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Quality of Ski Resorts and Competition Between the Emilian Apennines and Altipiani Trentini. an Estimate of the Hedonic Price.

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We use the hedonic framework to estimate and simulate the hedonic ticket prices of 19 ski resorts in the Emilian Apennines and Altipiani Trentini. To do so, we combine data on lift facilities and slopes from several sources as well as climatic data and characteristics of the ski resorts over the 2008-2012 winter seasons.

Hedonic logarithmic regression models are estimated for weekdays and weekends lift-ticket prices. The characteristics or attributes include any facility or service available to skiers which implicitly represents the value of their skiing experience. Our robust regressions yield precise and consistent estimates of positive effects on ticket prices. We find that the willingness to pay for the quality and diversification of slopes and the length of ski runs tend to be higher than the transport capacity, the altitude of the slopes or the other characteristics of the chairlifts.

Then, we use our estimates to predict the lift-ticket prices of the sample resorts as a measure of their quality and attractiveness. We found that the perception of skiers is very selective and their choices are based on the values of the characteristics of the ski resort.

Keywords: *Hedonic price, ski resorts, Emilian Apennines, predicted prices*

JEL Classifications: *D4; R5; C31*

1 Introduction

Various studies indicate that a significant number of ski resorts are vulnerable to the effects of climate change, especially those situated at low altitudes (below 1500 m). The economic literature has examined the negative economic effects of climate change on ski resorts and the mountain economy, extending the analysis to the assessments of visitors' price perception, and the price competition among international ski destinations (for example, Breiling M et al. 1999, Elsasser Burki 2002, Burki, Elsasser, Abegg 2003, OECD 2007, Wall 1992, Madison 2000, WWF 2006, Koslow 2006, Falk 2008).

In this paper, we will touch on these issues as we focus on skiers' perception of the lift tickets across three Italian regions. Our aim is to identify the extent and the determinants of the price differences in the Apennines. We will not discuss possible adaptation strategies.

The ticket pricing system generally falls into one of two categories, depending on the length of the stay: a season or multi-day ski pass or a one-day lift ticket. The first model is for those who have a second home or the economic means to pay for hotel accommodation and thus will stay on site. These visitors bring benefits to the ski resort beyond the revenue of the lift ticket, and the multiplier effect sustains the local economy. The one-day ski pass, instead, is for those skiers who use primarily only the lift facilities; some rent ski equipment from local shops, and they eat in the local cafés and restaurants, and then go home the same day. The benefits these skiers bring to the other businesses and accommodation facilities are thus much more limited. The characteristics of the ski resort are therefore very important; they directly shape the quality and the number of customers the resort attracts. This is especially true for a region like Emilia Romagna, where the revenue from multi-day lift tickets is relatively small compared to the overall total turnover of winter visitors.

Moreover, the operational model of these ski resorts and the additional cost of energy and snowmaking are also relevant for low altitude ski resorts. Since the specific activity of the lift operators is defined on the basis of an infrastructure-intensive mix of resources, they bear a higher proportion of fixed costs. The return of the investments tends to be more vulnerable and the number of customers must be considered carefully, particularly when most of the revenue comes from daily skiers. These skiers, who on weekends account for more than 90 percent of the total revenue, bear the greatest share of fixed costs, both in relative and absolute terms. The local communities are often unaware of this simple problem and thus tend to ignore the fact that the externalities of the lift facilities may become negative in the future. Furthermore, the local development models continue to be seen as a sum of different activities instead of as an integrated system that takes into account a greater share of multi-day skiers.

Ticket pricing is therefore one of the most important strategies to promote the ski resort. First, because the price of a one-day lift ticket (as well as the seasonal or multi-day passes) is the expression in value of all internal and external characteristics of the offered service. Second, because the consumers compare the price when they choose among the various alternatives and destinations. In short, ticket price is a good proxy for the perception of the quality of received services.

Pricing strategies are more flexible than other marketing and promotion strategies and are more easily adaptable to the changing market environment. They can be adapted to service intensity and its duration; in fact, ski resorts tend to record peak attendance on weekends and low demand on weekdays. In addition, different prices can be charged when considering the contribution of innovative lift technologies or other specific resort facilities. The price should also be adapted to the internal and external factors of the ski resort in order to compensate for the unpredictability of winter conditions. The ticket price, at the end, is the result of an interactive process that must guarantee a financial return on investments and preserve the economic sustainability of the resort (Hamilton et al. 2003).

The objective of this study is to measure how visitors evaluate the structural characteristics of a ski resort and how much they are willing to pay the lift ticket[1]. Unlike the Alpine resorts, Apennine ski resorts face the problem of a greater consumption of natural resources (in particular energy) and higher operation costs (in particular for snowmaking), that endanger the sustainability of the ski resorts[2]. The winter sports market is mature and satured, having shown no significant increases over the last decade, while consumer demand is moving to less traditional services. Ski resorts, in particular in the Alpine regions, have responded aggressively and the stronger competition has forced local operators to propose more expensive services like artificially made snow and non-sport diversification of the area. In addition to traditional downhill skiing, the demand for sports has increasingly shifted towards freeskiing, snowboarding, Nordic walking, and trekking, which partly make use of the lifts.

The paper is organized as following. Section 2 provides a brief review of the recent literature on hedonic price for lift tickets. Section 3 presents the model. Section 4 presents the methodology and the study area. Section 5 describes the variables and the data. Section 6 presents the results of the estimates. Section 7 discusses the predicted prices estimation. Finally, further steps are discussed in conclusions.

2 The Pricing of the One-Day Lift Ticket

Ski resorts generally adopt pricing techniques that include heterogeneous tools and methods, from the traditional cost-based/cost-plus to the most dynamic and strategically oriented methods that stimulate the competitive prices and focus customer preferences.

However, when these features are put into practice, they lose their effectiveness in a complex and competitive operating environment (Arnold et al., 1989). For example, the main disadvantage of cost-based pricing is that unit costs are difficult to assess and this methodology may lead to over- or underpricing. Likewise, fixing price targets with customer-oriented methodologies requires extensive market research, which is expensive and whose outcome is uncertain when one considers the reluctance of consumers to declare their

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[1] This research is part of the broader Nuova Energia Project of Emilia Romagna Snow, whose aim was to assess the impact of energy consumption on current ski resort operations and to evaluate the sustainability and the potential for innovation represented by the renewable energy resources in the region. A first draft of this paper was presented at the Conference "The Economics and Management of Leisure, Travel and Tourism" Rimini, 28-29 November 2011.

[2] Many positive initiatives can be undertaken in the name of sustainability. A conceptual definition has been proposed by Tania del Matto and Daniel Scott (2009). The vision of sustainability considers three conventional categories (environmental, economic, and social). Decision-making is based on the integration of all the requirements of efficiency and sustainability.

willingness to pay (reserve price) (Danziger et al. 2006). Therefore, in the case of lift operations and ski run management, the model of price-driven competition assumes that the operators know the prices charged by competitors and they behave as oligopolists with implicit or tacit agreements. Each pricing technique therefore has its merits and weaknesses.

Few works investigating this topic have been published. Barro and Romer (1987) used the pricing model of winter resorts to argue the efficiency of standard business ticketing practices, both in terms of consumer welfare and in allocative efficiency. Since the utility of the service is determined by the number of runs possible for the skier, the authors found that the vertical drop and the lift capacity affect the prices of lift tickets.

More recently, Mulligan and Llineares (2003) presented an econometric model to measure the effects on the ticket price of innovation in the transport systems (high-speed, automatic lifts). Based on the empirical evidence of 400 North American ski resorts, the authors highlighted the disincentive to technological innovation in the presence of first-movers, since innovation, and in particular expensive innovation, has been used as a deterrent for entry of new competitors. The basic notion is that a firm adopts a product or service innovation when it can attract more buyers who have a preference for that product or service and are willing to pay higher prices to obtain it. Ski resorts with high-speed lifts increase their capacity, which is interpreted by their competitors as a credible threat to expanding production and reducing prices to unprofitable levels (Mulligan 2006).

