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The Monetary Value of Winter Sport Services in the European Alps

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Abstract

Considering the increasing stress of competition in winter sports, e.g., caused by the increasing popularity of sun holidays in the winter season or recently developed new ski areas, cable-car companies have to optimize their price-performance ratio with a modified marketing management approach. For most decisions regarding the marketing mix (e.g. the price calculation of new supply attributes), the knowledge about the monetary value of the different single attributes a consumer receives when purchasing a ski-lift ticket is indispensable. Since economics in general has a certain value for practical decision-taking in leisure management we follow other authors and transfer the economic concept of 'hedonic prices' to the field of empirical leisure research to derive the monetary value of some core service attributes in winter sports. The study is based on data of n=260 ski areas in five countries of the European Alps (Austria, France, Germany, Italy, and Switzerland). While the developed hedonic price models show rather high-variance explanatory power, most of the estimated attribute prices differ significantly between the countries studied. Possible implications for the price and product policies of cable-car companies are presented and discussed.

JEL Classification Codes: D01, D12, L83

***Key Words*:** Winter sports, hedonic approach, monetary value, ski, service, price

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Introduction

Considering the increasing stress of competition in winter sports, e.g., caused by the increasing popularity of sun holidays in the winter season (Kepplinger, 1999) or recently developed new ski areas, cable-car companies have to optimize their price-performance ratio with a modified marketing management approach. In this context, it might be advisable to adapt ski-lift ticket fees according to the ski-area-specific supply characteristics. Furthermore, care should be taken concerning the price calculation of new supply attributes and it appears promising to put some efforts into the communication of specific ski-area characteristics that are precious for the consumer. Concerning all of these decisions, knowledge of the monetary value of the different single attributes a consumer receives when purchasing a ski-lift ticket is indispensable. Since the monetary values of the single attributes are not directly observable, they have to be calculated. This is the objective of the following empirical analysis.

The paper aims to provide two main contributions:

(1) Following Gratton and Taylor (1995) economics in general has a certain value for practical decision-taking in leisure management. Therefore, like Pompe and Rinehart (1995), we transfer the economic concept of 'hedonic prices' to the field of empirical leisure research to derive the monetary value of some core service attributes in winter sports.

(2) Since we have access to data of five different countries (Austria, France, Germany, Italy, and Switzerland) we want to analyse if differences (in the monetary values) between the different countries exist. Furthermore, possible implications for the price and product policies of cable-car companies are discussed.

The article is organized as follows. The first section presents the hedonic model applied to winter sports. Furthermore, the previous implementations of the hedonic approach in sports are summarized. This section is followed by considerations of methodological aspects like the observations, the data and the estimation. The results are presented in the third section, followed by a discussion of the results (implications), a conclusion and some ideas regarding further research directions.

The Hedonic Approach

In addition to methods based on primary data, for example, conjoint measurement (Gustafsson, Herrmann & Huber, 2001), it is possible to derive the monetary value of the single attributes by using data observed at the market.

This so-called hedonic approach is a two-step procedure. First, a functional relationship between market prices and attributes of the products is established. Secondly, based on this, the (hedonic) attribute prices are identified by partial derivation of the function.

Previous applications of the hedonic approach

The first empirical study that analyzed the functional relationship between product prices and product attributes was developed by Taylor (1916). This study was followed by numerous further analyses, as shown in Pawlowski (2007). The state of research, over the last 90+ years, can be summarized by six characteristics and tendencies. Firstly, particularly during the last ten years, the hedonic approach has been applied with increasing frequency and, secondly, worldwide, for instance, in Japan (Kawamura, 1999), Italy (Tomat, 2005), New Zealand and Australia (Schamel & Anderson, 2001), and Brazil (Batalhone, Nogueira & Mueller, 2002). Thirdly, overall, automobiles, personal computers and real estate are the main areas of application. Fourthly, the focus on specific aspects by several studies is remarkable. For example Gröhn (1996), Herp (1982), and Sander (1994) concentrate on the value of brands. Furthermore, studies focused on real estate evaluate attributes, such as the quality of beaches (Pompe & Rinehart, 1995) or air pollution caused by nearby sewage plants (Batalhone et al., 2002). Fifthly, a further objective of hedonic studies is the quality adjustment in the official price statistics (Linz, Behrmann & Becker, 2004). Finally, in the context of sport economics, the hedonic approach has been considered only a few times. Gerrard (2001), for instance, measures player and team qualities, while Gröhn (1996) tries to estimate the monetary value of surfboard brands. Melvin, McCormick, and Warren (1997) focus on golf-course characteristics, while Feng and Humphreys (2009) estimate the intangible benefits of professional sports facilities on residential property values.

