International Price Differences in Ski Lift Tickets

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1. Introduction

Lift ticket prices differ considerably across Alpine countries when expressed in a common currency. For example, based on a representative data set from the winter season 2010/2011, the average price of a one-day lift ticket is €37 in Austria, €34.50 in France, and €39.20 in Switzerland. Similarly, the six-day ski pass costs about €177 in Austria, €175 in France and €188 in Switzerland on average. One obvious factor of the price differences is the difference in VAT rates across countries. Countries with a higher value-added tax (VAT) rate experience higher prices.[1] However, when prices are adjusted for differences in value-added tax across countries and then expressed in a common currency, the international price differences in one-day lift tickets remain quite large, ranging from €33.30 in Austria to €32.60 in France and €36.10 in Switzerland. Overall, French one-day lift tickets (net of VAT) are 10 per cent lower on average than those in Switzerland, and 13 per cent lower when the medians are compared. When lift ticket prices are measured as six-day ski passes (net of VAT) the price differential between the two countries is less much pronounced. However, average prices are difficult to compare because there are large difference in the characteristics of the ski resorts across countries.

1   The VAT rates for lift tickets are 10 per cent in Austria, 5.5 per cent in France, and 8 per cent in Switzerland.

Prices are one of the most important factors in decisions regarding destinations and tourism demand (Forsyth and Dwyer, 2009; Lim, 2006). Knowledge of the price differences across countries and their determinants is not only useful for tourists, but may also provide some indication of the relative price competitiveness of destinations. Prices are also important for policy makers because they are a useful indicator of market integration.

In this paper, we look at the cross-sectional dimension of price differences in lift tickets across countries. In particular, we analyze the extent and determinants of international price differences in ski lift tickets in three Alpine countries – Austria, France, and Switzerland – based on a representative data set consisting of large and medium-sized ski areas. We estimate a price equation with one-day lift tickets and six-day lift passes as the dependent variables. Since there are large differences in the characteristics of ski areas across countries (e.g. size, altitude and quality of ski lifts, snowmaking capacity, proximity to nearest regional centres), we control for these differences when comparing lift ticket prices across countries. Another aim of the paper is to provide new insights on international price differences using quantile regressions at the 25th and 75th conditional percentiles. This allows us to investigate whether price differences across countries are different for the ski areas with (conditional) low and high ski lift ticket prices. To our knowledge, this is the first study on international price differences in lift tickets.

This paper also contributes to the literature on hedonic price analysis. The hedonic price model introduced by Rosen (1974) allows to investigate which characteristics are valued by consumers and to what extent. Numerous empirical applications can be found in applied business research and economics for goods, real estate and land prices. Relatively little attention has been paid thus far to the price-quality relationship, as it concerns ski lift companies. While there are already some studies for Austria and Switzerland (e.g. Berwert, Bignasca and Filippini, 1996; Falk 2008; Borsky and Raschky, 2009) a comprehensive analysis based on comparable data for two or more countries is not available so far.

Furthermore, this paper contributes to the increasing literature on international comparisons of price levels based on micro-data for a bundle of products and services (Broda and Weinstein, 2008; Crucini, Telmer and Zachariadis, 2005; Li, Gopinath, Gourinchas and Hsieh, 2010; Parsley and Wei, 2001). Other micro-level studies focus on specific products, such as televisions (Imbs, Mumtaz, Ravn and Rey, 2010) and books (Cabolis, Clerides, Ioannou and Senft, 2007). Most of these studies have investigated the cross-sectional distribution of deviations in the law of one price rather than its changes over time.

The main reason for the use of cross-sectional data is that the time-invariant component of variations of the law of one price's deviations is much higher than the in-country (i.e. time series) variation (Li, Gopinath, Gourinchas and Hsieh, 2010). Another argument for studying the cross-sectional price differences is that economic theory gives much more guidance on deviations in the law of one price at the cross-sectional level than over time (i.e. in-country deviation). The basic finding of this literature is that the deviation in the law of one price is much smaller when prices at the micro-level are used instead of price indices at the aggregate level. Therefore, price-level data at the micro-level should be preferred. For instance, using 1,800 goods and services, Crucini, Telmer and Zachariadis (2005) find that deviations in the law of one price at different cross-sections are nearly non-existent when VAT and income differences are accounted for.

Another basic result of the literature is that international price differences are larger for non-traded goods (such as services) and for goods and services with a high share of non-traded inputs (Crucini, Telmer and Zachariadis, 2005; Engel and Rogers, 1996). Furthermore, these studies demonstrate that price dispersion depends significantly on distance to the border region. This holds in particular for goods and, to a lesser extent, for services such as cinema tickets, taxis, and hotel rooms (Engel, Rogers and Wang, 2003; Crucini, Telmer and Zachariadis, 2005).