A set of works, conducted by Falk (2008, 2011) reached different conclusions for the Alpine winter resorts: technological innovation, measured by the quality of the lift, has a positive competitive effect on the prices of lift tickets since it incorporates skiers' perceived values.

For Bouter (1998) and for Borsky and Raschky (2009), the choice of winter resorts may be extended to the characteristics of the landscape, the snow-covered slopes, and the fresh air or other natural environment amenities; skiers are willing to pay in order to satisfy the various motivations they have, including their desire for risk-taking and for adventure.

Finally, Koslow (2006) extended the analysis to other activities beyond the typical skiing experience on the slopes. The author defined these activities as "non-participatory", since winter resorts may offer other leisure facilities, such as accommodation, spas, restaurants, entertainment and shopping. These characteristics, and the lift capacity, have a positive relationship with the price of the lift-tickets.

In this study, we apply the hedonic price method, developed by Rosen (1974). The hypothesis is that products are differentiated by measurable characteristics or attributes and that those characteristics are valued by consumers, who assign to each an economic value. This value is in turn reflected in the price of the product or service. There is also an explicit reference to Lancaster's demand theory (1966), which combined the utility of the consumer not only with his/her needs but also with the differential characteristics of goods and/or services.

Accordingly, the price of the lift ticket incorporates a set of qualitative characteristics. Lift ticket price differences depend on the value attributed by the consumer to the various characteristics of the resort. The model predicts that if these attributes are valued positively, the consumer will be willing to pay a higher price and vice versa, if the features have a negative value.

The lack of data on skier visits precludes the estimation of the determinants with the traditional demand function established by the ticket prices and skier visits relationship[3]. Using the hedonic approach, we explain the price regression in terms of characteristics (attributes) of the ski resorts across three Italian regions and in particular we control for these differences using other quantitative or qualitative variables. In this case, the characteristics of the ski resort are the benefits and the associated economic costs. For example, the length of the slope positively affects the ticket price, while the poor quality of snow can be a cost due to a lower consumer willingness to pay.

Falk (2008, 2011) and Pawlowski (2010) recently carried out a comparison among European ski resorts: the average ski ticket costs around € 22 per day (Switzerland +6 per cent, Germany -22 per cent). In the 2006-2007 ski season the average ski ticket price at the 35 Italian resorts was € 23.27, lower than in Switzerland, but 5 per cent higher than the overall average in Austria, France, and Germany (Pawlowski 2010). Excluding Italy, the same ranking was confirmed by Falk (2011) for the 2010/2011 season. One-day lift tickets for adults were € 39 in Switzerland, followed by Austria (€ 37) and France (€ 34).

These studies that examined the determinants of the skiers' demand and their willingness to pay reached some econometrically strong conclusions:

1. The estimated prices are aligned with the observed prices;
2. The estimated prices (hedonic prices) can be broken down into different characteristics, and a monetary value (willingness to pay) can be assigned to each attribute of the ski resort;
3. The different prices charged by the ski resorts can be explained by the differences in the values of the characteristics;
4. In terms of the altitude (ALT), skiers are willing to pay 19 cents for each 100 meters of altitude in the Italian ski resorts, the lowest monetary value among the sample, compared to 58 cents in Germany and 46 cents in France. This means that in Italy consumers evaluate the difference in the altitude between the highest (3480m) and the lowest (1440m) ski resorts at around € 3.90;

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[3] While most ski resort owners and operators collect data on skier days and other technical data, the operators and the lift or ski associations are reluctant to reveal this information.

5. Consumers are willing to pay 4.4 cents in Italy for each kilometer of slope, compared to 1.8 cents in France or 5.4 cents in Austria. Since the difference between the longest (165 kilometers) and the shortest slopes (1.4 Km) is 163.6 km, consumers in Italy are willing to pay around € 7.30 for each kilometer of slope. The same length in Austria has a value of € 8.10, while in France it is € 4.20.

3 The Model

Theoretically, there is no indication concerning the functional form assumed by the equation [1]. The econometric techniques offer different specifications, focusing on the linear, the semi-logarithmic, and log-linear relationships. In this work, we compared all specifications, but only the logarithmic specification will be presented as it showed the best fit.

The function to be estimated is as follow[4]:

$$\ln P_i = \alpha + \beta ln X_i + \epsilon_i \tag{1}$$

where P is the price of lift ticket and X are the characteristics of the ski resort. All variables, excluding those measured as ratios, are expressed in natural logarithm.

The econometric estimate provides values for the coefficients α and β, which can be used to calculate the predicted price by consumers.

The standard interpretation of coefficients is that a 1 per cent change in the independent variable X_i will result in the corresponding regression coefficient change in the expected value of the dependent variable P_i, while the other predictors are held constant. Therefore, the coefficient β identifies an elasticity.

Then, comparing the predicted price with the actual ticket price we have an estimate of the difference in appreciation by consumers.

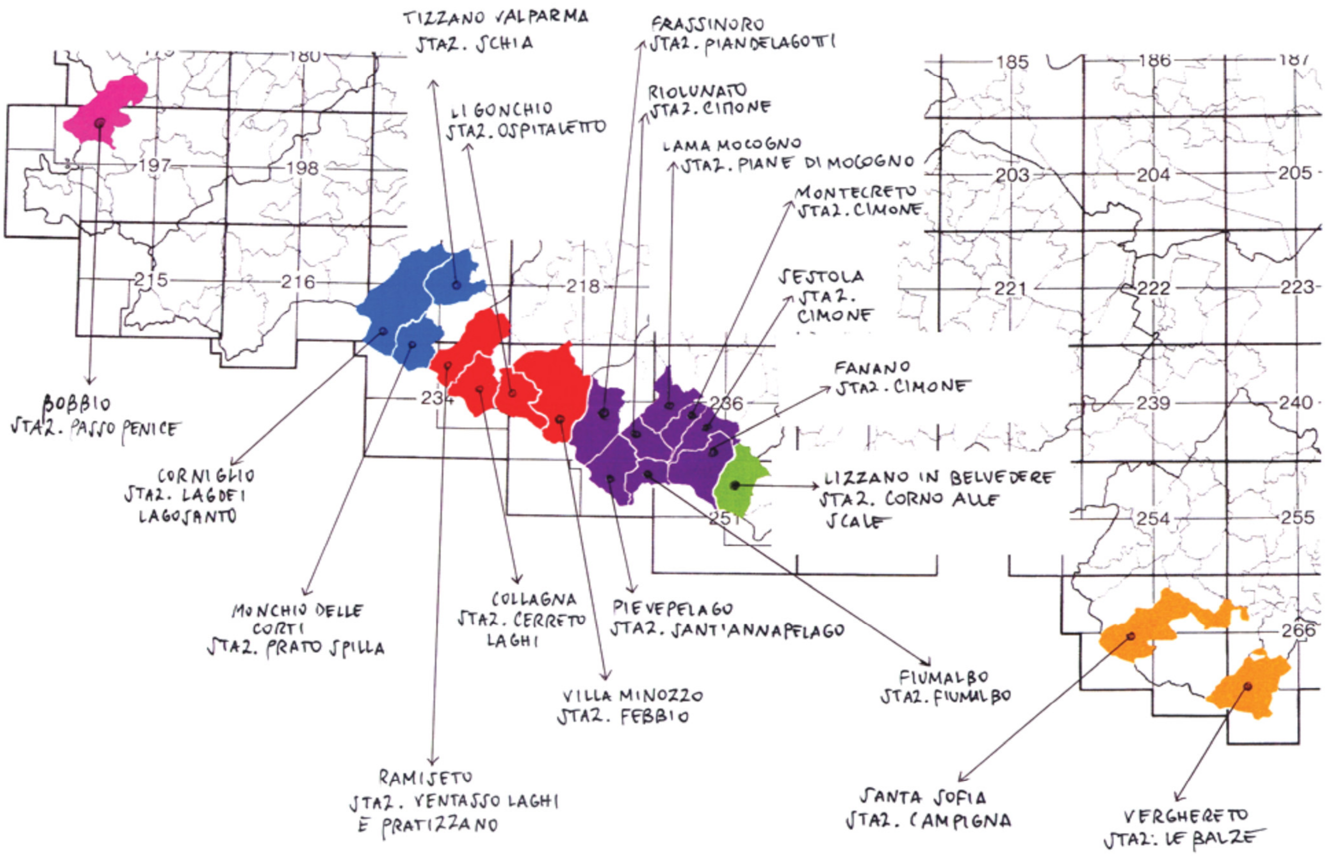
4 Methodology and the Study Area

The study is based on one-day adult lift ticket prices for all 15 ski resorts of the Emilia-Romagna Apennine Ridge, which goes from the province of Piacenza to that of Forli. Figure 1 displays the ski resorts included in the study. As direct competitors for the same customer basin, we added the Abetone ski area in the Tuscany Apennine near to Corno alle Scale and Cimone and Altipiani Trentini, an alternative destination with excellent facilities for alpine skiing that can be reached in two hours driving.

