Quality of ski resorts and competition between the Emilian Apennines and Altipiani Trentini. An estimate of the hedonic price

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Abstract

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 2008-2011 winter seasons.

Hedonic linear and logarithmic regression models are estimated for weekdays and weekends ticket prices. Our robust regression of changes in hedonic prices with respect to the characteristic of the ski resorts yield precise and consistent estimates of positive effects on ticket prices. We find that willingness to pay (WTP) for the length of winter season tends to be higher than transport capacity, length and the altitude of the slopes or the other characteristic of the chairlifts and ski runs.

Then, we use our estimates to predict the ticket price level as a measure of the quality of the ski resort. We found that the perception of skiers is very selective and their choices are based on the characteristic of the ski resort.

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

JEL Classification: D4; R5; C3

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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 1,500 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, Falk 2008).

In this paper, we will touch on these issues as we focus on skiers' perception of the ski 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 ski 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.

The operational model of these ski resorts and the additional cost of energy and snowmaking are also relevant. 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 tend 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 sum 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 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 proposed when considering innovating lift technologies or other 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 price at the end of this interactive process 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 ski 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.

Few works investigating this topic have been published. In 1987, Barro and Romer 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.

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 third set of works, conducted by Martin Falk (2008) 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.

2. The pricing of the one-day skipass

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

[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.

[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.

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 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.

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.

Each pricing technique therefore has its merits and weaknesses.

In this study, we apply the hedonic price method, developed by Rosen in 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 ski 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 percent, Germany -22 percent). 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 percent higher than the overall average in Austria, France, and Germany (Pawlowski 2010). Excluding Italy, the same ranking was confirmed by Falk in 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;

[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.

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;
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

The function to be estimated is as follows:

$$P_i = f(X_i) \qquad [1]$$

The effect of an increase of the feature $X_i$on the price P_i is the partial derivative of equation [1]

$$\frac{\partial P}{\partial X_i} = \frac{\partial f(X_i)}{\partial X_i},$$

which can be interpreted as the "willingness to pay" for each change of the consumer X_i attribute.

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 semilogarithmic, 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.

Linear $P_i = \alpha + \beta X_i + \epsilon_i$ **[1a]**

identifies for each ski resort the value P (the price of one-day pass) as a function of a vector X of characteristics of the ski resort, while ε is a disturbing factor. The linear form of the model assumes that there is a constant (linear) relationship between the ski lift price values and the site characteristics. Thus, the standard interpretation of coefficients in a regression analysis is that a one-unit change of the attribute of the ski resort (for instance, one km of slopes) will result in a change of the lift ticket price identical to the regression coefficient, while all the predictors are held constant. It is on this basis that we say that the price of a Km of slope is β euros ($\partial P/\partial KM = \beta$)

It should be noted that in *linear* hedonic function (as all of our examples so far have been) the price of characteristics is constant. This may not accurately reflect what happens in the marketplace.

Instead, in the semilogaritmic and log-linear relationships the dependent and/ or independent variables are transformed in logarithm, assuming a non-linear relationship.

Semi logarithmic $\ln P_i = \alpha + \beta X_i + \epsilon_i$ **[1b]**

identifies the value P in natural logarithm as a function of a vector X of characteristics. ε is a disturbing factor.

Log-linear $\ln P_i = \alpha + \beta ln X_i + \epsilon_i$ **[1c]**

where all variables P and X are expressed in natural logarithm.

The standard interpretation of coefficients is that a one unit change in the independent variable will result in the corresponding regression coefficient change in the expected value of the dependent variable X_i, while the other predictors are held constant.

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

The parameter β takes on different meanings in the three specifications. With linear specification [1a], the parameter β measures the linear relationship between the two variables, which tells us how much the value of P (in €) will vary as a result of a unit change of explanatory variable X. In the semi-log specification [1b], the parameter β indicates a relationship between a logarithm and a value not easy to understand. It tells us how much the price P (in logarithm) will change following a unit change of the explanatory variable. Multiplying by X (average), we get the elasticity[4]. With the specification [1c], the parameter β identifies an elasticity, i.e., the ratio of two percentage changes, which measures the percentage change in dependent P variable in response to a one percent change in the explanatory variable X.