The present paper is structured as follows. Section 2 introduces the empirical model, while Section 3 presents the data and descriptive statistics. Section 4 presents the empirical results, and Section 5 concludes.

2. Empirical Model

In order to investigate the determinants of ski lift tickets we adopt a hedonic price model. The theoretical basis is Lancaster's (1971) theory of consumer demand and the hedonic price model introduced by Rosen (1974). In the Lancaster's model of consumer demand, goods and services can be viewed as bundles of attributes that consumers value. Rosen (1974) extended Lancaster's work by formulating market equilibrium conditions for the hedonic price regression. The assumptions are perfect competition, no significant transaction costs, correct measurement of all attributes and choice of the correct functional form. The model predicts that the outcome of all the independent decisions of the producers and consumers is an exact functional relationship between the price of the quality-differentiated good and the attributes embodied in that good. The

market for ski destinations is assumed to be in equilibrium if skiers optimise their choice based on the lift ticket prices of alternative ski locations. Under the assumption of no search and information costs, the lift ticket prices of any ski resort can be described as a function of the resort's characteristics. These characteristics include size (i.e. length of ski runs and lift capacity), quality of ski lifts, average slope altitude, snowmaking capacity, age of resort and proximity to the nearest towns (Berwert, Bignasca and Filippini, 1996; Falk 2008; Borsky and Raschky, 2009). The characteristics vary considerably across countries based on the representative sample of ski resorts used in the study. For example, the average size of ski areas is much larger in France than in Austria and Switzerland, while Austria has a higher share of high-speed lifts and of slopes with snowmaking facilities (see Table 2). Swiss ski resorts are nearest and most accessible from the nearest towns, exhibits the highest average uphill lift station and have the longest history and most experience with winter sport tourism. Therefore, it is important to control for these characteristics when investigating lift ticket prices across countries.

We formulate a price equation in which lift ticket prices of any ski resort are described as a function of ski area characteristics and two country dummy variables:

$$\ln PN_{i,t} = \alpha + \beta X_{i,t-1} + \gamma_{AT} AT_i + \gamma_{FR} FR_i + \varepsilon_{i,t},$$

where i denotes the ski area, t refers to the winter season 2010/2011 and $t-1$ to the previous season, PN_i is the price of a one-day lift ticket net of VAT (alternatively the price of a six-day lift pass), X_i is a vector of characteristics, β is the corresponding vector of coefficients, and ε_i is error term. AT and FR are the country dummy variables, with Switzerland as the reference category. The coefficients on the two country dummy variables measure the average price difference relative to the base category. The percentage difference is simply obtained by $[exp(\gamma_k) - 1] * 100$, where $k = $ AT or FR. Note the price differential only gives an indication of the so called approximate absolute law of one price since no two ski areas are exactly identical even when a large number of characteristics are controlled for (Crucini, Telmer and Zachariadis, 2005; Broda and Weinstein, 2008). The partial derivative of the price equation with respect to ski area's characteristics gives the implicit marginal price of that characteristic.

Given the findings in the literature and the data availability, the price equation is specified as follows (e.g., Berwert, Bignasca and Filippini, 1996; Falk, 2008; Borsky and Raschky, 2009):

$$\ln PN_{i,t} = \alpha + \beta_1 \ln KM_{i,t-1} + \beta_2 \ln SVTMH_{i,t-1} + \beta_3 QUALITY_{i,t-1}$$
$$+\beta_4 \ln ALT_{i,t} + \beta_5 SNOWMAK_{i,t-1} + \beta_6 \ln AGE_{i,t}$$
$$+\beta_7 \ln DISTCITY_{i,t} + \beta_8 DWCUP_{i,t}$$
$$+\delta DNET_{i,t} + \gamma_{AT} AT_i + \gamma_{FR} FR_i + u_{i,t},$$

where ln is the natural log, i denotes the ski resort, and u_i is the error term. The variables are as follows:

PN: Price (net of VAT) of a one-day lift ticket for adults in the 2010–2011 peak season (which allows for guest card discounts granted to those staying at the resort), alternatively the price (net of VAT) of a six-day lift past for adults,

KM: Total length of slopes, in kilometres,

SVTMH: Total vertical lift capacity in persons per hour, measured as the sum of vertical transport metres per hour of each lift[2],

QUALITY: Share of fast lifts (e.g. detachable chairlifts, modern gondola ropeways or MGDs, and funitel systems) in total transport capacity (i.e. vertical transport metres),

ALT: Weighted average altitude of peak lift stations (excluding t-bar lifts),

SNOWMAK: Share of ski runs with snowmaking facilities in per cent,

AGE: Age of ski area in years,

DISTCITY: Road distance to the nearest largest town in kilometres (with population of 50,000 or more),

DWCUP: Dummy variable whether or not ski resorts have been a venue of the FIS Alpine ski World Cup in the last 15 years (with 3 or more events),

DNET Dummy variable for ski areas that are part of a greater ski network (usually not accessible with a one-day lift ticket but with a six-day lift pass),

AT and *FR:* Dummy variables for Austria and France.

