Hedonic Prices for Ski-Lift Passes in Europe

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Abstract: The knowledge of the monetary value of the different attributes a consumer receives when purchasing a ski-lift pass is of great importance for ski resort managers. In this article, the attribute values are calculated applying the hedonic price technique with a focus on a number of objectively measurable characteristics of n=255 ski resorts in Austria, France, Germany, Italy and Switzerland. To control for unobserved heterogeneity among the different countries, a fixed effects model for different ski-lift passes (adults and children; peak and low season) is used. Furthermore, a robust estimator of variance is used, and inference is drawn by bootstrapping.

Keywords: Winter Sports, Hedonic Price, Ski Lift Pass, Service

JEL Classification Number: D01, D12, L83

1. Introduction

Nowadays, the winter sports industry is a billion dollar business. For instance, the winter sports industry in Austria employs around 190 000 people and achieves a total turnover amounting to more than 12 billion euros each year (Wirtschaftskammer Österreich, 2005). However, considering the increased stress on winter sports, e.g., caused by the increasing popularity of winter sun holidays (Kepplinger, 1999) or new, recently developed ski resorts, cable-car companies have to optimize their price-performance ratio with a modified marketing management approach. In this context, it is advisable to adapt ski-lift pass fees according to the specific ski-resort characteristics. Furthermore, care should be taken concerning the price calculation of new supply attributes and it appears promising to put some effort into the communication of specific ski-resort characteristics that are important to the consumer. Therefore, the knowledge of the monetary value of the different attributes a consumer receives when purchasing a ski-lift pass is indispensable. Since these monetary values are not directly observable, they have to be calculated.

Previous studies have focused (primarily) on socioeconomic factors influencing willingness to pay for lift passes (Walsh *et al.,* 1983), a functional relationship between lift-pass prices and (a few) ski-resort characteristics (Mulligan and Llinares, 2003), or special attributes such as snowfall (Englin and Moeltner, 2004) based on data from (a few) US ski resorts. Therefore, this article presents the first comprehensive study for the winter sports industry in Europe, with a focus on a number of objectively measurable ski-resort characteristics.

The attribute values are calculated applying the hedonic price technique, pioneered by Taylor (1916) and Waugh (1928). Over past decades, numerous studies have focused primarily on automobiles or real estate. However, some applications indicate that the hedonic method is also appropriate for nondurable products (e.g. Anstine, 2000).

The article is organized as follows. Section II briefly discusses the theoretical model and the empirical specification. Section III discusses the empirical findings based on data for ski resorts in Austria, France, Germany, Italy and Switzerland. Section IV concludes the article and provides some ideas for further research directions.

2. Model

2.1. Theoretical Model

Following the hedonic approach the consumer receives a bundle of *J,* objectively measurable product attributes $(x_1,...,x_2,...,x_J)$,when purchasing a ski-lift pass. Therefore, the hedonic price function relates the ski-lift pass fee to the quantities of the different product attributes $P(X) = f(x_1,...,x_2,...,x_J)$. The partial derivatives of this function reflect the monetary value (hedonic prices) of the corresponding attributes $\partial P(X) / \partial x_j = p_j$. Following Rosen (1974), hedonic prices can be interpreted as equilibrium prices. In the context of hedonic theory, the utility *U* of a skier or snowboarder *k* is a function of the attributes they receive on purchasing a ski-lift pass *X*, other goods and services *Z* and their preference *T*. Thus $U_k = f_k(X_k, Z_k, T_k)$. Furthermore, the budget constraint *B* is a function of the ski-lift pass fee *P(X)* and expenditure for other goods and services *P(Z)*, thus $B_k = P(X_k) + P(Z_k)$. Therefore, skiers or snowboarders behave optimally when they choose the ski resort that provides a bundle of attributes *X*, where their marginal willingness to pay corresponds to the hedonic price p_j for each attribute x_j. The ski-lift pass fee *P(X)*, therefore, corresponds to the willingness to pay for the product. Similarly, cable-car companies maximize their revenue *R* considering the turnover (the product of the quantity *Q* and the ski-lift pass fee *P(X)*) and the corresponding cost function *C* that depends on the quantity *Q* the attributes they offer with selling ski-lift passes *X*, as well as the specific production technologies *τ*, thus $R_h = Q_h * P(X_h) - C_h(X_h, Q_h, \tau_h)$. Cable-car companies behave optimally when they offer a bundle of winter sport services *X*, where the marginal costs correspond to the hedonic price p_j for each attribute x_j. In this case the ski-lift pass fee *P(X)* also corresponds to the revenue optimal price for the product.