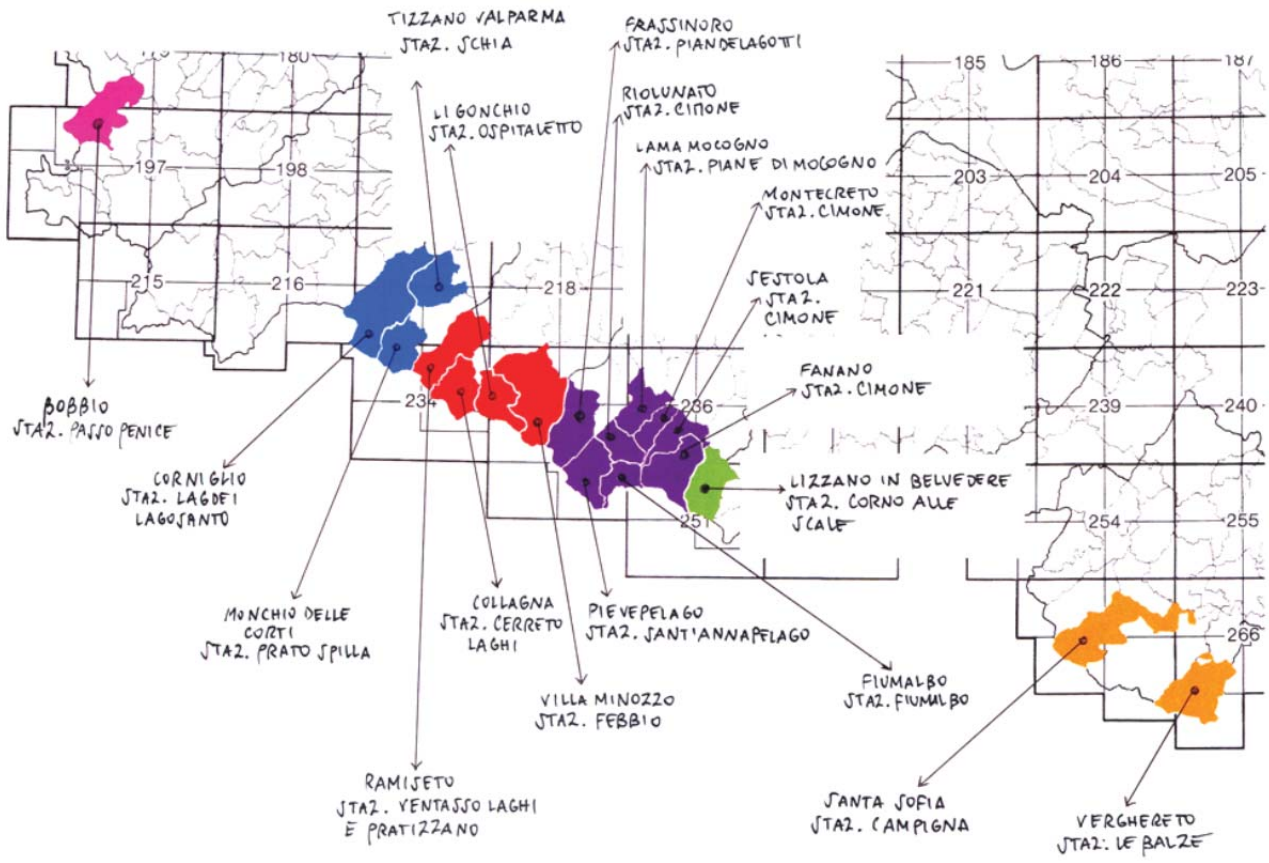
Finally, by comparing the estimated price of [1] (predicted price) with the actual ticket price of the ski resort we have an estimate of the difference in appreciation by consumers.

4. Methodology

4.1 The Study Area

The study is based on one-day adult ski lift prices for all 15 ski resorts of the Emilian Apennines, which goes from the province of Piacenza to that of Forli. Figure 1 displays the ski resorts included in the study.

[4] $\beta = \frac{\partial lnP}{\partial X} = \frac{\partial P}{P}\frac{1}{\partial X}$; multiplying by X we get $X\beta = \frac{\partial P}{P}\frac{X}{\partial X} = \varepsilon_{PX}$



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

Ski prices in the study area vary with respect to their physical attributes and location characteristics, and are subject to varying 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 Modena, Bologna, and Reggio Emilia.

We selected a number of ski resort characteristics. The ski lift prices were extracted from the ski resort web pages for the three winter seasons 2008-2009, 2009-2010, and 2010-2011, 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 2011. 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 June 2011[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

[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

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.

Similar information was included for Abetone and Doganaccia, which is a neighbouring ski resort in Tuscany, in the southeastern part of the Apennines only 7 km from Cimone; the two resorts directly compete in the same customer basin. A second competitor area was chosen in the lower Alps in Trentino (Folgaria and Lavarone).

Neighborhood 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.

4.2 The variables

As discussed by Falk (2008), Mulligan - Llinares (2003), Olmstrom - Muning (1998), 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, 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, snow conditions, and the operation of the snowmaking machines. External factors include 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 percent beginner, 35 percent intermediate, 20 percent advanced and 10 percent 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 three seasons (2008-2009, 2009-2010, 2010-2011), distinguishing between weekdays and weekends;

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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.

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 three winter seasons;

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

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;

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

RCCLTL: Percentage of chair and cabin lifts to total number of lifts

and dummies that identify the following aspects;

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

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

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

[6] VTMH equals vertical meter times lift capacity divided by 1,000. 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 when making lift capacity comparisons among different ski resorts

[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 an inverse correlation between the share of slopes with artificial snow (INN) and the altitude of the ski resort (ALT).

The hedonic price model is specified as follows:

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

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, INN the share of ski-runs with snowmaking, and the three dummy variables.

4.3 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. We added to the 15 ski resorts of the Emilian Apennines study area the nearby Abetone ski resort, which is the traditional rival of Cimone in the northern Apennines. Most of the Apennine resorts are 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.

This Apennine area was compared with the southern part of the Altipiani Trentini in the Alps, namely Folgaria and Lavarone.