The dependent variable is measured as a one-day lift ticket. Alternatively, we use the six-day ski pass. Note that multiple-day tickets often cover a wider geographical area with access to several other ski areas. One-day lift tickets usually only give access to one (often lift-linked) ski area and/or one section of the wider ski area. Some small ski areas that are part of large ski alliance do not offer a six-day lift pass for the part of the ski area but only a multi-area ski pass. This ski resorts have to be excluded from the sample.

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2   Ski lifts include t-bar and surface lifts; fixed and detachable chairlifts; aerial tramways; gondola ropeways, such as MGDs; and funitel systems.

Turning to the independent variables, we account for the size of the ski areas, which is one of the most important characteristics. Size is measured by two indicators. First, we use the total length (in kilometres) of ski runs; larger ski resorts typically charge higher prices. Second, we include lift capacity weighted by vertical transport metres. A greater lift capacity is obviously more valuable to skiers because it reduces the time spent in the queue waiting for the ski lift and makes the ski area more attractive (Müller and Michel, 2001). To measure lift capacity, we first calculate the vertical transport metres per hour for each lift: $VTMH = (\text{CAP} \times VM) / 1000$, where CAP denotes the capacity in skiers per hour and VM denotes the vertical rise in metres. This is a measure of lift capacity that multiplies passengers per hour by vertical distance to determine how many people can be transported uphill at approximately 1,000 metres per hour. For each ski resort, we calculate the sum of vertical transport metres per hour ($SVTMH$):

$$SVTMH = \sum_{j=1}^{J} VTMH_j,$$

where j denotes the ski lift, regardless of type (this includes surface lifts; fixed and detachable chairlifts; aerial tramways; gondola ropeways, such as MGDs; and funitel systems).

Previous empirical work indicates that adoption of new technologies are the key factor for productivity and performance at the firm level (see e.g. Brynjolfsson and Hitt, 2003). Mulligan and Llineares (2003) find that early adoption of new technologies (e.g. detachable chairlifts) has allowed firms to charge higher prices. New and fast lifts facilitate the transportation of a large number of skiers with shorter riding times, thus reducing queues. We expect a high share of modern chairlifts and gondolas to have a positive effect on ski lift ticket prices. This share is measured as the ratio of vertical transport metres per hour of modern high-speed lifts and cable cars to total vertical transport metres per hour. Fast lifts include fast and detachable chairlifts, modern gondola ropeways (e.g. monocable gondola detachables), and funitel systems, but excludes the transport capacity of surface lifts, fixed-grip chairlifts, and aerial tramways.

Snow is the most essential input factor for skiing. However, data for snowfall or snow depth at the resort level are only available for half of the sample. Furthermore, average slope height is important for snow conditions because snow is less affected by high temperatures and lasts longer at high altitudes. In order to measure average slope height, ALT, we calculate the weighted average of the uphill lift stations for each ski area, where the weights are the share of the capacity of

each lift in the ski area's total lift capacity (measured as vertical transport metres per hour).

Snowmaking can also be an effective means of compensating for a poor natural snow record. Snowmaking capacity is measured by the percentage of ski runs with snowmaking facilities. It may well be the case that snowmaking capacity is more valuable in low-altitude ski areas. Indeed, preliminary estimates show that snowmaking only shows the expected positive sign for low-altitude ski resorts. Therefore, we include an interaction term between snowmaking capacity and the average altitude of uphill lift stations.

Furthermore, older ski areas may set higher prices because of a good reputation and brand name. It is often hypothesized that the longer a firm has been in operation, the more productive it will become. This is often referred to as the "learning by doing" or "learning curve" effect (Bahk and Gort, 1993). Ski resort age is measured as the number of years in operation.

Some ski resorts have been traditional venues of the annual FIS alpine World Cup (e.g. Chamonix, Kitzbühel, Sölden, St. Moritz, Val d'Isère, Wengen). It is obvious that hosting ski races on a regular basis increase the publicity of the resort and tourism demand after the events. As an alternative measure of reputation we use information whether or not the ski resorts have been venues for the FIS World Cup in the last 15 years.[3] Ski resorts that are only occasionally venues of the FIS World Cup are not included in the group of World Cup venues. Events and tourist attractions during the summer period might also increase the overall image of the ski resort. However, for the summer period data for visits at the detailed resort level for all three countries are not readily available.

