.55)	(6.71)	(23.30)	(15.28)
Type	24.69***	24.69***	-22.13***	-22.13
	(5.60)	(8.26)	(8.50)	(22.22)
Category	12.69***	12.69***	72.54***	72.54***
	(4.28)	(2.41)	(13.89)	(7.05)
Lrooms	-.09***	-.09***	-.05*	-.05***
	(.03)	(.01)	(.03)	(.01)
Chain	29.87***	29.87***	26.49***	26.49***
	(2.98)	(1.13)	(2.86)	(.92)
Golf	.79	.79	-.36	-.36
	(1.59)	(.61)	(1.68)	(.56)
Convention	-8.76***	-8.76***	-5.59***	-5.59***
	(1.66)	(.61)	(1.35)	(.49)
Lplayers	-20.47	-20.47**		
	(13.80)	(7.98)		
Type*Lplayers	-23.50***	-23.50**		
	(7.33)	(10.09)		
Category*Lplayers	27.63***	27.63***		
	(6.63)	(3.20)		
Category*Type	-.52	-.52	22.04***	22.04***
	(1.80)	(3.42)	(2.85)	(7.62)
Type*Lplayers*Category	10.17***	10.17***		
	(2.21)	(3.65)		
HFI			42.00	42.00*
			(36.94)	(24.37)
Type*HFI			44.87***	44.87
			(13.00)	(34.93)
Category* HFI			-63.01***	-63.01***
			(20.29)	(10.84)
Type* HFI*Category			-22.88***	-22.88*
			(4.61)	(12.39)

Year Dummies	4		4	4
$AdjR^2$	.01	.02	.12	.12
N	38360	38360	38360	38360

Dependent variable: Room price.
Type is equal to one when the price corresponds to a double-use of the room.
**, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Observations clustered by hotel for models 1 and 3.
Standard errors bootstrapping for models 2 and 4.

We discuss now whether there might be additional unobserved factors that could explain our findings, especially with regard to hotel costs. Most hotel costs - like the real state cost and building and decorating the hotel- are fixed costs of production that do not depend on the number of customers. These fixed costs could be affected by competition in the marketplace since a large number of hotels may drive up real estate prices as well as the cost of construction and decorating. However, most of these fixed costs should not have an impact on room prices since most of our hotels have been built years before our sample period and, therefore, changes in competition should be unrelated to any changes in the fixed portion of hotel costs.

Yet, it could be the case that some hotels have undertaken a major reform in our sample period whose costs might have been higher in more competitive locations, but even in this case the costs of servicing single and double use of the same room should be equally affected and, therefore, this type of unobserved factor should not explain our results.

Another possibility is that competition in the marketplace may increase hotel variable costs. These variable costs are mainly the personnel needed to clean and maintain the rooms and its main component is unskilled workers' compensation. It could be the case that an increase in competition in a given location generates higher demand for unskilled labor that translates in a local increase of wages per hour. These higher costs may affect proportionally more differentiated hotels that offer higher quality service that is more labor intensive. Hence, the increase in labor costs may affect proportionally more the prices of double rooms especially in more differentiated hotels. However, we do not believe that this alternative explanation is actually driving the results. On the one hand, the greater costs of maintaining a double room are likely to be only minimally greater than the costs of maintaining a room that was used only by one guest. On the other hand, we obtained similar results when we explicitly controlled for average wages in the hospitality industry in each geographical area. With this purpose we cross our dataset with data coming from the administrative records of the Spanish Social Security, more precisely the 2006 wave of the Spanish Continuous Sample of Working Histories (CSWH) ("Muestra Contínua de Vidas Laborales"). This dataset is formed by a 4% random sample of all individuals who have had an affiliation with the Spanish Social Security during 2006[1]. Because the data for hotel wages is only available for the largest locations, the number of observations drops to 16,412 hotel/years. In Table 12 we replicate our estimation of (3) above including as a

[1] We thank the generosity of Daniel Fernández-Kranz in providing us with these data.

control local hospitality wages obtaining the same qualitative results as above. The impact of price competition on price discrimination is negative (positive) for low (high) category hotels.

TABLE 12 Room price regressions controlling for local labor costs

	Model 1	Model 2
Constant	-10.26	-12.97*
	(7.35)	(7.57)
Type	10.70***	4.84**
	(1.69)	(2.05)
Category	27.83***	25.76***
	(1.52)	(1.86)
Lrooms	2.05	1.78
	(1.38)	(1.37)
Chain	17.31***	17.45***
	(2.13)	(2.14)
Golf	1.51	1.42
	(1.04)	(1.04)
Convention	-.15	-.20
	(.36)	(.36)
Log Local Wages	3.14*	3.23*
	(1.85)	(1.86)
Lplayers	-1.17	
	(2.86)	
Type*Lplayers	-2.70**	
	(1.32)	
Category*Lplayers	-1.30	
	(1.07)	
Category*Type	4.97***	10.05***
	(.75)	(.85)
Type*Lplayers*Category	2.08***	
	(.53)	
HFI		3.74
		(7.67)
Type*HFI		5.88
		(3.37)*
Category* HFI		1.51
		(2.86)
Type* HFI*Category		-5.37***
		(1.47)
Location Dummies	1125	1125
Year Dummies	4	4
$AdjR^2$	.76	.76
N	16412	16412

Dependent variable: Room price.

Type is equal to one when the price corresponds to a double-use of the room.
**, **, * denote significant coefficients at .01, .05 & .10 level respectively.
Standard errors in parenthesis below each coefficient.
Location dummies assigned to 5-digit zip areas.
Observations are clustered by hotel.

7. Conclusion

In the context of the Spanish hospitality industry this paper provides strong empirical evidence that the linkage between product market competition and price discrimination crucially depends on firm differentiation strategies. For those companies that sell a service of relatively higher quality, product market competition is associated with more price discrimination while the opposite happens for companies that offer an undifferentiated service.

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