Theoretical model

Following the hedonic theory the consumer receives a bundle of *J* objectively measurable product attributes ($x_1,...,x_2,...,x_J$) when purchasing a ski-lift ticket. Therefore, the hedonic price function relates the ski lift ticket fee to the quantities of the different product attributes (Rosen, 1974) [1]:

$$P(X) = f(x_1,...,x_2,...,x_J) \tag{1}$$

The partial derivatives of this function reflect the monetary value of the corresponding attributes. These monetary values are called hedonic, marginal, and implicit prices of the attributes (Atkinson & Halvorsen, 1983):

$$\partial P(X) / \partial x_j = p_j \tag{2}$$

It can be shown, within a simple mathematical framework, that the hedonic prices are equilibrium prices: Following neoclassical demand theory, the consumers maximize their utility constrained to their disposable income. In the context of hedonic theory, the utility (*U*) of a consumer *k* is a function of the attributes he receives with purchasing a ski lift ticket (*X*), other goods and services (*Z*) and the preferences (*D*). Furthermore, the budget constraint (*B*) of a consumer *k* is a function of the ski lift ticket fee (*P(X)*) and the expenditures for other goods and services (*P(Z)*):

$$
\begin{aligned}
U_k &= f_k(X_k, Z_k, D_k) && \text{for each } k = 1,2,...,K \\
B_k &= P(X_k) + P(Z_k) && \text{for each } k = 1,2,...,K
\end{aligned}
\tag{3}
$$

Given a certain budget (*B**) and utility level (*U**), the demand function can be described as the willingness to pay for a product depending on the attributes (x_j):

$$
D_k = f_k(x_{1k},...,x_{2k},...,x_{3k},B_k^*,U_k^*) \qquad \text{for each } k = 1,2,...,K \tag{4}
$$

The partial derivatives reflect the marginal willingness to pay for an additional unit of the attributes (x_j):

$$
\partial D_k / \partial x_j = d_{jk} \qquad \text{for each } k = 1,2,...,K \tag{5}
$$

Consumers behave optimally when they choose the ski area that provides a bundle of attributes (*X*), where their marginal willingness to pay (d_j) corresponds to the hedonic price (p_j) for each attribute (x_j). The ski lift ticket fee, therefore, corresponds (*P(X)*) to the willingness to pay (*D(X)*) for the product:

$$
\begin{aligned}
d_{jk}(X_k) &= p_{jk}(X_k) && \text{for each } k = 1,2,...,K \text{ and } j = 1,2,...,J \\
D_k(X_k) &= P_k(X_k) && \text{for each } k = 1,2,...,K
\end{aligned}
\tag{6}
$$

Similarly, suppliers

maximise their revenue considering the turnover and the corresponding cost function. In the context of hedonic theory, it is assumed that the turnover of supplier *h* is the product of the quantity (*Q*) and the price of the ski lift ticket (*P(X)*). Furthermore, the production costs (*C*) depend on the quantity (*Q*) and the attributes they offer with selling ski lift tickets (*X*), as well as the specific production technologies (*T*):

$$R_h = Q_h * P(X_h) - C_h(X_h, Q_h, T_h) \qquad \textit{for each } h = 1, 2, ..., H \tag{7}$$

Given a certain production technology (*T**) and revenue level (*R**), the supply function can be described as ski lift ticket fee depending on the attributes they offer (x_j):

$$S_h = f_h(x_{1h}, ..., x_{2h}, ..., x_{3h}, T_h^*, R_h^*) \qquad \textit{for each } h = 1, 2, ..., H \tag{8}$$