Table 1 Descriptive statistics (winter 2010/2011)

	Number of ski resorts	Mean	Median	Standard deviation	Max	Min
SKFER: Price of one-day adult lift ticket - weekday (h)	19	18,2	15	5,7	29	12
SKFES: Price of one-day adult lift ticket – weekend (h)	**19**	22,9	23	6,3	36	13
VTMH: Lift capacity measured as vertical transport meters in persons per hour divided by 1000	19	1623	442	2272	7.148	14
KM: Total length of ski runs (km)	19	13,6	9,9	13,6	47,4	1,0
VTDR: Vertical drop (m)	19	447,6	377	224,4	951	160
SNOW: Average snow depth (cm)	19	41,0	33,0	27,4	109	6
DAYS: Number of days open	19	123	127	24,5	155	56
ETA-P: Average age of lift facilities (in years)	19	16,7	14,2	10,2	43,0	1,0
ALT: Weighted mean altitude of uphill lift stations (m)	19	1546	1521	153	1797	1139
SGAU: Share of detachable chairlifts, detachable cable cars and funitels (percentage)	19	8,0	0,0	16,1	47,8	0,0
INN: Share of km of ski runs with artificial snow	19	60,6	70,3	34,1	100,0	0,0
RITAS: Percentage of intermediate slopes of total slopes (in km)	19	46,3	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 19 observations reflect three winter seasons (Sources: www.lift-world.info, www.neveitalia.it, www.skiinfo.it, ski guides and ski magazines, and USTIF, PAT).

Table 1 presents the summary statistics on the variables for the ski resorts used in the subsequent regressions. We report the means, medians, standard deviation, and minimum and maximum values.

For the weekend, the one-day lift ticket prices for the winter season 2010-2011 ranged from € 13 in Fiumalbo (MO) to € 36 in Abetone (PT). The standard deviation of the lift prices is approximately € 6,30 (weekends), indicating a significant variation in lift ticket prices across ski resorts. The price of weekday ski passes ranged from € 12 to € 29 for the same ski resorts.

The average length of ski runs is 13,6 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.

The average lift capacity is 1623 persons (indicating the capacity to transport 1623 skiers up a mountain at a speed of 1000 vertical meters per hour). The average lift capacity is highest in Folgaria (TN), with 7.148 skiers on average every hour.

The share of high-speed (detachable) chairlifts and modern gondola lifts on total lift capacity is 8,0 percent. 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 percent at Abetone, followed by Cimone with 42 percent, Folgaria with 37 percent, and Corno alle Scale with 33 percent. Other 15 ski resorts offer only fixed-grip chairlifts and ski lifts.

The mean altitude of peak lift stations (i.e., uphill cable and chairlift terminals) is 1546 m. Not surprisingly, the average altitude is highest at the Apennine ski resorts, thereby maximizing the cold winter conditions (e.g., Cimone (MO), at 1797 m; Abetone (PT), 1772 m; and Cerreto Laghi (RE), 1689 m).

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 12 years, respectively, followed by Abetone (PT) with an average of 10 years, and Cimone (MO) and Cerreto laghi (RE), with an average of 15 years each.

The mean altitude of peak lift stations (chairlift terminals) is highest in Cimone (1797 meters on average), followed by Abetone (1772 meters) and Folgaria (1634 meters).

INSERT TABLE 2 HERE

Table 2 ranks the resorts in terms of quality for both internal and external factors. 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.

Table A2 in the Appendix presents the summary statistics on the variables for the 19 ski resorts used in the subsequent regressions. We report the means and medians for each of the three regional groups separately.

The wide availability of detailed information sources on ski resorts and on ski lift prices denotes the presence of a highly competitive environment and behavior. 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.

5. The results

Table 3 shows the correlation between the variables. 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 (0,89 to 0,92), the automation of the lifts (0,66-0,69), and the hourly capacity of slopes (0,86 to 0,81). Snow depth has some correlation with the number of days of the winter season (0,68). Among the explanatory variables, on the other hand, we found a high correlation between the flow capacity of the plants and the length of the slopes (0,97).

INSERT TABLE 3 HERE

Table 4 presents the estimates for the linear and logarithmic formulations of the hedonic price equation. The adult one-day tickets for weekdays and for weekends (including public holidays) was considered. We used the robust regression technique, which is an iterative, weighted least-squares procedure that puts less weight on outliers. The fit of the regression model was quite good for both linear and logarithmic relationships.

Specification (i) contains the estimates of the basic price equation, whereas specification (ii) contains the results of the price equation with the dummies indicating the Alpine and Abetone competitors.

The good fit is an indication that the dispersion of prices between the ski resorts of the three ski areas can be explained mainly by the difference in the characteristics expressed by the independent variables. In other words, the difference in ticket price is only marginally affected by unobserved factors.

The coefficients of the hedonic price equation represent the willingness to pay, assuming the market is in equilibrium. Some of the above selected variables were not included in the regression 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 three 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, RCCLTL as a proxy of comfort, measured by the share of cabin and chair lift over total lifts in the station, and AGE-P, the weighted average of the lift facilities.

5.1 Linear formulation

The explanatory power of the linear model measures around 93 percent. Overall, most of the attributes show the expected sign and are statistically significant at 1 percent level. While the length of the slopes (KM), the vertical drop of the slopes (VTDR), the length of the winter season (DAYS), and the quality of the slopes (RITAS) are all significant and have a positive impact on the weekend price, the quality of the lifts (SGAU) and the snowmaking equipment (INN) are only significant at 10 percent level and have a negative impact on weekday and on weekend prices.

With the linear formulation the most important attribute is the length of the slopes, with small differences between weekday and weekend lift prices. On average, consumers will pay from 50 to 70 cents for a slope kilometer, according to the specification. Considering the differences between the resorts under study, with the largest (47.4 km) and the smallest (1 km), the consumers will value the ski pass around € 23-32. The difference between Cimone (39,8 km) and Abetone, for example, is in the range of € 4-5. A 10 percent increase of the share of intermediate slopes in total km slopes (RITAS) would increase the price, on average, by around 37-72 cents on weekends and decrease the price by 39-48 cents on weekdays. Instead, the hedonic price of ALT is significant only for the weekdays. Its value varies between 45 and 95 cents each 100 meters of altitude. This means that the difference in the altitude between the highest (1797 meters) and the lowest (1139 meters) winter sports resort is evaluated by consumers at from € 3 to € 6,20.