The attractiveness of ski areas also depends on whether they are connected by ski bus to other ski resorts that are accessible with the same ski pass. For instance, Ski Arlberg (AT), Les Portes du Soleil (F/CH), Espace Killy (F), Paradeski (F), St. Moritz (CH), Davos (CH), Quatre vallées (CH), trois vallées (F), and ski amadé (AT) all offer a multi-area ski pass that is valid at all of their ski locations. These interlinked ski areas are connected either by a free shuttle bus service or lifts. These effects will be captured by the dummy variable indicating linked ski resorts. However, neighbouring ski resorts that are part of a greater ski network are usually not accessible with a one-day lift ticket. Despite this, we include geographical dummy variables for the ski areas that are part of ski alliances because of their potentially increased destination marketing, promotion efforts, and brand name.

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3   I am grateful to an anonymous referee for this suggestion.

Furthermore, distance to the nearest town is expected to have a significant and negative impact on lift ticket prices. This means that ski resorts that are farer away from the nearest regional town exhibit lower prices. Distance to the nearest town is an indicator for local accessibility via transportation networks. In particular, for day trippers travel time is of critical importance. Ski resorts in close proximity to regional centres have clearly an advantage because of local market potential. Berwert et al. (1996) find that proximity to population centres is significantly positively related to ski lift prices based on 84 Swiss ski resorts for the season 1992/1993. We use road distance to the nearest regional town with a population of at least 50,000 following Eurostat's definition of agglomerations.

Distance to the nearest border may also affect lift ticket prices (Li, Gopinath, Gourinchas and Hsieh, 2010). Price differences in absolute terms are expected to increase with the distance of the nearest border ski area. Li, Gopinath, Gourinchas and Hsieh, (2010) suggest that it is important to investigate the price differences in goods and services sold that are located immediately across the border rather than at a greater distance. In the following, we extend the baseline specification by including distance to the nearest border ski area and an interaction term between distance and the country dummy variables:

$$\ln P_{i,t} = \alpha + \beta X_{i,t-1} + \gamma_{AT} AT_i + \gamma_{AT} FR_i \\ + \delta_1 AT_i \cdot D_i + \delta_2 FR_i \cdot D_i + \chi D_i + u_{i,t},$$

where D is the road distance (in kilometres) between a given ski area and the nearest border ski area. We define distance as positive for Swiss ski areas and negative for Austrian and French ski areas. Following Li, Gopinath, Gourinchas and Hsieh (2010), we estimate the price equation for ski areas within a certain distance to the border (in this case, 200 km).

There are a few factors that cannot be controlled for because they are difficult to measure or data are not readily available. These factors include friendliness and atmosphere, safety aspects, and attractive views and natural surroundings, preparation of runs and ski slope grooming, and hygiene in toilets (Müller and Michel, 2001). Other factors that are related to the infrastructure include the availability of carpet lifts ("magic carpets") that are especially suitable for beginners and children, the presence of snow parks with half pipes and rails as well as off-piste terrain. These factors all increase the attractiveness of the ski resort. Finally, snow conditions in the past winter seasons is also an important factor in selecting ski resorts. Travel behaviour depends not only on past snow conditions but also on average temperatures and sunshine. Most skiers and snowboarders

prefer sunny weather and pleasant temperatures. However, weather data is only available for half of the sample resorts.

The price equation can be estimated by OLS. In order to investigate whether there are differences in the coefficients at different points in the conditional distribution, we apply quantile regressions (see KOENKER and HALLOCK, 2001). The main hypothesis is that the determinants of lift ticket prices differ between low- and high-priced ski areas. Indeed, previous studies often show considerable parameter heterogeneity at different points in the conditional distribution of the left-hand variable. The quantile regression method allows one to focus on specific parts of the distribution of conditional prices and is suitable for detecting differences in the determinants of lift ticket prices at various quantiles (KOENKER and HALLOCK, 2001). For a given cross-section, the quantile regression model can be written as

$$PN_{i,t} = Z'_{i,t-1}\beta_\theta + u_{\theta i};$$
$$Q_\theta(PN_{i,t} \mid Z_{i,t-1}) = Z'_{i,t-1}\beta_\theta,$$

where PN denotes log net prices and Z the vector of explanatory variables. β is the vector of parameters to be estimated for a given value of the quantiles Q. $Q_\theta(PN_{i,t} \mid Z_{i,t-1})$ is the θ-th quantile of the conditional distribution of prices given the vector of explanatory variables Z. The estimation of the quantile parameters can be done by solving a minimization problem where the corresponding residuals have to be weighted. For $\theta = 0.5$, the median is obtained and the least absolute deviation estimator can be employed. Standard errors are obtained by using the bootstrap method with 1,000 repetitions (see GOULD, 1997). Another advantage of the quantile regression technique is that it is consistent and robust when the error term is heteroscedastic and non-normally distributed. Given the relatively small sample of 214 observations, we estimate quantile regressions for the 0.25, 0.5, and 0.75 quantiles only.