The partial derivatives reflect the marginal cost for an additional unit of the attributes (x_j):

$$\partial S_h / \partial x_j = s_{jh} \qquad \textit{for each } h = 1, 2, ..., H \tag{9}$$

Suppliers behave optimally when they offer a bundle of winter sport services (*X*), where the marginal costs (s_j) correspond to the hedonic price (p_j) for each attribute (x_j).The ski lift ticket fee, therefore, then, corresponds (*P(X)*) to the revenue optimal price (*S(X)*) for the product:

$$\begin{aligned} s_{jk}(X_k) &= p_{jk}(X_k) \qquad \textit{for each } h = 1, 2, ..., H \textit{ and } j = 1, 2, ..., J \\ S_k(X_k) &= P_k(X_k) \qquad \textit{for each } h = 1, 2, ..., H \end{aligned} \tag{10}$$

The decisions made by customers and suppliers simultaneously and independently result (within the hedonic framework) in a market equilibrium, where marginal utility equals marginal cost for the certain winter sport services.

Methods

Observations

The data for this study were collected from the Allgemeiner Deutscher Automobil-Club (2007) and the Deutscher Skiverband (2007). The study is based, therefore, on a cross-section of data from the season 2006/07. In winter sports, it is often the case that ski-lift tickets vary regarding their geographical coverage. In particular, more-days-tickets often cover a wider geographical area and contain several ski areas. In this context, the *Oberlungauer* ski-lift ticket and the *Lungo* ski-lift ticket in the Salzburg region might serve as an example. These tickets permit the access to five respectively three single ski areas: Fanningberg, Katschberg-Aineck, Großeck-Speiereck, Obertauern, and Schönfeld-Innerkrems, as shown in Figure 1. So as not to double or triple the ski areas in our database, we focus on the ski-lift tickets that cover a single ski area only.

Insert Figure 1 about here

Variables

Price data: The lift ticket prices vary (amongst others) between the age of the consumer (children versus adults), the season (peak versus low), and their validity (for example, one day, a few days, from 11 am, or from 12 am). Furthermore, special offers (e.g. for students or retired persons) often exist. Due to some data restrictions, it is not possible to cover all these aspects. Nevertheless, it is possible to display the most often occurring price differentiations (age and season). The arithmetical mean of four lift ticket prices (adults peak and low season, children peak and low season), therefore, serves as dependent variable in the model [ELT].

Service attributes: There are several attributes that are expected to influence lift ticket prices. The maximum altitude of the winter sport resort in meters [ALT] is implemented as an indicator of snow reliability. Although it is not changeable by managers it has a considerable and increasing value for sport consumers due to the observable decreasing snow reliability in the European Alps (OECD, 2007). Thus, ALT is expected to influence ELT positively. As a macro indicator of winter sport variety, the total kilometers of Alpine slopes [TAS] are also expected to influence ELT positively. As corresponding micro indicator of winter sport variety serves the ratio of intermediate kilometers of Alpine slopes to total kilometers of Alpine slopes [RITAS]. *A priori*, it cannot be said if this indicator positively or negatively influences ELT in general, since sport consumers' preferences might be heterogeneous in different countries. Crowded lifts and congestion are expected to influence the perceived monetary value of the lift ticket prices negatively. Since we do not have access to direct measures of congestion we try to approximate this effect with implementing the ratio of total kilometers of Alpine slopes to total transportation capacity (in 1,000 persons per hour) [RTASCAP]. Following the above argument, this ratio is expected to influence ELT negatively. In addition, the ratio of the number of chair and cabin lifts to the total number of lifts serves as an indicator of transportation comfort [RCCLTL] and is expected to have a positive influence on ELT. Beside these metrical scaled variables, halfpipe(s) [PIPE] and/or snow and fun parks [PARK] in the winter sport resort are implemented as dummy variables (yes=1) in the model. From a theoretical point of view, these additional services are expected to influence ELT positively [2].