2.2. Empirical Specification

Since ski-lift passes often cover a wide geographical area and comprise several ski resorts we focus on the ski-lift passes that cover a single ski resort only (as not to double or triple the ski resorts in our database). The lift-pass prices vary according to 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 a.m. or others). Furthermore, special offers (e.g. for students or retired persons) often exist. In this study we are able to distinguish between the former two characteristics. Therefore, five different prices serve as dependant variables in our model: adults, peak and low season; children, peak and low season; as well as the arithmetical mean of all four prices.

There are several attributes that are expected to influence lift-pass prices. The maximum altitude of the winter sport resort in metres [ALT] is implemented as an indicator of snow reliability. Although it is not changeable by managers, it has a considerable value for sport consumers owing to the observable decreasing snow reliability in the European Alps (OECD, 2007). Furthermore, the total kilometres of Alpine slopes [TAS] and the ratio of intermediate kilometres of Alpine slopes to total kilometres of Alpine slopes [RIAS] (indicators of winter sport variety), the total transportation capacity (in 1000 persons per hour) [CAP] (indicator of possible congestion), and the ratio of the number of chair and cabin lifts to the total number of lifts [RCC] (indicator of transportation comfort) are considered. Beside these, metrical-scaled variables, halfpipe(s) [PIPE], snow and fun parks [PARK], lighted slopes [LIGHT], free of charge ski busses [BUS], as well as ski kindergartens [KIND] in the winter sport resort are implemented as dummy variables (yes=1) in the model.

To control for unobserved heterogeneity between the different countries a fixed effects model is used. This appears suitable since it allows for arbitrary dependence between the unobserved effects and the observed explanatory variable (Wooldridge, 2010). To carry out the fixed effects analysis a pooled dummy variable OLS regression is run with Austria [AUST], France [FRA], Germany, [GER], as well as Switzerland [SWISS] as further dummy variables (yes=1) in the model. Since Lagrange Multiplier tests reveal heteroskedasticity, a robust estimator of variance is used and inference is drawn by bootstrapping with 1,000 replications.

Summing up, the empirical specification (with expected coefficient signs in parentheses) is:

$$\ln P = f(ALT(+), TAS(+), RIAS(?), CAP(+), RCC(+), PIPE(+), PARK(+), LIGHT(+),$$
$$BUS(+), KIND(+), AUST(?), FRA(?), GERM(?), SWISS(?))$$

3. Data and Empirical Results

3.1. Data

The data (winter season 2006/07) for this study was collected from the Allgemeiner Deutscher Automobil-Club (2007) and the Deutscher Skiverband (2007). All in all, n=255 ski resorts are accessible for the following analysis. Of these n=55 belong to Switzerland, n=41 to France, n=83 to Austria, n=41 to Germany and n=35 to Italy.

3.2. Empirical Results

Since PIPE, LIGHT, KIND and TAS were found to be statistically insignificant, the variables were omitted from the Hedonic Equations 1–6. Furthermore, the value of ALT and CAP are likely to depend on the available level of these characteristics: from a consumer perspective it is assumed that ski resorts need to be sufficiently high to allow for snow reliability, while cable car companies do not have to produce artificial snow in higher ski resorts. Furthermore, cable-car companies are likely to benefit from economies of scale for maintenance work with increasing CAP. To see this, we included the two second-order terms ALT-*squared* and CAP-*squared* in Equations 2–6 (see Table 1).

Overall, all the estimates show the expected and, as described above, plausible sign. ALT, CAP and RCC have a positive impact on the lift-pass fees. Although intermediate slopes are best for carving, there is rather little evidence that consumers prefer a higher portion of intermediate kilometres of Alpine slopes in the ski resort (RIAS). Consumers are willing to pay a price premium for ski resorts with snow and fun park(s) and a free ski bus. Also, adults are willing to pay a price premium for ski resorts in Austria and Switzerland (compared to Italy) while the opposite is true for children (see Table 1). The latter is true also for France and Germany and might relate to the fact that (following information provided by Allgemeiner Deutscher Automobil-Club: *ADAC*), on average, children aged eight and under gain free access to ski resorts in Italy, while this holds true only for children aged five and under in Germany and France, and six and under in Austria and Switzerland.