Ski prices in the study area vary with respect to their physical attributes and location characteristics, and are subject to different levels of competition. As can be seen from the map in Figure 1, the study area contains 15 resorts, with a concentration in the provinces of

[4] Similar results were obtained using a linear or a semi-logarithmic specification

Modena, Bologna, and Reggio Emilia.



Source: Nuova Energia, Intermediate Report of 2 August 2011.

We selected a number of ski resort characteristics. The lift ticket prices were extracted from the ski resort web pages for the four winter seasons from 2008/2009 to 2011/2012, while the other technical information regarding the characteristics of the slopes and the lifts were obtained from a number of sources such as USTIF (Ministry of Transport), world-lift.info, skiinfo.it, and ski resorts websites (table A1).

Data for snow depth at the resort level were available from the stations of ARPA-SIM (Emilia Romagna) and PAT (Trentino). The stations were selected according to the following requirements: (i) close to ski resorts), (ii) located at altitudes close to the ski area base levels (at least 1000 meters), and (iii) able to measure the depth of the snow in the winters from 2008 to 2012. The daily data were processed by calculating the monthly and seasonal average from December 1 to April 15. In addition, we tested the alternative indicator proposed by Falk for the snow conditions (ALT) as a weighted average of the uphill lift stations for each ski resort.

Data were accessed on April 2012[5]. Lift systems included detachable chairlifts, fixed-grip chairlifts, and MGD gondola lifts, as well as surface lifts and moving walkways. The information on lift characteristics included the lift capacity in persons per hour, vertical drop in meters, year of installation, and altitude of the highest lift station. Considering the different sources and methodologies, all data were checked to ensure accuracy and reliability. We collected information on a total of more than 120 chairlifts, cable cars, and other lift systems.

These administrative data were transferred into a database which included ticket prices, days open, slope types with length and characteristics, lift types with length, speed, capacity, owners' names and addresses, managers' names and addresses, USTIF code, and other relevant technical characteristics (chairlift, ski lift, vertical length, altitude, code number, year of opening). There was also information relating to any structural improvements of the ski resort, in particular the amount of investment over the last 10 years supported by regional law n. 17 of 2002.

Neighbourhood characteristics for each ski station were obtained from ISTAT, 2001 Census of Population and Household Characteristics (or more updated references for the demographic patterns) and the 2010 Tourism statistics from ONLIT.

5 Variables and Data

5. 1 Variables

As discussed by Falk (2008), Mulligan - Llinares (2003), Olmstrom - Muning (1998), Koslow (2006) and Pawlowski - Pawlowski (2010), ski resorts differ in several ways and features. The characteristics may be associated with demand-driven elements such as visitors' preferences, their disposable income, and willingness to travel from their hometowns, or may be related to factors that explain the production of this particular touristic service. Falk (2008,

[5] Most of this information was available on the websites of the ski resorts but can also be found at other sources: http://www.skiinfo.it/stazioni-sciistiche/italia-EIT-96-it.jhtml has seven stations: Cerreto Laghi, Cimone, Corno alle Scale, Piendelagotti, Piane di Mocogno, Pratospilla, St. Anna Pelago; http://www.appenninobianco.it/ shows all 15 ski resorts of the Emilia. Additional information was collected from magazines that offer detailed information on ski resorts (such as www.montagnaonline.com) or catalogs, which are always useful. The data on the ticket prices, the vertical drop, the type of ski lifts were taken from http://www.emiliaromagnaturismo.net, http://www.neveitalia.it, www.skiinfo.it, www.dovesciare.it. As shown by the research group Nuova Energia (2011), ski resorts in Emilia Romagna generally treat visit data, income, expenditure, water and power consumption, and even snow cover as commercially confidential and very little relevant information appears in their annual reports. Despite heavy public subsidies for the operation of the ski lifts, the Regional Administration does not require additional reporting that could help to assess the ex-post efficacy of the support policies.

2009) distinguishes supply-related factors as internal or external factors. Internal factors are those that are entirely under the control of ski resort operators and include lift capacity, the development of ski runs, snowmaking capacities and operations. External factors include natural snow conditions and all additional amenities, services, and accommodation that increase the attractiveness and the value of the ski resort, as well as its elevation and the landscape. In addition, the technical literature suggests to include among the internal factors the speed on the line between terminals, the comfort and the safety of the lifts, and a balanced proportion of slopes (35 per cent beginner, 35 per cent intermediate, 20 per cent advanced and 10 per cent expert).

Therefore, according to the literature and available data, the indicators for a resort's quality are the following:

P: Price of one-day lift ticket in four winter seasons (from 2008/2009 to 2011/2012), distinguishing between weekdays and weekends;

KM: Length of the ski runs (in km). We expected that the length of the slopes would increase the attractiveness and the value for the skiers;

VTMH: Total vertical transport capacity per hour of the ski resort[6]. The indicator is constructed using the hourly capacity of each plant in operation and weighted in relation to the vertical drop, according to the formula $VTMH_i$ = (lift capacity in skier per hour x vertical drop (m)) / 1000. We expected that the lift speed would reduce the time spent in queuing at the downhill station and thus would increase the number of passages;

VTDR: Vertical drop of the slopes, measured in meters, defined by the average between the highest level (uphill) and the lowest level of slopes, which indicates the quality of the run, assuming that the skiers will pay more for longer runs;

SNOW: The average seasonal snow depth, published by the meteorological stations of ARPA – SIM and PAT. The variable is measured as the average snow cover for the whole season, using average daily data from ARPA-SIM and monthly data for PAT. We expected that the natural snow conditions would positively affect the choice of ski destination. Snow conditions can of course be created artificially with snowmaking equipment, but the information on this quantitative variable was unavailable and we therefore used the natural snow specification;

DAYS: The number of operating days of the resort in the last four winter seasons;

AGE-P: Average age of the lifts, weighted by the hourly capacity (VTMH);

ALT: Weighted average of the uphill lift stations (in meters), where the weight is the capacity of the lifts of the ski resorts;

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[6] VTMH equals vertical meter times lift capacity divided by 1000. Lift capacity as reported by ski resorts is the number of persons who can be transported to the top of the hill per hour. This definition of capacity, however, does not account for the ski resort's vertical drop (VTDR) when making lift capacity comparisons among different ski resorts

SGAU: Percentage of transport capacity with high-speed and high capacity lifts. This qualitative attribute was expected to have a positive impact on consumer choice;

INN: Percentage of Km of ski runs with artificial snow, defined as km of ski runs with artificial snow / length of the ski runs (in km)[7];

RITAS: Percentage of intermediate Km of ski runs out of total Km of slopes in the ski resort[8];

RTASCAP: Km of slopes for 1000 persons per hour (KM / VTMH);

RCCLTL: Percentage of chair and cabin lifts to total number of lifts[9]

and dummies that identify the locational aspects;

DAB: Dummy variable to identify the ski resorts of Abetone (PT);

DTN: Dummy variable to identify the ski resorts of the Altipiani Trentini;

DSMALL: Dummy variable to identify ski resorts with a transport capacity lower than 5000 skiers per hour.