Estimation

To detect the hedonic attribute prices in the different countries, multiple regression analysis was applied. Concerning the hedonic price function, which is estimated by ordinary least squares

(OLS), one can distinguish between different functional forms. Since the estimation results with logarithmized metrical scaled attributes ($P = \beta \ln X$), show quite similar model fits (adjusted R^2) compared with the standard linear models ($P = \beta X$), we focus on the linear models with the attributes as independent variables in their basic forms.

Results

All in all, n=260 ski areas are accessible for the following analysis. Hereof, n=57 belong to Switzerland, n=40 to France, n=87 to Austria, n=41 to Germany and n=35 to Italy. The empirical lift ticket price [ELT] has an overall average of around 22€ per day, While it is around 23.4€ in Switzerland, the average (17.2€) in Germany is comparably low. The average of the maximum altitude [ALT] of the winter sport resort is around 2,219 meters. While Switzerland shows the highest average of ALT - 2,618 meters - the ski resorts in France show the highest average of total kilometers of Alpine slopes [TAS]. With more than 103 kilometers, the average value total of Alpine slope kilometers of Switzerland more than doubles the average value for all countries (50.8 kilometers). It is interesting to note that intermediate kilometers of alpine slopes make up more or less half of the total kilometers of Alpine slopes in the countries (RITAS is around .5). On average, the winter sport resort offers a transportation capacity of 1,000 persons per hour for each 3.5 kilometers of Alpine slopes in the resort [RTASCAP]. Between the different countries, some significant differences exist: While in France, Austria and Italy the cable-car companies offer a transportation capacity of 1,000 persons per hour for less than each three kilometers of Alpine slopes in the resorts, the value in Switzerland is close to five. While the ratio of the number of chair and cabin lifts to the total number of lifts [RCCLTL] is close to .5 in most of the countries, only 25% of the total number of lifts in Germany is made up by (more comfortable) chair and cabin lifts. Around 40% of all winter sport resorts offer a halfpipe [PIPE], while more than 64% have a snow or fun park [PARK]. Again, there are some significant differences between the different countries. While more than 72% of the French ski resorts offer a halfpipe, only 7% of the German ski resorts do so. The country-specific differences concerning PARK are, on average, around 40%: 86% of Swiss cable-car companies offer PARK, while only 46% of the German ones do so (Table 1).

Insert Table 1 about here

Table 2 provides the results of the OLS estimates, which can be directly interpreted as the hedonic prices of the different attributes (see Equation 2).

Insert Table 2 about here

The variance explanatory power of the overall model (all) measures around 59%, which is quite high for cross-section data. Considering the country-specific models, we can obtain a surprisingly good fit for Germany (85%) and France (78%), while the available attributes appear to be less good predictors for the lift ticket prices in Switzerland (39 %) and Austria (49%). Overall, most of the estimates show the expected and, as described above, plausible sign. While ALT, TAS and RCCLTL have a positive impact on ELT, RTASCAP has a negative impact on ELT. Although only significant in one model each, RITAS, PIPE and PARK tend to have a positive impact on ELT.

The hedonic price of ALT varies between 19 (Italy) and 58 (Germany) cents each 100 meters of altitude. This means, for example, for Austria, that the difference in the altitude between the highest (3,440 meters) and the lowest (855 meters) winter sport resort is evaluated by around 5.4€ (difference in ELT) by consumers and suppliers. TAS is the only attribute with a highly significant impact on ELT in each model. Nevertheless, the hedonic price for an Alpine slope kilometer also varies between the different countries, from 1.8 cents in France, up to around 10 cents in Germany. This means, for example, for Germany, that the difference in the total Alpine slope kilometers between the winter sport resort with the highest (50 kilometers) and the lowest (1 kilometer) value is evaluated by around 4.9€ (difference in ELT) by consumers and suppliers. A percentage increase of the share of chair and cabin lifts to the total number of lifts [RCCLTL] by 10% would increase the ELT, on average, by around 67 cents. A winter sport resort in Italy that extends the offer by a PIPE might increase the ELT by 3.5€. A winter sport resort in Germany that extends the offer by a PARK might increase the ELT by around 1.8€.