5.2 Logarithmic formulation

The fit of the logarithmic formulation for the weekday tickets model is fairly good, with an adjusted R2 in the range of 0,9196-0,9385 according to the specification. This indicates that 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 two characteristics, all are significant and show the expected sign.

Among the internal factors, the length of the ski runs (ln km) and the vertical drop (ln VTDR) have a positive and significant effect at the 1 percent level. Instead, on weekends, the ski lift capacity (ln VTMH) is not significant. These three variables have a positive sign, as expected.

The elasticity of ticket price to the length of slopes has an average magnitude of 0,16. An increase of 10 percent of the total length of slopes, equal to an average increase of 1,4 km, would leads to a 1,6 percent increase in lift ticket price (from €23,20 to €23,60).

The vertical drop (VTDR) is also positive and statistically significant, with an elasticity of 0,26 based on the robust regression estimates. This suggests that a 10 percent increase in vertical lift capacity would lead to a 2,6 percent increase in the lift ticket price.

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 0,041 on weekends and 0,065 on weekdays, with a significant level of 1 percent, suggesting that a 10 percent increase in the transport capacity would lead to a 0,4 – 0,6 percent increase in the weekend ticket price.

From the econometrics, we find a significant difference from the largest Alpine ski resorts, where the size of the skiable area and the length of the slopes are preferred to transport capacity. 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 capacity, but found no significant relationship for the Italian resorts. The magnitude of the elasticities is much lower for both variables (0,042 for VTMH and 0,034 for KM)[8]. Similar conclusions from the same author hold for Switzerland and France (Falk 2008, 2010), 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 differ only in terms of the magnitude of the effects, which is significantly higher than in Alpine resorts, but not in the ranking of the attributes. The value of the coefficient of the capacity of the ski lifts is higher than the length of the ski runs in both regions, confirming that the consumers are willing to pay for a better lift capacity. The results also have an important implication for the Emilian small resorts, with less than 3 Km of slopes. With an average elasticity of 0,15 on weekends, this implies that by doubling the length of the ski runs, the consumers will value the additional services as an increase of 15 percent 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, as shown by the 0,37-0,58 elasticity on weekdays. The coefficient is positive and significant at 1 percent level and is very high by international standards. The result is also consistent with Falk (2008). This may suggest that the sustainability of the ski resort is largely dependent upon significant factors outside the control of lift operators and may require, instead, a broader systemic vision by the interested local community.

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 requires further research in order to assess the potential impact on the small ski resorts outside the Alpine region.

In this sense, our results provide a valuable contribution to explaining the price differences between the Apennine 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.

Besides, contrary to previous research on international ski resorts, we did not find a positive and statistically significant impact from the quality of the fast chairlifts (SGAU). 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. Instead, the coefficient is positive and significant at 1 percent on weekdays, with a value of 0,363, which

[8] 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 57 observations, while sizes in the literature are much bigger. However, country-specific regressions in the Pawlowski study support our estimates.

translates into an elasticity of 0,03 (= β * Percentage Average Share =-0,363 * 0,080) for all ski resorts.

The results are surprising since we expected a positive impact from the 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 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[9]. 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.

While high-speed chairlifts may increase the number of skiers on weekends and reduce the waiting time at the downhill station, 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 0,33-0,43. 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 0,35 translated into an elasticity of 0,03 (= β * Percentage Average Share = 0,35 x 0,080=0,0280), but it could increase up to 0,15 in Abetone and Cimone because of their higher share (40 percent) of high-speed chairlifts, the same order of magnitude of the length of slopes on weekdays.

The average altitude of peak lift stations (ALT) is negative and statistically significant at 1 percent level, for both weekend and weekday tickets, with a high elasticity, approximately 0,78-0,89. This is quite surprising 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 (ALT). 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 favorable temperatures. With the exception of two small ski resorts, investments have been significant over the last decade and the average share of slopes covered by artificial snow in the largest resorts reach over 70 percent 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[10].

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

[9] 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.

[10] 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).

relatively higher than in the international resorts (Falk 2008 and 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 percent) than that of Switzerland or France.

Snowmaking (INN) is another puzzle. The sign of the coefficient is negatively significant at 10 percent level. The value of -0,0641 leads to an elasticity of -0,04 (= β * Percentage Average Share =-0,0641 * 0,606), which has a magnitude higher than the share of high-speed chairlifts. Increasing the share of slopes with artificial snow will lead to a reduction in the ticket price. Again, the question is whether the competition effect will prevail over the oligopolistic behavior. A much more significant value of the coefficient is estimated for weekdays. The effect of artificial snow (INN) is significant at 1 percent level with, again, a negative sign. In this case, the elasticity of lift price is -0,146.

Finally, the quality of the slopes, measured by the share of intermediate slopes: the estimated coefficients are positive, as expected, and significant only for the weekends, while they are negative (and significant at 1 percent) on weekdays.