The hedonic price model is specified as follows:

$$lnP_i = \alpha + \beta_1 lnKM + \beta_2 lnVTMH + \beta_3 lnVTDR + \beta_4 lnSNOW + \beta_5 lnDAYS + \beta_6 lnALT + \beta_7 SGAU + \beta_8 RITAS + \beta_9 RCCLTL + \beta_{10} INN + \beta_{11} DAB + \beta_{12} DTN + \beta_{13} DSMALL + u_i$$

where *ln* is the natural log. The right-hand variables are in log form, except for the SGAU, share of high-speed chairlifts and modern cable cars in the lift capacity, RITAS, the percentage of intermediate Km of ski runs, RCCLTL, the percentage of chairs and cabin lifts and INN the share of ski-runs with snowmaking, and the three dummy variables.

5.2 Data and descriptive statistics

We examined a total of 19 ski resorts located in Emilia Romagna, Tuscany, and Altipiani Trentini, with a total of 120 operating lifts and 260 Km of slopes. Most of the resorts are

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[7] Only few ski resorts report the percentage of ski runs or km of ski runs with *artificial snow* cover. We thus proceeded to a detailed review of the ski resort or ski lift operator websites to construct the indicator. We adopted the km share instead of the number of slopes because of the great diversity of slopes, not only in their length, but also in the altitude of the ski area. The share of km allows a better representation of the quality and the cost of snowmaking and grooming. We found a positive low correlation (0.04170) between the share of slopes with artificial snow (INN) and the altitude of the ski resort (ALT).

[8] Intermediate ski runs are defined as RED runs, with grades commonly ranging from 25 to 40 percent (UNI 8137:2004 "Specific signs for ski slopes – Characteristics". Red runs are usually groomed.

[9] This variable is defined by Pawlowski (2010) as alternative of SGAU used by Falk (2008)

within or adjacent to national or regional parks. The ski season normally extends over a period of 113-120 days, although the actual season may be much shorter, as outlined below.

Table 1 presents the summary statistics on the variables for the ski resorts in our sample, averaged over the whole sample period. We report the means, medians, standard deviation, and minimum and maximum values. The characteristics of each ski resort are available in table A2 in the Annex: each ski resort is ranked in terms of quality for both internal and external factors as suggested by Falk (2008). Among the internal factors, which are the subject of the marketing mix of the ski resort, we include the length of the slopes, the size of the lifts, and their comfort. We include among the external environmental factors the natural beauty of the landscape and the snow conditions. The descriptive statistics of the variables for regional group are in table A3 with the means and medians allows to find the differences between the Emilian Apennines and the Altipiani Trentini.

For the weekend, the one-day lift ticket prices for the winter seasons ranged from € 13 in Fiumalbo (MO) to € 36 in Abetone (PT). The standard deviation of the lift prices is approximately € 6.40 (weekends), indicating a significant variation in lift ticket prices across ski resorts. The price of weekday ski passes ranged from € 12 to € 30 for the same ski resorts.

The average length of ski runs is 13.4 km per ski resort. However, according to our selection criteria, three ski resorts (Folgaria, Cimone, Abetone) have a total length of slopes of 33 Km or more. Six other ski resorts (Schia, Cerreto, Febbio, Corno alle Scale, Lavarone and Doganaccia) have 13 to 22 km and the remaining 10 have an average length of 3.5 km.

As far the quality of the slopes, the average share of slopes with intermediate difficulties is 46 per cent. According to their rating. the higher shares are found in the largest resorts: 69 per cent in the three largest Emilian resorts, followed by Tuscany with a 47 per cent and Altipiani with an average 40 per cent.

The average lift capacity is 1644 persons (indicating the capacity to transport 1644 skiers up a mountain at a speed of 1000 vertical meters per hour). Over the period, the average lift capacity is highest in Abetone (PT), with 6963 skiers on average every hour, and a maximum of 7083 skiers in Folgaria (TN) in the winter season 2010/2011 after the opening of four high speed detachable lifts. We notice that the range of values of the sample is quite wide, with a significant differentiation between the three largest resorts and the 11 small resorts with a lower transport capacity.

The average share of high-speed (detachable) chairlifts and modern gondola lifts on total lift capacity is 8.1 per cent. New detachable chairlifts and MGD are available in four ski resorts: Cimone in Emilia Romagna opened its first LCD in 1990 and then increased its transport capacity further in 2003 and 2004 to cover one quarter of the capacity of transport time; Corno alle Scale, which made a substantial investment in 2006 (one-fifth the capacity of transport time), Abetone, which was an innovator when its first MGD opened in 1999, and Folgaria with 6 recent CLDs. The share of high-speed chairlifts in total lift capacity is an average of 48 per cent at Abetone, followed by Cimone with 42 per cent, Folgaria with 37 per cent, and Corno alle Scale with 33 per cent. Other 15 ski resorts offer only fixed-grip chairlifts and ski lifts.

Table 1 Descriptive statistics (four winter seasons from 2008/2009 to 2011/2012)

	Number of ski resorts	Media	Median	St. dev.	Max	Min
SKFER: Price of one-day lift ticket for adults-weekdays (€)	19	18	15	5.7	30	12
SKFES: Price of one-day lift ticket for adults – weekend (€)	19	23	23	6.4	36	13
VTMH: Lift capacity measured as vertical transport meters in persons per hour divided by 1000	19	1644	442	2300	7083	14
KM: Total length of ski runs (km)	19	13.4	7.0	13.9	47.4	0.0
VTDR: Vertical drop (m)	19	437	377	222	951	0
SNOW: Average snow depth (cm)	19	72	57	59	287	0
DAYS: number of days open	19	115	118	30	155	0
ETA-P: Average age of lift facilities (in years)	19	16.4	14.3	10.6	44.0	0.0
ALT: Weighted mean altitude of uphill lift stations (m)	19	1549	1539	157	1797	1139
SGAU: Share of detachable chairlifts, detachable cable cars and funitels (%)	19	8.1	0.0	16.2	47.8	0.0
INN: Share of Km of ski runs with artificial snow	19	58.8	70.1	31.8	100.0	0.0
RCCLTL: Percentage of chair and cabin lifts of total lifts	19	32.3	38.1	27.0	75.0	0.0
RITAS: Percentage of intermediate slopes on total slopes (in KM)	19	47.7	53.3	25.0	77.9	0.0
DTN	19	0	0	0	1	0
DAB	19	0	0	0	1	0
DSMALL	19	1	1	0	1	0

Note: The number of observations is 19 for 4 years (Sources: www.lift-world.info, www.neveitalia.it, www.skiinfo.it, ski guides and ski magazines and USTIF, PAT).

The comfort of the lifting infrastructure is measured by the share of chair and cabin lifts with an average of 32 per cent. The largest share is in Folgaria (66 per cent), followed by the three largest Emilia resort with 58 per cent and Tuscany (49 per cent). Besides, the smaller resorts of the region rely on cheaper skilifts as shown by the 17 per cent index.

The mean altitude of peak lift stations (i.e., uphill cable and chairlift terminals) is 1549 m. Not surprisingly, the average altitude is highest at the Apennine ski resorts, thereby maximizing the cold winter conditions (e.g., Cimone (MO), at 1786 m; Abetone (PT), 1772 m; and Cerreto Laghi (RE), 1689 m), while a bit lower is the average altitude in Altipiani, with Folgaria (1620 m).

The diffusion of snowmaking facilities is a quite advanced reality, with an average coverage of 59 per cent of the skiable area. The highest share is in the Altipiani with an average coverage of 89 per cent of the skiable area with the aim of extending the duration of the skiing season, followed by Abetone (80 per cent), Cerreto Laghi (74 per cent) Corno and Cimone (70 per cent).

The weighted average age of the mountain lift systems (including surface lifts) is 16.7 years. Lavarone (TN) and Folgaria (TN) offer the most updated lift capacity, with an average age of 10 and 13 years, respectively, followed by Abetone (PT) with an average of 10 years, and Cimone (MO) and Cerreto Laghi (RE), with an average of 14 years each.

The availability of detailed information sources on ski resorts and on lift ticket prices denotes the presence of a highly competitive environment and behaviour. As a result, the differences in the ticket prices should be determined solely by quality characteristics and demand factors. In particular, one should expect a strong correlation between the price and the service quality expressed by the length of the slopes and the number and capacity of the lifts.