Table 1: Parameter Estimates of the Hedonic Price Equations

Dependant Variable	ln PRICE (total mean)	ln PRICE (total mean)	ln PRICE (adult peak)	ln PRICE (adult low)	ln PRICE (child peak)	ln PRICE (child low)
Equation Number:	1	2	3	4	5	6
Constant	2.40939***	2.08104***	2.1884***	2.03265***	2.1767***	2.03265***
ALT	.00015***	.00048***	.00049**	.00055***	.00036**	.00044**
RIAS	.12096	.10301	.10302	.13852*	.04669	.10566
CAP	.003078***	.00670***	.00671***	.00676***	.00674***	.00657***
RCC	.23870***	.19098***	.26729***	.21382***	.11900*	.09092
PARK *(Yes=1)*	.07644***	.06358***	.06116***	.06458**	.06187**	.07272**
BUS *(Yes=1)*	.06665**	.04331	.07079***	.06233*	.00416	.00289
AUST *(Reference category Italy)*	.08432**	.08335**	.16004***	.23012***	-.10503***	-.06568
FRA *(Reference category Italy)*	-.04681	-.07952*	-.10103**	-.03435	-.11246**	-.07977
GER *(Reference category Italy)*	-.03348	-.01130	.02819	.09926	-.14333***	-.11086**
SWISS *(Reference category Italy)*	.00128	-.00274	.11200***	.14692***	-.23320***	-.21992***
ALT-*squared*		-7.18e-08**	-7.41e-08**	-8.77e-08**	-4.82e-08	-6.66e-08*
CAP-*squared*		-3.25e-05***	-3.28e-05***	-3.27e-05**	-3.27e-05*	-3.1e-05
No. of Observations	255	255	255	255	255	255
R-squared	.65	.68	.71	.65	.57	.49
Adjusted *R-squared*	.64	.66	.69	.63	.54	.46

Note: *, ** and *** denote test statistic significance at the 10%, 5%, and 1% levels respectively based on z-statistics.

Table 2 displays the hedonic prices for different ski-lift passes in the European Alps. Since the natural logarithm for *P* is used, these prices are calculated at the mean ski-lift pass fee. These values can be interpreted as follows: for instance, a snow and fun park is evaluated at around 1.71 euros by adults in a peak season, while it is evaluated at around 1.20 euros by children in low season. Furthermore, an maximum altitude of 2219 metres (total average of all winter sport resorts) is evaluated at around 10 euros by adults in a peak season and 5,30 euros by children in a low season.

Table 2: Hedonic Prices for Ski Lift Passes

Dependant Variable	ln PRICE (total mean, mean: 22.13)	ln PRICE (total mean, mean: 22.13)	ln PRICE (adult peak, mean: 28.01)	ln PRICE (adult low, mean: 26.88)	ln PRICE (child peak, mean: 17.07)	ln PRICE (child low, mean: 16.55)
Equation number	1	2	3	4	5	6
ALT *(per* metre*)*	.00332	.00357	.00451	.00432	.00249	.00239
RIAS *(for RIAS=1)*	2.67684	2.27961	2.88559	3.72342	(.79700)	(1.74867)
CAP *(per 1,000 persons)*	.06812	.12165	.15394	.14917	.09439	.08974
RCC *(for RCC=1)*	5.28243	4.22639	7.48679	5.74748	2.03133	(1.50473)
PARK *(if yes)*	1.69162	1.40703	1.71309	1.73591	1.05612	1.20352
BUS *(if yes)*	1.47496	.95845	1.98283	1.67543	(.07101)	(.04783)
AUST *(if yes)*	1.86600	1.84454	4.48272	6.18563	-1.79286	(-1.08700)
FRA *(if yes)*	(-1.03591)	-1.75978	-2.82985	(-.92333)	-1.91969	(-1.32019)
GER *(if yes)*	(-.74091)	(-.25007)	(.78960)	2.66811	-2.44664	-1.83473
SWISS *(if yes)*	(.02833)	(-.06064)	3.13712	3.94921	-3.98072	-3.63968

Note: All hedonic prices (Equations 1–6) are computed at the corresponding mean ski-lift pass fees, and the hedonic prices for ALT and CAP are computed at the mean levels of ALT (2,219) and CAP (18.51) (Equations 2–6). Hedonic prices in parentheses are based on nonsignificant estimates.

4. Conclusion

The adjusted *R*-squares for the hedonic regressions are rather high indicating that the ski-lift pass price differentials are primarily determined by the analysed ski-resort characteristics. Therefore, we could derive the monetary value of the core service attributes that can be seen as the most important ones for winter sports. However, although it is not possible to collect reliable data at this moment, owing to data restrictions such as missing information on web pages and in books, it might be interesting to focus on further attributes and their monetary value (e.g. transport connections, après-ski opportunities) in future research in this area. However, the information of the above derived single-service attribute prices can be used for the price calculation of new supply attributes and the communication of specific ski-resort characteristics in the European Alps. Furthermore, it is possible to compare the specific ski-resort 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.

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