Table 4a: Ticket price estimates (**linear** specification)

Variables	**Weekend**							
	WE(1)				WE(2)			
Constant	4.616964		0,642189		15,8336	***	-0.66466	
SVTH Vertical capacity	-0.00169	***	-0,00180	***	-0,001897	***	-0,002480	***
KM slopes	0,69522	***	0,70738	***	0,51035	***	0,5985	***
VTDR	0.00665	***	0,00818	***	0.00888	***	0,011473	***
SNOW			-0,02631	*			-0,03874	***
Average Altitude of Lifts (ALT)	-0,00078				-0,006284	*		
DAYS	0,06969	***	0,09625	***	0,05973	***	0,10657	***
Percentage of fast lifts (SGAU)	-13,3824	***	-14,6607	***	-3,9487		-4,3125	
Percentage of runs with snowmaking (INN)	0,91706		1,2071	*	-0,72166		0,7352	
Percentage of intermediate slopes (RITAS)	3,7648	***	3,3835	***	7,1926	***	4,6853	***
DTN					3,7215	***	4,9948	***
DAB					1,6889		1,41222	
DSMALL					-2,47123		-0,28716	
R2 Adjusted	0,9295		0,9346		0,9468		0,9518	
Obs	57		57		57		57	

Note: *significant at 10 percent: ** significant at 5 percent; *** significant at 1percent

Variables	**Weekdays**							
	WE(1)				WE(2)			
Constant	16.39573	***	13,0668	***	28,0456	***	14,49746	***
SVTH Vertical capacity	-0.001245	*	-0,001103		-0,00174	***	-0,001812	***
KM slopes	0,68917	***	0,6676	***	0,51423	***	0,6174	***
VTDR	0.005257	***	0,002505		0.00708	***	0,003625	*
SNOW			0,022748	*			0,012119	
Average Altitude of Lifts (ALT)	-0.0045237	**			-0,009497	***		
DAYS	0,01597	*	-0,01104		0,001274		-0,01049	

Percentage of fast lifts (SGAU)	-8,7169	*	-9,1008	*	3,3904		-0,5765	
Percentage of runs with snowmaking (INN)	-0,2083		0,24743		-1,9411	***	-0,2747	
Percentage of intermediate slopes (RITAS)	-4,3904	***	-4,8439	***	-0,9797		-3,9165	***
DTN					4,8807	***	3,9246	***
DAB					0,6272		-0,9046	
DSMALL					-2,9441	***	-1,3381	***
R2 Adjusted	0,9248		0,9243		0,9698		0,9592	
Obs	57		57		57		57	

Note: *significant at 10 percent: ** significant at 5 percent; *** significant at 1percent

Table 4b: Ticket price estimates (**logarithmic** specification)

Variables	**Weekend**							
	WE(1)				WE(2)			
Constant	5.2306	***	-0,4803		5,8559	***	-1,5936	*
ln SVTH Vertical capacity	0.04168	***	0,02951		0,02860	*	0,01902	
ln KM slopes	0,1473	***	0,1411	***	0,11547	***	0,1514	***
ln VTDR	0.2092	***	0,17136	**	0.2549	***	0,2623	***
ln SNOW			-0,03873	*			-0,0620	**
ln Average Altitude of Lifts (ALT)	-0.7850	***			-0,8926	***		
ln DAYS	0,3737	***	0,4522	***	0,3727	***	0,5799	***
Percentage of fast lifts (SGAU)	-0,1418	*	-0,2798	***	-0,1490	*	-0,2119	**
Percentage of runs with snowmaking (INN)	-0,06418	*	0,0357		-0,07646	*	0,04491	
Percetnage of Intermediate slopes (RITAS)	0,1444	**	0,09009		0,2552	***	0,04160	
DTN					0,07183		0,1003	*
DAB					0,09538	*	0,0522	
DSMALL					-0,02933		0,1228	**
Elasticity: Percetnage of fast lifts (SGAU)	-0,012		-0,024	***	-0,013	*	-0,019	***
Elasticity: Percetnage of runs with snowmaking (INN)	-0,040	*	0,022		-0,048	*	0,028	
Elasticity: Percentage of Intermediate slopes (RITAS)	0,067	***	0,042		0,118	***	0,019	
R2 Adjusted	0,9370		0,9125		0,9385		0,9196	
Obs	57		57		57		57	

Note: *significant at 10 percent ** significant at 5 percent *** significant at 1 percent.

Variables	**Weekdays**							
	WE(1)				WE(2)			
Constant	9.9511	***	3,309	***	11,829	***	3,5388	***
ln SVTH Vertical capacity	0.04629	***	0,06499	***	0,02362		0,05338	*
ln KM slopes	0,2129	***	0,1828	***	0,1373	***	0,1489	***
ln VTDR	0.2118	***	-0,03399		0.23196	***	-0,02607	
ln SNOW			0,06493	**			0,05889	*
ln Average Altitude of Lifts	-1.2253	***			-1,4052	***		

(ALT)								
ln DAYS	0,03867		-0,22034	*	-0,04520		-0,2493	*
Percentage of fast lifts (SGAU)	0,43008	***	0,3324	***	0,4128	***	0,3857	***
Percentage of runs with snowmaking (INN)	-0,20907	***	-0,07896		-0,2411	***	-0,08678	
Percentage of Intermediate slopes (RITAS)	-0,41013	***	-0,4120	***	-0,1374		-0,29718	***
DTN					0,1424	***	0,1408	**
DAB					0,0576		-0,02607	
DSMALL					-0,1687	***	-0,04472	
Elasticity: Percentage of fast lifts (SGAU)	0,037	***	0,028	***	0,035	***	0,033	***
Elasticity: Percentage of runs with snowmaking (INN)	-0,131	***	-0,049		-0,151	***	-0,054	
Elasticity: Percentage of Intermediate slopes (RITAS)	0,190		-0,191		-0,064		-0,138	***
R2 Adjusted	0,9269		0,8816		0,9434		0,8973	
Obs	57		57		57		57	

Note: *significant at 10 percent ** significant at 5 percent *** significant at 1 percent.