6 Results

Table 2 presents the correlation matrix for the variables used in the analysis. As expected, the most significant correlation is between the ticket price and the physical characteristics of the ski resort, in particular the length of the slopes (0.85 to 0.91), the automation of the lifts (0.68-0.63), and the hourly capacity of slopes (0.85 to 0.88). Snow depth has some correlation with the number of days of the winter season (0.64). Among the explanatory variables, on the other hand, we found a high correlation between the flow capacity of the lifts and the length of the slopes (0.88).

Table 3 presents the OLS estimates of the hedonic price equation for different data configuration. The formulation of equation [1] has been splitted into separate factors to distinguish the impacts on the adult one-day tickets between weekdays and weekends (including public holidays). In the first equation (W.1) the ticket prices are measured by the main physical and objective characteristics of the ski resort. The second equation (W.2) considers the qualitative characteristic of the skiing area and lifting infrastructure and how they may affect changes in the prices, while in the third equation (W.3) we add a set of dummy variables for controlling the locational characteristics of the Trentino Altipiani and

Abetone competitors. We used the robust regression approach [10], for estimating the coefficients. The major advantage of the Eicker-Huber-White procedure is that few assumptions regarding the population distribution are required.

Table 2. Correlation Matrix

	SKFER	SKFES	KM	VTMH	VTDR	SNOW	DAYS	AGE-P	SGAU	ALT	INN	RITAS	RTASCAP	RCCLTL	DTN	DAB	DSMALL
SKFER	1.00																
SKFES	**0.86**	1.00															
KM	0.85	0.91	1.00														
VTMH	0.85	0.88	**0.89**	1.00													
VTDR	0.70	0.79	0.75	**0.85**	1.00												
SNOW	0.27	0.44	0.39	0.40	0.27	1.00											
DAYS	0.08	0.18	0.13	0.10	-0.17	0.64	1.00										
AGE-P	-0.18	-0.11	-0.19	0.05	0.02	-0.14	-0.13	1.00									
SGAU	0.69	0.64	0.68	0.68	0.60	0.38	0.19	-0.20	1.00								
ALT	0.48	0.59	0.67	0.72	**0.71**	0.34	0.04	-0.07	0.60	1.00							
INN	0.43	0.46	0.50	0.41	0.50	-0.03	-0.26	-0.06	0.28	**0.04**	1.00						
RITAS	0.36	0.63	0.62	0.51	0.68	0.29	-0.08	-0.03	0.48	0.55	0.33	1.00					
RTASCAP	-0.56	-0.54	-0.43	-0.80	-0.68	-0.27	-0.03	-0.35	-0.45	-0.54	-0.15	-0.18	1.00				
RCCLTL	0.77	0.75	**0.69**	0.83	**0.69**	0.34	0.10	0.10	**0.55**	**0.59**	0.22	**0.32**	-0.72	1.00			
DTN	0.55	0.41	0.41	0.40	0.18	0.09	0.15	-0.19	0.15	0.03	0.16	-0.11	-0.26	0.44	1.00		
DAB	0.33	0.30	0.37	0.37	0.17	0.19	0.12	-0.11	0.33	0.32	0.20	0.01	-0.24	0.22	-0.12	1.00	
DSMALL	-0.83	-0.76	-0.80	-0.82	-0.63	-0.39	-0.28	0.15	-0.66	-0.62	-0.38	-0.25	0.56	-0.74	-0.45	-0.45	1.00

The fit of the logarithmic formulation for the weekday tickets model is fairly good, with an adjusted R2 in the range of 0.87-0.91 according to the specification[11]. This indicates that

[10] Classical methods of least squares regression analysis rely on the correctness of the model assumptions. Since these assumptions are only approximations of reality, additional statistical methods have been developed to produce estimators that are robust against the deviation from the model assumptions, as in the case of small sample or outliers that violate the assumption of normally distributed residuals. See D. Birkes and Y. Dodge (1990). The robust variance estimation technique is available with STATA. The command option vce(robust) calculates the standard errors in a way which does not imply homoskedasticity of the error term.

[11] Tests were conducted for heteroskedastic and normally distributed residuals, as well as collinearity, influential observations and outliers that may substantially change the results. In the

the dispersion of prices between the ski resorts of the three regional ski areas can be explained by the difference in the attributes expressed by the independent variables. The relationship is non-linear and is marginally affected by unobserved factors. The explanatory power of this model is also good when compared to the results of Falk (2008, 2011) and Pawlowski (2010), who report an adjusted R2 ranging between 0.67 and 0.84.
With the exception of one characteristic, the internal factors are significant and show the expected sign.

In particular, among the internal factors, the length of the ski runs (ln KM) and the vertical capacity (ln VTMH) have a positive and significant effect at the 1 per cent level. Instead, on weekdays, the ski lift capacity (ln VTMH) is significant at the 10 per cent level according to the specification. For these two variables, the positive sign on the coefficients conforms to expectations.

The elasticity of ticket price to the length of slopes has an average magnitude of 0.11 (0.08-0.15). An increase of 10 per cent of the total length of slopes, equal to an average increase of 1.4 km, would leads to a 1.1 per cent increase in lift ticket price (from €23.20 to €23.41).

The elasticity of lift tickets with respect to the lift capacity (VTMH) is considerably lower than that of the length. The elasticity is in the range of 0.049 – 0.072 on weekends, with a significant level of 1 per cent, suggesting that a 10 per cent increase in the transport capacity would lead to a 0.5 – 0.7 per cent increase in the weekend ticket price.

From the econometrics, our results indicate a significant difference from the largest Alpine ski resorts in term of magnitude of the coefficients. In his investigation on the Austrian ski resorts, Falk (2008) found that the coefficient of the ski runs is positive but insignificant, possibly reflecting the multicollinearity between length and vertical lift. Pawlowski (2011) did not explicitly consider the vertical lift capacity, using instead the ratio between length and

diagnostic for heteroskedasticy we used both the White and the Breusch-Pagan tests. Then, considering that we are working with a sample of small size (76 observations) we used the Eicher-Huber-White-sandwich estimator of the variance of the regression estimation available in the STATA 'regress' command. To detect multicollinearity we examined the variance inflation factor (VIF) and the condition index (CI) and we found that both the VIF and CI of our regression results are lower than10 (only VTDR and SNOW variables with VIF above 10 were dropped from the model). Some of the above selected variables were not included in the regressions because they were not significantly related to the lift ticket price; for example, SNOW, which was measured by the daily snow depth reported by ARPA and other regional observatories, was substituted with the average altitude of the winter resort (ALT). The same was true for two qualitative variables, namely RTASCAP as a proxy of congestion of the ski resort, measured by the ratio of the length in km of slopes and the vertical transport capacity, and AGE-P, the weighted average of the lift facilities.

capacity, but found no significant relationship for the Italian resorts. In addition, in the Austrian ski resorts the magnitude of the elasticities is much lower for both variables (0.042 for VTMH and 0.034 for KM)[12]. Similar conclusions from the same author (Falk 2010) hold for Switzerland and France, with strong support for differences that are positively correlated with the lift capacity, the share of modern chair lifts, and the proportion of high-speed cable cars in the Alpine ski resorts.

In this respect, the estimates for the Emilian resorts show two main differences: in terms of the magnitude of the effects, which is significantly higher than in Alpine resorts; in term of the ranking of the attributes. Considering that the value of the coefficient of the length of the ski runs is higher than the capacity of the ski lifts, the results indicate that the consumers are willing to pay for more and comfortable ski runs then additional lift capacity. These results also have an important implication for the Emilian small resorts, with less than 3 Km of slopes. With an average elasticity of 0.11 on weekends, this implies that by doubling the length of the ski runs, the consumers will value the additional services as an increase of 11 per cent of the weekend /weekday ticket price.

However, in term of magnitude, the impact of the length of the winter season (that may be considered by the lift operators as an external factor) is very relevant only on weekdays but with an unexpected negative sign, as shown by the -0.18-0.26 elasticity. For the weekend, the coefficient is positive and significant only at 10 per cent level and the magnitude conforms to the international standards. This result is also consistent with Falk (2008) and may suggest that the sustainability of the ski resort is largely dependent upon significant factors outside the control of lift operators which require, instead, a broader systemic vision by the interested local community.