Implications

The information of these single-service attribute prices can be used for the price calculation of new supply attributes and the communication of specific ski area characteristics. Furthermore, it is possible to compare the ski-resort specific prices with the projected prices that appear to be appropriate, based on the evaluation of the consumers and the cable-car companies in the respective country. Table 3 provides an example of two specific ski resorts - Zermatt in Switzerland and Zugspitzplatt in Germany. Based on their specific attribute characteristics and the estimated country-specific hedonic prices (Table 2), it is possible to calculate the ski resorts' specific attribute prices. By aggregating the attribute prices and adding the constant term of the regression equation, the estimated ELT can be derived. As shown in Table 3, the observable ELTs of Zermatt and Zugspitzplatt differ just slightly from the estimated ELT.

Insert Table 3 about here

This implies that, on the one hand, the estimated models are quite appropriate, while on the other, since both estimated ELTs are slightly higher compared with the observable ELT, the tickets for these winter sport resorts are a slightly overpriced compared with ski resorts in the other countries studied. This slightly extra charge might be traced back to the brand and the recognition of these ski resorts, since both ski resorts are quite popular in Europe.

Conclusion

As intended in the introduction, we could derive the monetary value of single-service attributes in winter sports, based on the hedonic approach. Furthermore, it has been possible to reveal the differences of these values between the different countries within the Alps (Austria, France, Germany, Italy, and Switzerland) and to project the ELT of two popular ski resorts in Europe (Zermatt and Zugspitzplatt). Based on the estimation results, we discussed possible implications for the price, and product policies.

Whereas we could derive the monetary value of the core service attributes that can be seen as the most important ones in winter sports, it might be interesting to focus on further attributes and their monetary value (e.g. transport connections, Après ski opportunities). Although it is not possible to collect reliable data at this moment, due to such data restrictions as missing information on web pages and in books, this should be an objective for future research in this area. Furthermore, it would be interesting to extend the analysis in further research projects to other regions and countries, e.g., the Rocky Mountains.

Notes

[1] It is worth noting that the theoretical background of the hedonic approach was developed independently and even slower than its empirical applications (Ethridge 2001). Basic articles concerning the theoretical hedonic model are provided by Houthakker (1952), Griliches (1961), Becker (1965), Muth (1966) and Lancaster (1966; 1971).

[2] The interpretation of the three ratio variables is quite plausible. Furthermore, a serious problem in hedonic analysis, with a resulting estimation bias, is the often-occurring collinearity between the attributes (multicollinearity). With the implementation of three ratio variables, we can avoid this problem (the Variance Inflation Factors (VIF) for each attribute measures less than two).