The results of the test show that the regional dummy variable for Altipiani Trentini is positive and significant on both weekends and weekdays when the different characteristics are accounted for, implying that the one-day lift ticket price in Altipiani Trentini is, on average, respectively 10.5–15.0 percent higher than that in Emilia Romagna[11]. The corresponding price gap for Abetone was not significant. Instead, the coefficients on weekdays are negative and significant for the small Emilian winter resorts, which justify the offered discount of 15 percent[12].

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, 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. This behavior applies in particular on weekdays. On average, consumers are paying 28 percent more for Altipiani Trentini on weekdays when the characteristics are excluded[13], 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 are not willing to pay a substantial price premium for the nearby Abetone resort as compared to the Emilian Apennines with similar characteristics (e.g., size and quality of lifts, length and vertical drop of slopes; compare Table 4 with Table A3 in the Appendix).

[11] The percentage difference is obtained by: exp(0.1003)-1)*100 = 10,5 percent and exp(0.1408)-1)*100 = 15,1 percent
[12] The percentage differences are obtained by: (exp(-0,1687)-1)*100) = -15,5 percent
[13] The percentage difference is obtained by: exp(0,2466)-1)*100 = 28 percent and . exp(0,0925)-1)*100 = 10 percent.

6. The predicted price

A parameter of greatest 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 and 6 present the hedonic price schedule of the one-day ticket price on weekends and weekdays.

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). Lavarone and Cerreto Laghi (RE) are ranked fourth and fifth. Corno alle Scale (BO) is ranked seventh.

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, as is the case for Abetone (PT), Lavarone (TN), Cerreto Laghi (RE), Corno alle Scale (BO), Febbio (RE), Prato Spilla (PR), S. Anna Pelago (MO), Piane di Mocogno (MO), Ventasso Lagni (RE), Passo Penice (PC), Le Balze (FC), Lagdei (PR), skiers may overpay for lift tickets. On the contrary, if it is below the predicted price, as is the case for Folgaria (TN), Cimone (MO), Schia (PR), Doganaccia (PT), Campigna (FC), Ospitaletto (RE), and Fiumalbo (MO), the resort is a good value and the skiers may be willing to pay even more.

Table 5: Actual and predicted prices of ski lift tickets, 2010-2011 – weekend

	Predicted	Rank	Actual	SVTMH	KM	SNOW	DAYS	SGAU	ETA-P	INN	RITAS	OverPriced / Underpriced
Folgaria	33,9	1	32,0	7.148	39,0	59	141	0,375	12	0,883	0,635	**-1,93**
Abetone	32,8	2	36,0	6.963	47,4	28	126	0,478	10	0,799	0,697	**3,25**
Cimone	32,4	3	32,0	6.500	39,8	39	128	0,426	15	0,699	0,764	**-0,38**
Lavarone	29,0	4	32,0	2.333	22,9	59	141	0,000	10	0,869	0,160	**3,00**
Cerreto Laghi	27,2	5	28,0	1.602	14,0	33	128	0,000	15	0,743	0,607	**0,81**
Schia	25,5	6	25,0	510	13,4	37	127	0,000	13	0,396	0,679	**-0,46**
Corno alle Scale	25,3	7	27,0	2.229	19,2	39	127	0,333	14	0,703	0,708	**1,74**
Febbio	24,4	8	25,0	1.385	12,3	31	64	0,000	7	1,000	0,719	**0,63**
Doganaccia	24,0	9	23,0	1.548	14,4	28	126	0,000	18	0,718	0,243	**-1,03**
Prato Spilla	23,1	10	25,0	442	10,0	39	127	0,000	25	0,528	0,764	**1,85**
S. Anna Pelago	21,9	11	22,0	410	5,7	37	127	0,000	32	0,579	0,526	**0,14**
Piane di Mocogno	18,8	12	20,0	382	3,1	33	127	0,000	8	0,613	0,290	**1,24**
Ventasso Laghi	17,7	13	18,0	148	3,3	31	127	0,000	5	0,641	0,539	**0,27**
Campigna	17,6	14	17,0	95	2,3	37	127	0,000	17	0,000	0,533	**-0,64**
Passo Penice	17,4	15	18,0	50	1,7	31	127	0,000	21	1,000	0,230	**0,57**
Ospitaletto	17,1	16	15,0	344	6,8	17	64	0,000	29	1,000	0,441	**-2,09**
Le Balze	16,4	17	17,0	34	3,6	37	127	0,000	10	0,722	0,278	**0,57**
Lagdei-Lagosanto	14,8	18	15,0	232	1,0	37	127	0,000	43	0,000	0,000	**0,16**
Fiumalbo	13,2	19	13,0	14	1,5	28	127	0,000	2	0,000	0,000	**-0,22**

Table 6: Actual and predicted prices of ski lift tickets, 2010-2011 –weekdays

	Predicted	Rank	Actual	SVTMH	KM	SNOW	DAYS	SGAU	ETA-P	INN	RITAS	OverPriced / Underpriced
Folgaria	25,5	1	29,0	7.148	39,0	59	141	0,375	12	0,883	0,635	**3,54**
Abetone	25,3	2	29,0	6.963	47,4	28	126	0,478	10	0,799	0,697	**3,70**