The average altitude of peak lift stations (ALT) is negative and statistically significant at 1 per cent level, with a high elasticity, approximately 0.50-0.53 for weekends and 1.01-1.19 for weekdays. The sign on ln ALT does not agree with expectations, since the altitude is relevant for snow conditions and should have a positive effect. In fact, Falk and Pawlowski found that consumers are willing to pay for the altitude of the peak lift stations. However, it is well known that the latitude of the ski resorts of the Apennines receive less snow than in the Alps; although, Cimone and Abetone are among the snowiest areas of the region, with more than 3 meters of snow fall per year, they are negatively affected by the wind from the south. The scarcity of natural snow can be compensated by snowmaking techniques, given the availability of water, energy, and favourable temperatures. With the exception of two small ski resorts, investments have been significant over the last decade and the average share of

[12] The high elasticity values of length of slopes and vertical drop may have been due to the effect of the study's sample size, with only 74 observations, while sizes in the literature are much bigger. However, country-specific regressions in the Pawlowski study support our estimates.

slopes covered by artificial snow in the largest resorts reach over 70 per cent of the skiable area. The regional legislation does not restrict the duration of snowmaking operations, which are mainly concentrated at the beginning of the season[13].

Of course, there is a limit imposed by the cost of infrastructures and energy, which can be considered a fixed cost included in the non zero intercept of the regression, which can be interpreted as a trend in the demand not driven by changes in attributes. These externalities may explain the differences in the magnitude of the elasticities and in the intercept, which are relatively higher than in the international resorts (Falk 2008, 2011). A similar asymmetry was found in Pawlowski's national estimates, where the Italian resorts had a greater magnitude of the constant term (significant at 1 per cent) than that of Switzerland or France.

The qualitative characteristics of the ski resorts are considered in the second formulation of the price equation, WE(2) and WD(2) in table 4.

The impact from the quality of the fast chairlifts (SGAU) is not consistent with previous research on international ski resorts. Our robust regression estimates show a negative sign, which is statistically not significant on the weekend, in line with those of Pawlowski (2010), who included Italian Alpine resorts in his analysis.

The results are surprising since we expected a positive impact from the investment in modern, high-speed chairlifts. What is surprising is the negative sign on the weekend rather than the magnitude of the elasticity: to compensate for the increased high speed lift capacity (excess capacity), the ski area must charges lower ticket prices to stimulate more skier demand and covers the extra operating costs. Innovation in the ski resorts will lead to more competition among ski resorts, but the final outcome on the total revenue for the lift operators is still uncertain or negative[14]. Therefore, if modernizing the lift systems does not result in significant increases in the number of the users, the major investment costs will only create additional problems for the sustainability of the ski resort and higher prices in the weekdays.

[13] This result is quite surprising, as anecdotic evidence shows that consistent snow conditions are important both for consumers and suppliers of snow-based recreation services. Adaptation policies to climate change support the conclusions of previous studies (Bürki et al. 2003; Breiling and Charamza 1999), which predict that climate change will have negative consequences for low elevation ski resorts, in favour of a concentration of the ski industry at higher elevations, where natural snow is readily available or in locations where water and energy costs make snowmaking financially viable (Scott et al. 2003).

[14] From the perspectives of consumer preferences, the results justify the pessimism and doubts of the local lift operators represented by the Managing Director of Cimone Sci: "In our area management costs are 20 percent higher than in Alpine areas …" and under these conditions ".. the low profitability creates a vicious circle from which operators hope to exit by diversifying the supply and relying on the green economy" ... "without public aid for at least six chairlifts in the region, including two or three in Cimone, the risk of closing is high, as is that of having to reduce the service, with openings for short or limited periods", Gazzetta di Modena, 28 July 2011.

On weekdays the innovation has a positive effect on ski lift prices, which was estimated with a positive and significant coefficient in the range of 0.41-0.46. To provide an indication of the effect's magnitude, we calculated the elasticity of the price with respect to the share of fast lifts. The coefficient of 0.44 translated into an elasticity of 0.03 (= β * Percentage Average Share = 0.44 x 0.080 = 0.035), but it could increase up to 0.18 in Abetone and Cimone because of their higher share (40 per cent) of high-speed chairlifts, the same order of magnitude of the length of slopes on weekdays.

Snowmaking (INN) is another puzzle. The sign of the coefficient is positive but not statistically significant on weekend periods. The value of 0.022 leads to an elasticity of 0.013 (= β * Percentage Average Share =0.022 * 0.575), which has quite irrelevant effects. The result indicates that an increase of the share of slopes with artificial snow will lead to an increase in the ticket price, but with extra costs transferred to the consumers of marginal magnitude. Again, the question is whether the competition effect will prevail over the oligopolistic behaviour. In fact, a lower and higher negative coefficient, and statistically significant at 10% level, is estimated for weekdays. With a lower demand from customers, the effect of artificial snow (INN) is to lower the lift prices with an elasticity of -0.058.

Finally, the quality of the ski runs and the lifting infrastructure, measured respectively by the share of intermediate slopes (RITAS) and the share of chair and cabin lifts (RCCLTL). The quality of chair lifts has a positive impact on weekend prices, which is significant at 1 per cent level with an elasticity of 0.07. Similar results have been found for the weekdays prices.

The quality of the ski runs, measured by the share of intermediate slopes, indicates a coefficient significant at 5 per cent for the weekends with the expected positive sign and a high elasticity of 0.12-0.17. Instead, for the weekdays the sign turn negative with a significant level at 1 per cent. The multicollinearity is expected since the length of the slopes depends on the average slope height (ALT) and for the small ski resorts of the sample, without differentiation and variety, would lead to be exposed to intense price competition arising from most skiers choosing the cheaper resort.

The results of the test show that the regional dummy variables are significant only for the weekdays tickets. In particular the coefficient for Altipiani Trentini is positive and significant at 10 per cent level, while the coefficient for the small resorts is negative and significant at 1 per cent level. The corresponding price gap for Abetone was not significant.

When the different characteristics are accounted for, the one-day lift ticket price in Altipiani Trentini is, on average, respectively 6.1–8.7 per cent higher than that in Emilia Romagna[15]. For small winter resorts in Apennines, the coefficients on weekdays are negative

[15] The percentage difference is obtained by: (exp(0.0598-1)*100 = 6.1 percent and (exp(0.837)-1)*100 = 8.7 percent

Table 3: Ticket Price Estimates

Variables	Weekend					
	WE(1)		WE(2)		WE(3)	
Weekend						
Constant	4.4967	***	5.3150	***	5.8059	***
ln VTMH Vertical capacity	0.0721	***	0.0541	***	0.0493	**
ln KM slopes	0.1483	***	0.1127	***	0.0822	***
ln Average Altitude of Lifts (ALT)	-0.3493	***	-0.4978	***	-0.5372	***
In DAYS	0.0871		0.1405	*	0.1157	
Percentage of fast lifts (SGAU)			-0.0754		-0.0936	
Percentage of Intermediate slopes (RITAS)			0.2693	***	0.3807	***
Percentage of runs with snowmaking (INN)			0.0225		0.0071	
Percentage of chair and cabin lifts (RCCLTL)			0.2204	**	0.1994	**
DTN					0.0598	
DAB					0.0521	
DSMALL					-0.0602	
Elasticity: Percentage of fast lifts (SGAU)			-0.006		-0.007	
Elasticity: Percentage of runs with snowmaking (INN)			0.013		0.004	
Elasticity: Percentage of Intermediate slopes (RITAS)			0.125	***	0.176	***
Elasticity: Percentage of chair and cabin lifts (RCCLTL)			0.069	**	0.063	**
R2 Adjusted	0.8686		0.9051		0.9091	
Obs	74		74		74	
Weekdays						
Constant	8.4061	***	10.5550	***	12.4562	***
ln VTMH Vertical capacity	0.1099	***	0.0495	*	0.0428	*
ln KM slopes	0.1269	***	0.1775	***	0.1155	***
ln Average Altitude of Lifts (ALT)	-0.8558	***	-1.0188	***	-1,1905	***
In DAYS	-0.0436		-0.1784	***	-0.2606	***
Percentage of fast lifts (SGAU)			0.4659	***	0.4110	***
Percentage of Intermediate slopes (RITAS)			-0.2178	***	0.0068	
Percentage of runs with snowmaking (INN)			-0.1004	*	-0.1580	**
Percentage of chair and cabin lifts (RCCLTL)			0.2534	**	0.1591	
DTN					0.0837	*
DAB					0.0220	
DSMALL					-0.2072	***
Elasticity: Percentage of fast lifts (SGAU)			0.037	***	0.033	***
Elasticity: Percentage of runs with snowmaking (INN)			-0.058	*	-0.091	**
Elasticity: Percentage of Intermediate slopes (RITAS)			-0.101	***	0.003	
Elasticity: Percentage of chair and cabin lifts (RCCLTL)			0.080	**	0.050	
R2 Adjusted	0.8128		0.8850		0.9051	
Obs	74		74		74	

Notes: *significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

and significant, which justify the offered discount of 18 per cent[16].