3. Data and Descriptive Statistics

We create a representative sample of 214 ski resorts in Austria, France, and Switzerland. According to the selection criteria, all ski resorts with a length of slopes of 50 km or more are included. For the group of resorts with 20 to 50 km, we use a random sample (for a list of the included ski areas, see Table 8 in the appendix). Data on one-day and six-day lift tickets is obtained directly from the websites

of the ski lift companies (accessed September 2010). Note that lift tickets vary with skier age and seasons. Here we focus on lift ticket prices for adults in the peak season. Ski lift ticket prices have been adjusted for VAT differences; the net price, PN, is obtained by the gross price P divided by 1 minus the tax rate V: $PN = P / (1 + V / 100)$. In the next step, lift ticket prices in Swiss francs are converted into Euros using the corresponding exchange rate from the three months between June and August 2010 which is CHF 1.36/1€. This is because lift ticket prices for the upcoming season are usually set during the summer period. Furthermore, we take into account that some ski resorts offer discounts to guests who are staying overnight. However, only a few resorts give discounts on one-day lift tickets and six-day ski passes to overnight guests. More importantly, in Switzerland there are discounted lift tickets available. The Swiss Federal Railways (SBB) offer a combined ticket for public transport (train and bus) and lift tickets with a considerable discount. This so-called "Snow'n'Rail" ticket is available for all major ski resorts and consists of a discounted train ticket from any Swiss station and the return trip combined with 20 per cent reduction for either a one-day or a two-day lift ticket.[4] Discounts are also available for six-day passes but limited to 12 ski resorts. The availability of discounts on one-day lift tickets complicates the price comparison across countries. Therefore, it might be more appropriate to compare six-day lift passes rather than one-day lift tickets since only few resorts offer discounts on six-day lift tickets (combined with a public transport ticket). While there are significant discounts on lift tickets in Switzerland, discounts on lift tickets are hard to find in Austria and France.

We draw our ski area information from a number of sources. The information on lift characteristics and resort attributes comes mainly from official sources (see Table 1 for a description of the data sources). Generally, the lift databases are very detailed, including information on mountain lift capacity in persons per hour, vertical drop in metres, year of installation, and altitude of the highest lift station. Mountain lift systems include detachable chairlifts (carriers for two, four, six, or eight passengers), fixed-grip chairlifts (carriers for one, two, four, or six), funitel systems, and MGD gondola lifts, as well as aerial ropeways and surface lifts (such as T-bars). We carefully checked the data from these various sources to ensure accuracy and reliability. Road distance to the nearest town with 50,000 or more inhabitants is calculated from the centre of the city to the centre of the ski resort and measured in kilometres. If the closest town is located in another country (e.g. Germany) the road distance to that city is used.

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4   See the homepage of the Swiss Federal Railway (www.railaway.ch/snow-n-rail/).

Table 1: Description of the Data Sources

Price of one-day lift ticket for adults (€); total length of ski runs (km); percentage of slopes with artificial snowmaking facilities (%).	web sites of individual ski resorts web sites of individual ski resorts and/or personnel correspondence F: ski magazines: Montagne Leaders varies issues, ADAC Ski-Atlas, DSV-Atlas various issues website www.bergfex.com.
Lift capacity measured as vertical transport metres in persons per hour divided by 1000; share of detachable chairlifts, detachable cable cars and funitels (%); weighted mean altitude of uphill lift stations (m).	AT: (i) BMVIT 2001/2002 cable car database (Seilbahnstatistik), Amt der Tiroler Landesregierung (ii) „Seilbahnen, Lifte in Tirol 2009/2010" ("Cable Cars and Chairlifts in Tyrol") and „Seilbahnen, Sessel- und Schlepplifte in Vorarlberg 2010" ("Cable Cars and Chair- and T-Bar Lifts in Vorarlberg"). CH: Swiss ministry of transport and regional development. FR: «Fichier Informatisé des appareils de Remontées Mécaniques, Ministère des Transports, de l'Equipement, du Tourisme et de la Mer». Available at the internet from: http://firm.application.equipement.gouv.fr/ FirmInternetAction.do?choix=Init retrieved September 2010. Online Lift database www.remontees-mecaniques.fr; retrieved May 2010. AT, CH, FR: "Online database for Alpine Ski resorts", Retrieved October 2010 (http://www.lift-world.info/english.php).