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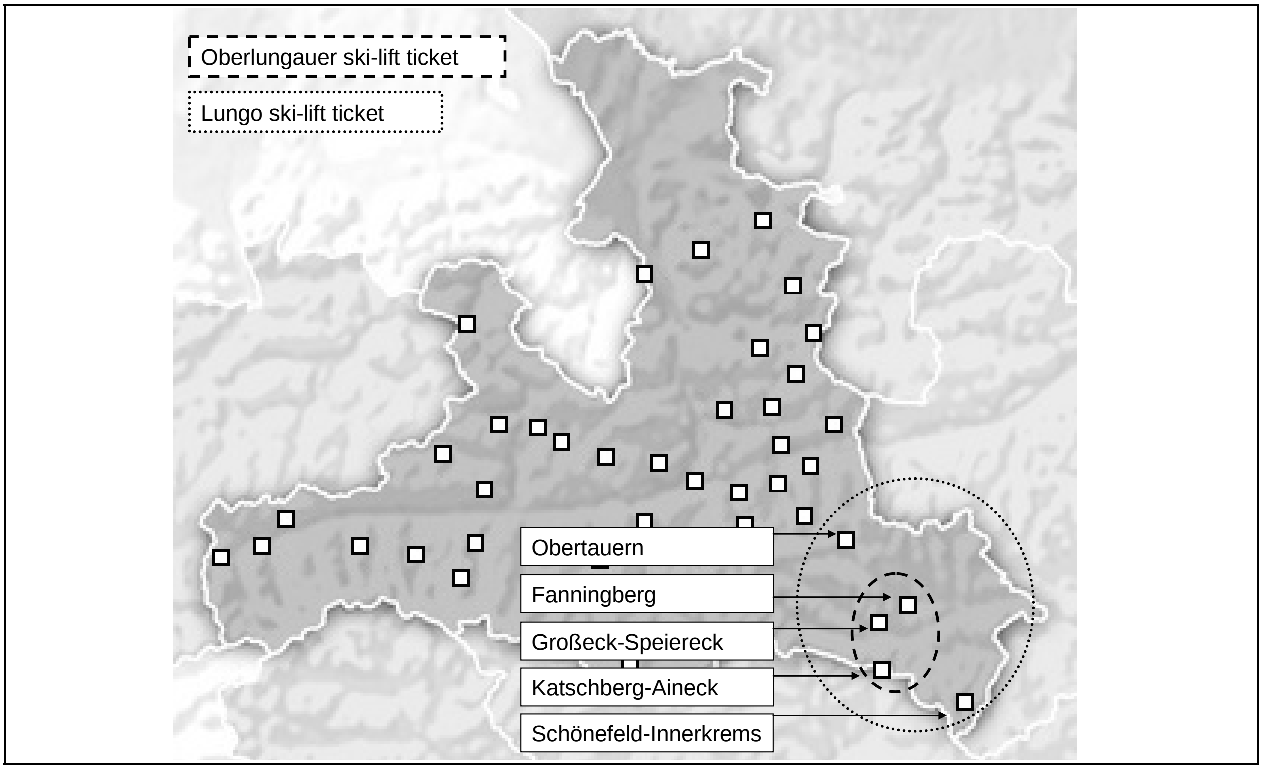
Figures

Figure 1: The geographical coverage of different ski-lift tickets. An example for the Salzburg region in Austria.



Tables

Table 1: Descriptive statistics of the variables.

attributes			all		SW		FR
ELT	mean sd	22.13	4.91	23.42	3.96	23.06	4.74
	min max	7.00	39.50	16.56	39.50	12.43	30.50
ALT	mean sd	2,219	608	2,618	448	2,571	437
	min max	800	3,883	1,685	3,883	1,710	3,566
TAS	mean sd	50.77	51.32	67.21	50.89	103.79	63.80
	min max	1.00	250	7.00	220	13.00	250
RTASCAP	mean sd	3.52	4.15	4.89	3.58	2.87	1.27
	min max	.63	46.15	2.14	25.00	.86	6.14
RITAS	mean sd	.48	.19	.47	.15	.43	.13
	min max	.00	1.00	.10	.80	.20	.83
RCCLTL	mean sd	.44	.25	.48	.20	.42	.19
	min max	.00	1.00	.00	.83	.00	.86
PIPE	mean sd	.39	.49	.50	.50	.72	.45
	min max	.00	1.00	.00	1.00	.00	1.00
PARK	mean sd	.64	.48	.86	.35	.81	.39
	min max	.00	1.00	.00	1.00	.00	1.00

all ≡ all five countries together, SW ≡ Switzerland, FR ≡ France.

Table 1: Descriptive statistics of the variables (continued).

attributes			AU		GE		IT
ELT	mean sd	22.67	3.90	17.21	5.02	23.27	5.38
	min max	10.00	32.38	7.00	29.75	10.50	33.25
ALT	mean sd	2,047	511	1,523	405	2,371	562
	min max	855	3,440	800	2,720	1,410	3,480
TAS	mean sd	33.58	30.30	14.54	11.90	43.57	45,87
	min max	3.00	155	1.00	50	1.40	165
RTASCAP	mean sd	2.93	1.81	4.41	8.87	2.46	1.15
	min max	1.01	16.67	.63	46.15	1.00	6.00
RITAS	mean sd	.49	.19	.47	.26	.54	.20
	min max	.00	1.00	.00	1.00	.00	1.00
RCCLTL	mean sd	.43	.22	.25	.27	.59	.30
	min max	.00	1.00	.00	1.00	.00	1.00
PIPE	mean sd	.28	.45	.07	.26	.43	.50
	min max	.00	1.00	.00	1.00	.00	1.00
PARK	mean sd	.51	.50	.46	.50	.57	.50
	min max	.00	1.00	.00	1.00	.00	1.00

AU ≡ Austria, GE ≡ Germany, IT ≡ Italy.