This may indicate that consumers are willing to pay a substantial price premium on weekend and weekday ski passes for the Trentino ski resorts but not in Abetone and Emilian Apennines, despite having similar characteristics (e.g., length of ski runs, transport capacity, and snowmaking capacity).

However, as presented in table 4, it is interesting to note that the price differences between the Trentino and the Emilian ski resorts are much greater in absolute terms when the characteristics are not included.

Table 4: Lift ticket differences across ski resorts

	ln net one-day lift ticket (week end)			ln gross one-day lift ticket (week days)		
	Coefficient		Emilian ski Resort Discount	Coefficient		Emilian ski Resort Discount
Constant	3.3612	***		3.0963	***	
DTN Dummy Altipiani Trentini	0.0720	***	7.5%	0.2350	***	26.5%
DAB Dummy Abetone	-0.0124		-1.2%	0.0528		5.4%
SMALL Dummy Small Resorts	-0.4317	***	-35.1%	-0.4192	***	-34.2%
R2	0.5884			0.7251		
Obs	74			74		

Note: *significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

This behaviour applies in particular on weekdays, due to the better amenities offered by the Alpine resort. On average, consumers are paying 26 per cent more for Altipiani Trentini on weekdays, while for the weekend the margin is reduced to 7.5 per cent[17], This can be explained by the fact that visitors to the Emilian resorts are mainly weekend day-skiers; travel costs to the Altipiani Trentini resorts, which are much larger on average in terms of lift capacity and total length of ski runs, are thus minimized.

The econometric results also indicate that consumers on weekends <u>are not willing to pay</u> a substantial price premium for the nearby Abetone resort as compared to the Emilian Apennines resorts that offer similar characteristics.

[16] The percentage differences are obtained by: (exp(-0.2072)-1)*100) = -18,7 percent

[17] The percentage difference is obtained by: exp(0.2349)-1)*100 = 26,5 percent and . exp(0.0712)-1)*100 = 7.5 percent.

7 The Predicted Price

A parameter of great interest is the predicted price level, which serves as a measure of the quality of the ski resort. Assuming that the skiers base their choice on the characteristics identified by the explanatory variables of the 19 ski resorts, tables 5 presents the hedonic price schedule of the one-day ticket price on weekends and weekdays estimated for the winter season 2011-2012.

Based on robust regression techniques the estimates for weekend one-day lift ticket indicate that the highest quality resort is Folgaria (TN), followed by Abetone (PT) and Cimone (MO). Corno alle Scale (BO) and Lavarone (TN) are ranked fourth and fifth. Cerreto Laghi is ranked sixth.

When the predicted price is compared with the actual price, the difference reveals which ski resort is, statistically speaking, significantly over- or underpriced. The perception of the skiers is very selective and their choices are based on the characteristics of the ski resort. If the actual price is higher than the predicted price, skiers may overpay for lift tickets. On the contrary, if it is below the predicted price, the resort is a good value and the skiers may be willing to pay even more.

From Table 5 we see that the Emilian ski resorts significantly overprice their lift tickets in the attempt to infer quality through higher prices or transferring their higher costs to consumers. Differently, Folgaria (TN) in the Altipiani Trentini underprices its seasonal tickets with the aim to increase the share on the market or for other strategic reasons supported by compensatory public subsidies.

The results indicate that for Cimone (MO) the predicted price is lower than the actual average price on weekends and on weekdays, indicating that the one-day tickets are overpriced in relation to their "quality" as measured by the standard hedonic physical characteristic variables. The extra-cost for the consumer is € 2.63 on the weekend, while they can bargain on weekdays with a lower price of € 0.32.

Definitively, the preferred ski resort on weekends is Folgaria, which is under-priced given consumers' preferences. Considering the characteristics of the ski resort in terms of lift capacity, length of ski runs, and modern facilities, skiers should pay € 34.5 for the one-day ticket instead of the € 33 actually charged by the lift operators. The ticket price is therefore underpriced by € 1.50. As can be expected, Abetone (PT) ranks second, with € 2 less than Folgaria, although the skiers will consider the ticket price overpriced by € 3.94. The same judgment is reserved for Lavarone, whose ticket price is overpriced by € 1.68. Also overpriced are Cerreto Laghi (RE) and Corno alle Scale (BO), since skiers should pay about € 1-2 less than the actual ticket price. Doganaccia also offers good price-quality ratio, with an underpriced difference of € 1.17.

Table 5: Actual and predicted prices of lift tickets, 2011-2012

	Weekend				**Weekdays**			
	Predicted	Rank	Actual	Overpriced / Underpriced	Predicted	Rank	Actual	Overpriced / Underpriced
Folgaria	34.5	1	33.0	**-1.50**	30.3	1	30.0	**-0.34**
Abetone	32.1	2	36.0	**3.94**	28.0	2	29.0	**1.02**
Cimone	30.4	3	33.0	**2.63**	26.3	4	26.0	**-0.32**
Corno alle Scale	27.9	4	30.0	**2.06**	22.7	5	23.0	**0.31**
Lavarone	27.3	5	29.0	**1.68**	26.6	3	26.0	**-0.64**
Cerreto Laghi	27.1	6	29.0	**1.88**	19.4	7	20.0	**0.58**
Schia	25.0	7	25.0	**-0.05**	18.0	8	20.0	**1.95**
Doganaccia	24.2	8	23.0	**-1.17**	21.2	6	19.0	**-2.20**
Prato Spilla	22.5	10	23.0	**0.52**	17.7	9	15.0	**-2.69**
S. Anna Pelago	21.8	11	23.0	**1.22**	15.3	11	14.0	**-1.30**
Ventasso Laghi	19.0	12	19.0	**-0.01**	13.1	15	14.0	**0.89**
Piane di Mocogno	17.4	13	22.0	**4.55**	13.2	14	13.0	**-0.20**
Campigna	16.5	14	17.0	**0.53**	12.6	17	12.0	**-0.64**
Le Balze	16.2	15	19.0	**2.78**	13.9	13	19.0	**5.14**
Lagdei-Lagosanto	14.7	16	15.0	**0.35**	15.6	10	15.0	**-0.56**
Passo Penice	14.6	17	18.0	**3.43**	14.6	12	15.0	**0.43**
Fiumalbo	13.0	18	13.0	**-0.03**	12.8	16	13.0	**0.24**
Febbio *								
Ospitaletto *								

Febbio and Ospitaletto were not operative during the 2011-2012 winter season.

All the other small ski resorts, in particular Schia (PR) and Lagdei-Lagosanto (PR), Prato Spilla (PR) which charge lower ticket prices, are well located and receive a good evaluation from the visiting skiers.

For weekdays, the predicted price is lower and confirms Folgaria (TN) over Abetone (PT) and Cimone (MO). Although paying a lower ticket price, the skiers considered the one-day ticket for the two top positions overpriced by € 1. Cimone (MO) and Lavarone (TN) receive a favourable evaluation, near the equilibrium between price and ski resort characteristics. In general, we notice that for the small resorts the difference between actual and predicted prices is attractive only for S. Anna Pelago (MO) and Campigna (FC), while all the other small resorts are largely overpriced as in the case of Le Balze (FO).