Table 2 presents the summary statistics on the variables for the sample used in the subsequent regressions. We report the means and medians for each of the three countries separately. The average one-day lift ticket prices net of VAT for the winter season 2010/2011 range between €32.60 in France and €36.10 in Switzerland, with Austria in between at €33.30. When the median is used, the differences are even more pronounced: €30.60 in France, €33.90 in Austria, and €35.20 in Switzerland. The average six-day lift ticket price net of VAT is €159 in Austria, €165 in France and €173 in Switzerland.

Regression results show that these international price differences are significant at the 5 per cent level, even when the characteristics are not included. This holds both for gross and net prices and for the OLS and median regression results (see

Table 2: Descriptive Statistics (Winter 2010/2010) (Number of Observations = 214)[a]

	mean			median		
	AT	CH	FR	AT	CH	FR
Price of one-day lift ticket for adults (€)[b]	37.0	39.2	34.5	36.5	38.2	32.5
Price of one-day lift ticket for adults (€) net of VAT	33.3	36.1	32.6	32.9	35.2	30.7
Price of six-day lift ticket for adults (€)[b]	176.9	187.6	174.9	181.0	180.1	170.0
Price of six-day lift ticket for adults (€) net of VAT	159.2	172.5	165.3	162.9	165.7	160.7
length of ski runs in km	67	89	142	41	60	120
Lift capacity measured as vertical transport metres in persons per hour divided by 1000[c]	9109	7374	18021	5085	5067	10906
Share of detachable chairlifts, detachable cable cars and funitels (%)	0.64	0.43	0.54	0.68	0.48	0.56
Weighted mean altitude of uphill lift stations (m)	1940	2216	2100	1872	2236	2107
Percentage of slopes with artificial snowmaking facilities, per cent	0.68	0.24	0.27	0.76	0.19	0.20
Age of ski area in years	48	65	53	47	52	49
% ski resorts that host the FIS Alpine Ski World Cup venues	13.0	13.8	5.1			
% ski resorts that are part of a greater ski alliance/network	26.4	40.0	52.5			
Distance to the nearest regional centre in km	69.7	53.4	85.6	69.9	46	88
distance to the nearest border ski area in km[d]	−248	116	−291	−230	108	−180

Notes: a) for six-day lift passes there are 199 observations. b) Lift ticket prices in Swiss Francs are converted into EUR using average exchange rates. c) Vertical transport metres measure the number of skiers who can be transported uphill of approx. 1,000 metres per hour. d) distance is positive for Swiss ski areas and negative for Austrian and French ski areas.
Sources: Table 3 in the appendix.

Table 3). Overall, the two country dummy variables explain 9 per cent of the variation in gross lift ticket prices (including VAT) as indicated by the R squared. When lift ticket prices are measured as the six-day ski pass price differences are much less pronounced.

Table 3: OLS and Median Regression Estimates of the Lift Ticket Differences across Countries

	log gross		log net	
	coeff.	*t*-value	coeff.	*t*-value
one-day ski lift ticket				
OLS estimates				
Dummy variable Austria	−0.050**	−2.03	−0.073***	−2.93
Dummy variable France	−0.132***	−3.98	−0.106***	−3.18
Constant	3.654***	170.63	3.571***	166.16
R^2	0.090		0.060	
Median regression estimates				
Dummy variable Austria	−0.046	−1.52	−0.068**	−2.03
Dummy variable France	−0.163***	−3.72	−0.136***	−3.01
Constant	3.644***	153.1	3.560	131.91
six-day ski pass				
OLS estimates				
Dummy variable Austria	−0.038	−1.28	−0.060**	−2.03
Dummy variable France	−0.070**	−2.17	−0.043	−1.33
Constant	5.216***	224.47	5.133***	220.88
R^2	0.094		0.028	
Median regression estimates				
Dummy variable Austria	−0.038	−1.25	0.005	0.16
Dummy variable France	−0.070*	−1.93	−0.058	−0.97
Constant	5.216***	197.5	5.194***	181.0

Notes: Median regressions with bootstrapped standards errors and 1000 replications. Significance at the 1, 5 or 10% level is denoted by ***, ** and *, respectively.