Cimone	25,1	3	26,0	6.500	39,8	39	128	0,426	15	0,699	0,764	**0,92**
Lavarone	24,0	4	29,0	2.333	22,9	59	141	0,000	10	0,869	0,160	**4,98**
Corno alle Scale	17,9	5	21,0	2.229	19,2	39	127	0,333	14	0,703	0,708	**3,11**
Doganaccia	17,1	6	19,0	1.548	14,4	28	126	0,000	18	0,718	0,243	**1,93**
Schia	16,7	7	20,0	510	13,4	37	127	0,000	13	0,396	0,679	**3,30**
Cerreto Laghi	16,3	8	20,0	1.602	14,0	33	128	0,000	15	0,743	0,607	**3,69**
S. Anna Pelago	14,0	9	13,0	410	5,7	37	127	0,000	32	0,579	0,526	**-1,00**
Ospitaletto	14,0	10	15,0	344	6,8	17	64	0,000	29	1,000	0,441	**1,04**
Prato Spilla	13,5	11	15,0	442	10,0	39	127	0,000	25	0,528	0,764	**1,49**
Lagdei-Lagosanto	13,1	12	15,0	232	1,0	37	127	0,000	43	0,000	0,000	**1,89**
Fiumalbo	12,9	13	13,0	14	1,5	28	127	0,000	2	0,000	0,000	**0,10**
Piane di Mocogno	12,7	14	13,0	382	3,1	33	127	0,000	8	0,613	0,290	**0,28**
Febbio	12,3	15	20,0	1.385	12,3	31	64	0,000	7	1,000	0,719	**7,69**
Campigna	12,1	16	12,0	95	2,3	37	127	0,000	17	0,000	0,533	**-0,14**
Le Balze	11,8	17	12,0	34	3,6	37	127	0,000	10	0,722	0,278	**0,18**
Ventasso Laghi	11,6	18	13,0	148	3,3	31	127	0,000	5	0,641	0,539	**1,41**
Passo Penice	10,9	19	15,0	50	1,7	31	127	0,000	21	1,000	0,230	**4,13**

The results indicate that for Cimone (MO) the predicted price is very close to the actual average price on weekends and on weekdays. 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 for the one-day ticket instead of the € 32 actually charged by the lift operators. The ticket price is therefore underpriced by € 1,90. As can be expected, Abetone (PT) ranks second, with € 1 less than Folgaria, although the skiers will consider the ticket price overpriced by € 3,25. The same judgment is reserved for Lavarone, whose ticket price is overpriced by € 2.80 since skiers refuse to pay the same price as Folgaria. Also overpriced are Cerreto Laghi (RE), Corno alle Scale (BO), and Prato Spilla (PR), 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 € 2.50.

All the other small ski resorts, 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 € 3. Cimone is better, near the equilibrium between price and ski resort characteristics. Lavarone (TN) receives a negative evaluation since the skiers consider the €29 weekday ticket price overpriced by € 5. 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.

7. 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 duration of the winter season is considerably larger than that of the lift capacity of the ski resort. In addition the altitude of the resort, measured as vertical drop of the slopes, is more important than the length of the ski runs in determining the price of a one-day lift ticket. The magnitude of the effects of the total length of the ski runs is marginal compared to the other attributes.

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

The results of this application are promising. Of course, there is still a significant information gap due to the availability and accessibility of data, which we collected 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. The consistency of data is important for the econometric test of the hedonic price.

Nevertheless, these preliminary results appear very promising and could be refined and extended when new data or additional variables become available in order to test the hedonic price equation.

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Table 2 Basic characteristics of the ski resorts (ranked by lift capacity)

		SKFER	SKFES	SVTMH	KM	VTDR	SNOW	DAYS	ETA-P	ALT	SGAU	INN	RITAS	RTASCAP	RCCLTL
1	Folgaria	29	32	7.148	39,0	625	59	141	12,2	1634	37,5	88,3	63,5	5,5	75,0
2	Abetone	29	36	6.963	47,4	694	28	126	9,9	1772	47,8	79,9	69,7	6,8	52,4
3	Cimone	26	32	6.500	39,8	951	39	128	14,7	1797	42,6	69,9	76,4	6,1	63,6
4	Lavarone	29	32	2.333	22,9	450	59	141	10,2	1486	0,0	86,9	16,0	9,8	60,0
5	Corno alle Scale	21	27	2.229	19,2	535	39	127	14,4	1764	33,3	70,3	70,8	8,6	62,5
6	Cerreto Laghi	20	28	1.602	14,0	670	33	128	14,9	1689	0,0	74,3	60,7	8,7	50,0
7	Doganaccia	19	23	1.548	14,4	358	28	126	17,8	1623	0,0	71,8	24,3	9,3	42,9
8	Febbio	20	25	1.385	12,3	938	31	64	7,3	1500	0,0	100,0	71,9	8,8	50,0
9	Schia	20	25	510	13,4	330	37	127	13,0	1445	0,0	39,6	67,9	26,3	25,0
10	Prato Spilla	15	25	442	10,0	368	39	127	25,2	1608	0,0	52,8	76,4	22,5	33,3
11	S. Anna Pelago	13	22	410	5,7	380	37	127	32,1	1495	0,0	57,9	52,6	13,9	33,3
12	Piane di Mocogno	13	20	382	3,1	377	33	127	8,0	1521	0,0	61,3	29,0	8,1	0,0
13	Ospitaletto	15	15	344	6,8	447	17	64	29,1	1479	0,0	100,0	44,1	19,8	0,0
14	Lagdei-Lagosanto	15	15	232	1,0	275	37	127	43,0	1491	0,0	0,0	0,0	4,3	50,0
15	Ventasso Laghi	13	18	148	3,3	280	31	127	4,7	1556	0,0	64,1	53,9	21,9	0,0
16	Campigna	12	17	95	2,3	330	37	127	16,5	1626	0,0	0,0	53,3	23,6	0,0
17	Passo Penice	15	18	50	1,7	200	31	127	20,6	1139	0,0	100,0	23,0	34,9	0,0
18	Le Balze	12	17	34	3,6	203	37	127	10,0	1377	0,0	72,2	27,8	106,1	0,0
19	Fiumalbo	13	13	14	1,5	160	28	127	2	1400	0,0	0,0	0,0	107,1	0,0