8. Discussion

Our results show that resort characteristics (length of the ski slopes, vertical drop, capacity of the lifts and length of the season) are positively valued by skiers and therefore directly affect ticket prices. We obtained these results by applying the hedonic price model to 19 ski resorts in Emilia, Tuscany, and Altipiani Trentini. The high dispersion on prices among ski resorts and regions can be explained by the differences in these four attributes.

We find that the elasticity of lift tickets with respect to the length of the slopes is considerably larger than that of the lift capacity of the ski resort. In addition quality of the slopes and the accessibility as well as the quality of the chairs are even more important than the length of the ski runs in determining the price of a one-day lift ticket.

So, do skiers have a preference for the size (and beauty?) of the ski area over the characteristics of the lifts systems? The answer to this question is statistically affirmative for the Apennines ski resorts. In this sense, our results provide a valuable contribution to explaining the price differences between the Apennines and the Altipiani Trentini resorts. The ticket price responsiveness and interaction to the resort attributes is much higher, so we find an incentive for the Emilian ski resorts to exert their control on those internal factors (attributes) that have the largest positive impact on the demand of customers. The statistical evidence is relevant to marketing policy and product development. Since the development of new slopes can be expensive and time-consuming, particularly in the Apennines, where large areas are part of natural parks, the alternative could be a multiple ski ticket that covers all regional resorts or some trans-regional resorts.

These considerations are particularly important for ski resorts that are currently overpriced, i.e., Cimone (MO), Cerreto Laghi (RE), Corno alle Scale (BO), Prato Spilla (PR), Lavarone (TN) and Abetone (PT).

The results of this application are promising although limited by the availability of data. Subsequent studies should involve a time series of data and a larger number of observations. There is still a significant information gap on some potentially valuable variables, that cannot be filled when collecting data from different sources. It is common that when official data are missing or reserved for administrative uses, the Web provides what is very often an approximation of the reality of the ski resorts. It is therefore quite common to find values for the lengths of slopes or for snowmaking whose parameters are the number of ski runs instead of the km covered with artificial snow. The same problem exists for the length of the slopes, since very often a ski resort website will not distinguish between slopes for Alpine sports and for Nordic Sports. Other valuable variables were not included in this study. These may include buyer and seller characteristics, the number of tickets or passages on the lifts, the seasonality effects, as well as the presence of “non-participatory” amenities such as hotels, restaurants, touristic apartments, sport events and scenic views.

Nevertheless, these results appear very promising and enhance our knowledge about the factors affecting lift tickets prices and the behaviour of the ski resort communities.

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Appendix Tables

Table A1. Description of the data sources

Price of one-day lift ticket for adults (€)	Web sites of individual ski resorts
Total length of ski runs (Km)	Web sites of individual ski resorts http://en.skiinfo.com/snowreport/, http://www.emiliaromagnaturismo.net, http://www.neveitalia.it, http://www.dovesciare.it.
Lift capacity measured as vertical transport meters in persons per hour divided by 1000 Average age of lifts Vertical drop	Emilia Romagna: USTIF Emilia Romagna data base http://lnx.funivie.org/web/tecnica/dati-tecnici-impianti/ Trentino: web sites of individual ski resort; PAT, Servizio Impianti a Fune, updated 31 March 2010. Toscana: web sites of individual ski resort. Online database database http://www.lift-world.info/, http://en.skiinfo.com/snowreport/, http://www.emiliaromagnaturismo.net, http://www.neveitalia.it, http://www.dovesciare.it.
Snowfalls and snow depth Snow making and grooming: number of slopes covered	Emilia Romagna and Toscana: ARPA-SIM Trentino: PAT

Table A2 Basic characteristics of the ski resorts (ranked by lift capacity) - Average values over the winter seasons

		1		**Internal Factors**										**External Factors**	
		SKFER	SKFES	SVTMH	KM	VTDR	RITAS	SGAU	RTASCAP	RCCLTL	DAYS	ETA-P	INN	ALT	SNOW
1	Abetone	29	35	6963	47	694	69.7	47.8	6.8	52.4	128	9	80	1772	143
2	Cimone	26	32	6456	40	951	74.9	42.7	6.2	61.2	125	14	71	1786	120
3	Folgaria	29	32	6401	38	575	60.5	30.3	5.9	72.9	132	10	72	1620	100
4	Lavarone	28	31	2333	23	450	16.0	0.0	9.8	60.0	124	10	72	1486	75
5	Corno alle Scale	21	27	2229	19	535	70.8	33.3	8.6	62.5	124	14	70	1764	133
6	Cerreto Laghi	20	28	1602	14	670	62.3	0.0	8.7	50.0	128	14	74	1689	74
7	Doganaccia	19	23	1505	14	358	24.3	0.0	9.6	46.4	126	19	72	1626	78
8	Febbio	15	19	612	5	704	53.4	0.0	7.9	50.0	49	14	100	1597	28
9	Schia	20	25	510	13	330	67.9	0.0	26.3	25.0	125	13	40	1445	71
10	Prato Spilla	15	25	442	10	368	76.4	0.0	22.5	33.3	109	25	26	1608	75
11	S. Anna Pelago	13	22	410	6	380	52.6	0.0	13.9	50.0	125	32	58	1495	61
12	Piane di Mocogno	13	21	398	3	377	29.0	0.0	7.8	0.0	125	15	61	1467	98
13	Ospitaletto	15	15	344	7	447	44.1	0.0	19.8	0.0	49	29	100	1479	12
14	Lagdei-Lagosanto	15	15	232	1	275	0.0	0.0	4.3	50.0	111	43	0	1491	41
15	Ventasso Laghi	13	18	147	6	280	53.9	0.0	38.0	0.0	125	5	64	1557	61
16	Campigna	12	17	95	2	330	53.3	0.0	23.6	0.0	121	16	0	1626	61
17	Fiumalbo	13	13	53	2	160	0.0	0.0	82.6	0.0	125	12	0	1400	37
18	Passo Penice	15	18	50	2	225	31.4	0.0	32.4	0.0	122	20	85	1139	46
19	Le Balze	14	18	34	4	203	27.8	0.0	106.1	0.0	121	10	72	1377	61

Table A3: Descriptive statistics (average four winter seasons)

	MEAN					MEDIAN				
		Emilia Romagna		Toscany	Trentino		Emilia Romagna		Toscany	Trentino
	Overall	Cimone, Corno alle Scale, Cerreto	Other ER	Abetone	Altipiani Trentini	Overall	Cimone, Corno alle Scale, Cerreto	Other ER	Abetone	Altipiani Trentini
SKFER: One-day pass (weekdays)	18	22	14	24	28	15	21	14	24	28
SKFES: One-day pass (weekend)	23	29	19	29	31	22	28	18	29	31
SVTMH: Lift capacity measured as vertical transport meters in persons per hour divided by 1000	1622	3429	277	4234	4367	442	2229	288	4234	4367
KM: length of ski runs in Km	13	24	5	31	30	7	19	4	31	30
VTDR: Weighted mean altitude of uphill lift stations (in meters)	437	719	340	526	513	377	670	330	526	513
SNOW: Average seasonal snow depth in cm.	72	109	54	111	87	71	120	61	111	87
DAYS: average winter season with open lifts (days)	115	126	109	127	128	125	125	121	127	128
ETA-P: Weighted average age of lifts	16..8	14.3	19.2	14.2	9.7	13.9	14.4	15.3	14.2	9.7
ALT: Weighted average altitude of lifts	1549	1747	1473	1699	1553	1557	1764	1485	1699	1553
SGAU: Percentage of detachable chairlifts or cable cars	58.8	71.9	50.6	75.9	71.8	71.0	71.0	59.6	75.9	71.8
INN: Percentage of slopes with artificial snow	32.3	57.9	17.4	49.4	66.4	46.4	61.2	0.0	49.4	66.4
RTASCAP: Km of slopes for lift capacity	45.7	69.4	40.8	47.0	38.2	53.3	70.8	48.4	47.0	38.2
RCCLTL: Percentage of C+CL over total lifts	18	22	14	24	28	15	21	14	24	28
RITAS: Percentage of intermediate slopes on total slopes (in KM)	23	29	19	29	31	22	28	18	29	31