Obviously, the ski areas differ significantly in their characteristics across countries. French resorts are larger on average than their competitors in Austria and Switzerland in terms of length of slopes and transport capacity. In particular, the average length of ski runs is 40 km in Austria, 120 km in France, and 105 km

in Switzerland. Average lift capacity is highest in France, with 10,906 on average (indicating the capacity to transport 10,906 skiers up a mountain of about 1,000 vertical metres every hour). Swiss resorts are older and have higher ski-area altitudes. Specifically, the mean altitude of peak lift stations (i.e. uphill cable and chairlift terminals) is highest in Switzerland with 2,236 metres on average, followed by France with 2,107 metres and Austria with 1,872 metres. Austrian ski areas have a greater snowmaking capacity and the greatest share of fast lifts. In particular, the share of high-speed (detachable) chairlifts and modern gondola lifts in total lift capacity is 68 per cent on average in Austria, followed by France with 56 per cent and Switzerland with 48 per cent. In Austria, snowmaking facilities are in place on 68 per cent of the runs on average, as compared to about 24 and 27 per cent in France and Switzerland, respectively. Furthermore, the average distance to the nearest regional population centre is lowest in Switzerland with 53 kilometres, followed by Austria with 69 kilometres on average and France with 88 kilometres on average.

4. Estimation Results

OLS and Quantile Estimation Results

Table 4 presents OLS estimates of the log-linear price equation for both one-day and six-day lift tickets net of VAT, where the t-values are based on heteroscedasticity-consistent standard errors. Overall, the fit of the OLS model is quite good, with an adjusted R^2 of 0.75 for one-day lift tickets and 0.66 for six-day ski passes. Specification (i) contains the estimates of the basic price equation, whereas specification (ii) contains the results of the price equation with an interaction term between snowmaking capacity and altitude of uphill lift stations. The interpretation focuses on specification (ii) because the interaction term is highly significant, indicating that the impact of snowmaking is significantly positive, but decreases with increasing ski-area altitude.

   The results for the cross-country effects show that the country dummy variable for France is negative and significant when the different characteristics are accounted for, implying that one-day lift ticket prices in France are an average of 17 per cent lower than those in Switzerland (percentage difference is obtained by: $(exp(-0.19) - 1) * 100$). The corresponding price gap for Austria is 7.5 per cent. For six-day ski passes we find that the price differential is less pronounced but still significant with in France 14 per cent and Austria 9 per cent lower prices on average than those in Switzerland. This may indicate that consumers are willing

to pay a substantial price premium for Swiss ski areas as compared to French ski areas with similar characteristics (e.g. size and quality of lifts, snowmaking capacity). It is interesting to note that the price differences between French and Swiss ski resorts are much lower in absolute terms when the characteristics are not included. In particular, the difference between Swiss and French one-day lift ticket prices decreases from 17 per cent to 10 per cent when the characteristics are excluded (compare Table 4 with Table 3). The corresponding change for six-lift tickets is from 14 per cent to 4 per cent, respectively. This can be explained by the fact that French resorts are much larger on average in terms of lift capacity and total length of ski runs.

Furthermore, unreported results show that one-day lift ticket prices in France and Austria are 19 per cent and 5.2 per cent lower, respectively, than those in Switzerland when lift ticket prices (including VAT) are used. Differences in the VAT rates thus only explain a small portion of the price differences across countries. This is consistent with the Commission (2002), which finds that differences in VAT rates are not a major cause of the price dispersion in supermarket goods across countries.

The characteristics are all significant and show the expected sign. In particular, capacity of mountain lift systems and average altitude of uphill lift stations are significant at the 1 per cent level. Length of slopes is positive, but only marginally significant. Furthermore, the share of fast chairlifts and modern cable cars in total lift capacity is positive and statistically significant at the 1 per cent level. The coefficient of 0.20 translates into an elasticity of 0.11 ($= 0.55 * 0.20$). There is no significant relationship between lift ticket prices and the percentage of slopes covered by artificial snow based on specification (i). However, the interaction term between percentage of slopes covered by artificial snow and altitude of uphill lift stations shows that snowmaking capacity has a significant and positive impact on lift ticket prices at lower-altitude ski areas (with uphill lift stations at an average of 2,060 metres or lower; see Figure 1). For instance, the coefficient is 0.13 for ski resorts with uphill lift stations at an altitude of around 1,500 metres, indicating that an increase in the share of snowmaking capacity by 10 percentage points (from the sample mean of 0.43 to 0.53) would raise the price level by 1.3 per cent. Furthermore, older ski areas charge significantly higher lift ticket prices, indicating that older resorts have a better reputation because they are well known; in the market, however, this may also be due to an early-mover advantage. In addition, older ski areas are often characterised by a high-quality infrastructure (such as public transport systems). Besides resort age, hosting FIS Alpine World Cup events is significantly positively related with lift ticket prices. The price differential between ski resorts that hosts World Cup races and the