Table 3. Correlation matrix

	SKFER	SKFES	KM	VTMH	VTDR	SNOW	DAYS	AGE-P	SGAU	INN	RITAS	RTASCAP	RCCLTL	DTN	DAB	DSMALL
SKFER	1															
SKFES	0,9003	1														
KM	0,9200	0,8927	1													
VTMH	0,8621	0,8116	0,9708	1												
VTDR	0,6535	0,7037	0,6955	0,6556	1											
SNOW	0,2676	0,2748	0,1867	0,1854	0,0475	1										
DAYS	0,1292	0,2093	0,1473	0,1924	-0,2902	0,6793	1									
AGE-P	-0,3163	-0,3541	-0,3126	-0,2520	-0,2660	-0,1025	-0,0757	1								
SGAU	0,6915	0,6691	0,8696	0,8998	0,5877	0,1034	0,1699	-0,2192	1							
INN	0,3847	0,3773	0,3799	0,3526	0,4456	-0,0708	-0,2971	-0,3353	0,2695	1						
RITAS	0,3609	0,5984	0,5129	0,4379	0,6523	0,0102	-0,1390	-0,3023	0,4948	0,2871	1					
RTASCAP	-0,2221	-0,1200	-0,2700	-0,3563	-0,1003	-0,0939	-0,1913	-0,0014	-0,3233	-0,0563	0,3301	1				
RCCLTL	0,7440	0,7621	0,6813	0,6430	0,6256	0,2642	0,1406	0,0393	0,5268	Breilin0,	0,3549	-0,2942	1			
DTN	0,5965	0,4437	0,3982	0,4059	0,0873	0,3115	0,2138	-0,1897	0,1258	0,2097	-0,1018	-0,186	0,4228	1		
DAB	0,3430	0,3342	0,4424	0,3965	0,1209	-0,0213	0,1104	-0,0888	0,3429	0,1548	0,0097	-0,1676	0,2192	-0,1176	1	
DSMALL	-0,8187	-0,7791	-0,7954	-0,7723	-0,5315	-0,2367	-0,2832	0,2660	-0,6547	-0,3506	-0,2504	0,3994	-0,7192	-0,4491	-0,4491	1

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

database http://www.lift-world.info/

Table A2: Descriptive statistics (winter 2010-2011)

	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	15	24	29	15	21	14	24	29
SKFES: One-day pass (weekend)	23	29	19	30	32	23	28	18	30	32
SVTMH: Lift capacity measured as vertical transport meters in persons per hour divided by 1000	1.623	3.444	337	4.255	4.741	442	2.229	288	4.255	4.741
KM: length of ski runs in Km	13,6	24,3	5,4	30,9	30,9	10,0	19,2	3,4	30,9	30,9
VTDR: Weighted mean altitude of uphill lift stations (in meters)	448	719	357	526	538	377	670	330	526	538
SNOW: Average seasonal snow depth in cm.	41	37	33	28	59	33	39	35	28	59
DAYS: average winter season with open lifts (days)	123	128	116	126	141	127	128	127	126	141
ETA-P: Weighted average age of lifts	16,7	14,7	17,6	13,8	11,2	14,2	14,7	14,7	13,8	11,2
ALT: Weighted average altitude of lifts	1.546	1.750	1.470	1.698	1.560	1521	1.764	1.493	1.698	1.560
ALTMAX: Maximum altitude of lifts	1.678	1.905	1.591	1.843	1.725	1617	1.890	1.580	1.843	1.725
SGAU: Percentage of detachable chairlifts or cable cars	8,0	25,3	0,0	23,9	18,7	0,0	33,3	0,0	23,9	18,7
INN: Percentage of slopes with artificial snow	60,6	71,5	54,0	75,9	87,6	70,3	70,3	59,6	75,9	87,6
RTASCAP: Km of slopes for lift capacity	24,7	7,8	33,1	8,1	7,6	9,8	8,6	22,2	8,1	7,6
RCCLTL: Percentage of C+CL over total lifts	31,5	58,7	16,0	47,6	67,5	33,3	62,5	0,0	47,6	67,5
RITAS: Percentage of intermediate slopes on total slopes (in KM)	46,3	69,3	41,7	47,0	39,7	53,3	70,8	48,4	47,0	39,7

Table A3: Robust regression estimates of the lift ticket differences across ski resorts

Robust regression estimates

	Ln one-day ski lift ticket (weekdays)		ln one-day ski lift ticket (weekend)	
		Emilian ski Resort Discount		Emilian ski Resort Discount
Dummy variable Abetone	0,0617	6,4	0,0042	0,42
Dummy variable Altipiani Trentini	0,2466***	28,0	0,0925***	10,0
Dummy variable Small Resorts	-0,4140 ***	-33,9	-0,4101 ***	-33,6
Costant	3,0851		3,3410 ***	
R2	0,7191		0,5723	

Notes: Significance at the 1 , 5 or 10 percent level is denoted by ***,** and *, respectively