Table 2: Ordinary least squares estimates of the empirical lift ticket prices (Numbers in parentheses below each coefficient represent t-ratios for the null hypothesis).

attributes	**all**	**SW**	**FR**	**AU**	**GE**	**IT**
ALT	.0029***	.0020*	.0046***	.0021***	.0058***	.0019
	(6.51)	(1.81)	(3.87)	(3.00)	(5.26)	(1.25)
TAS	.0204***	.0294***	.0179**	.0536***	.1009***	.0447**
	(4.03)	(2.83)	(2.40)	(4.40)	(3.06)	(2.51)
RTASCAP	-.1761***	-.0990	-.8152***	-.0526	-.1043*	-.4266
	(-3.65)	(-.71)	(-3.00)	(-.31)	(-1.96)	(-.74)
RITAS	1.1844	3.0100	-.9209	-.9430	3.0327**	1.6639
	(1.12)	(.95)	(-.34)	(-.58)	(2.27)	(.45)
RCCLTL	6.7331***	3.3880	8.0051***	3.7015**	5.0349**	1.4560
	(7.52)	(1.39)	(3.53)	(2.42)	(2.56)	(.47)
PIPE	.1893	.2831	-.4271	-.0035	1.0018	3.5188**
	(.37)	(.30)	(-.46)	(-.00)	(.78)	(2.05)
PARK	.5508	1.7187	-.2025	.2822	1.7679**	.8212
	(1.14)	(1.17)	(-.20)	(.37)	(2.53)	(.48)
constant	11.4342***	12.0672***	9.5102***	15.381***	3.8156**	14.2050***
	(12.20)	(3.36)	(3.53)	(9.70)	(2.61)	(3.87)
n	260	57	40	87	41	35
adj. R^2	.590	.386	.774	.486	.846	.524

Models: all ≡ all five countries together, SW ≡ Switzerland, FR ≡ France, AU ≡ Austria, GE ≡ Germany, IT ≡ Italy, **significant**: * ≡ $p < .1$, ** ≡ $p < .05$, *** ≡ $p < .01$,

Table 3: Projections of the empirical ski-lift ticket prices based on ski resort specific characteristics and the estimated hedonic prices.

Attributes	**Attribute characteristics**	**Hedonic prices**	**Attribute prices**
Zermatt (Switzerland)			
Price children	21.66		
Price adults	43.31		
ELT (observable)	32.49		
ALT	3883	0.0020	7.77
TAS	195	0.0294	5.73
Intermediate Alpine slope km	106		
Total transportation capacity (in 1,000 persons per hour)	50.66		
Number of chair and cabin lifts	23		
Total number of lifts	33		
RTASCAP	3.8492	-0.0990	-0.38
RITAS	0.5436	3.0100	1.64
RCCLTL	0.6970	3.3880	2.36
PIPE	1	0.2831	0.28
PARK	1	1.7187	1.72
Constant	1	12.0672	12.07
ELT (estimated)			31.18
Zuspitze/Zugspitzplatt (Germany)			
Price children	22.50		
Price adults	37.00		
ELT (observable)	29.75		
ALT	2772	0.0058	16.08
TAS	22	0.1009	2.22
Intermediate Alpine slope km	19		
Total transportation capacity (in 1,000 persons per hour)	13,66		
Number of chair and cabin lifts	4		
Total number of lifts	12		
RTASCAP	1.3909	-0.1043	-0.15
RITAS	0.8636	3.0327	2.62
RCCLTL	0.3333	5.0349	1.68
PIPE	1	1.0018	1.00
PARK	1	1.7679	1.77
Constant	1	3.8156	3.82
ELT (estimated)			29.04