Table 4: OLS Estimates of the Determinants of One-Day and Six-Day Lift Tickets

| | One-day lift tickets | | | | Six-day lift passes | | | |
| | (i) | | (ii) | | (i) | | (ii) | |
	coeff	t	coeff	t	coeff	t	coeff	t
ln total length of ski runs in km	0.025	1.62	0.027*	1.82	0.027	1.40	0.029	1.53
ln vertical transport metres p.h.	0.070***	4.45	0.073***	5.00	0.071***	3.65	0.074***	3.96
% fast lifts and gondolas	0.195***	5.47	0.198***	5.77	0.183***	4.10	0.184***	4.27
ln average altitude of lifts	0.177***	4.70	0.362***	5.65	0.183***	4.15	0.349***	4.03
ln age of ski area	0.063***	2.79	0.071***	3.35	0.016	0.62	0.025	0.95
dummy greater ski alliance/network	0.059***	3.96	0.044***	2.96	0.080***	4.10	0.068***	3.40
dummy FIS World Cup venue	0.034*	1.77	0.019	1.01	0.049**	2.25	0.033	1.53
% runs with snowmaking	0.016	0.64	2.865***	3.73	0.054*	1.71	2.561**	2.45
% runs with snowmaking multiplied by ln altitude			−0.375***	−3.72			−0.331**	−2.40
dummy variable Austria	−0.080***	−4.08	−0.080***	−4.11	−0.097***	−4.31	−0.096***	−4.36
dummy variable France	−0.192***	−9.42	−0.187***	−9.63	−0.148***	−6.56	−0.144***	−6.68
Constant	1.138***	3.61	−0.341	−0.67	2.816***	7.83	1.490**	2.17
R^2	0.73		0.74		0.65		0.66	
# obs	214				199			

Notes: t-values based on White's heteroscedasticity-consistent standard errors. Significance at the 1, 5 or 10% level is denoted by ***, ** and *, respectively. The dependent variable refers to the winter season 2010/2011, whereas the explanatory variables refer to the previous season.

remaining ski resorts is about 3 per cent for one-day lift tickets and 5 per cent for six-day lift tickets on average. However, the coefficient is no longer significant when the interaction term between percentage of runs with snowmaking facilities and altitude of the uphill lift stations is included. Finally, ski resorts that are part of a greater ski network or alliance charge higher prices. Note that one-day lift tickets usually restrict access to a single ski area.

Figure 1: Impact of Snowmaking on the One-Day Lift Ticket Price by Altitude
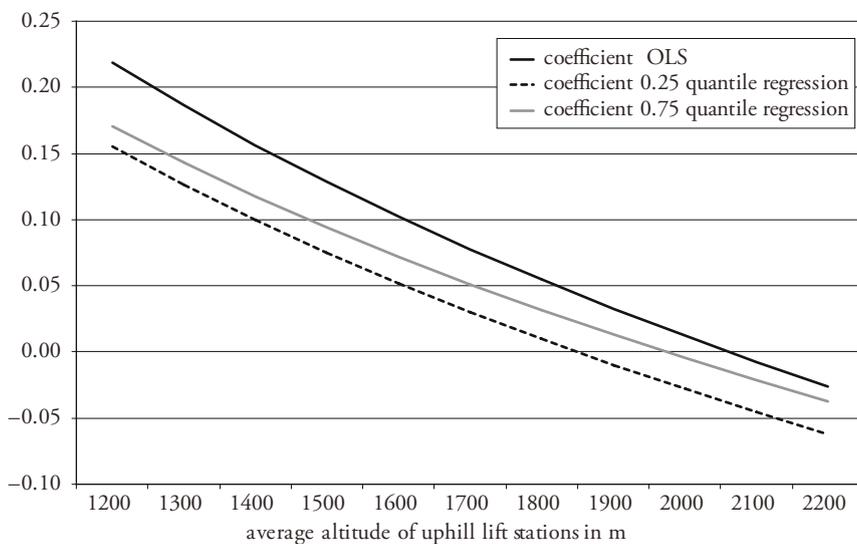
Notes: Quantile regressions with bootstrapped standards errors and 1000 replications.

Overall the results are consistent with the previous literature. Based on representative sample of Swiss ski resorts, BERWERT et al. (1996), find that ski lift ticket prices are significantly positively related to lift capacity, quality of the ski facilities (i.e. share of chairlifts and gondolas in total lift capacity) and the average altitude of the ski resorts. However, snowmaking capacity is not significantly different from zero. Based on a similar data set for Austria, FALK (2008) find that lift ticket prices depend on lift capacity and speed of lift facilities, length of ski runs, altitude of uphill lift stations and percentage of slopes covered by snowmaking machines.

Some variables are not included in the regression because they are not significantly related to lift ticket prices. These variables include the longest downhill valley run, average age of lift facilities, and the length of the planned ski season. Surprisingly, the coefficient of log road distance between the ski resort and the nearest town is not significant (see Table 5). In general, one would expect that the distance coefficient is negative indicating that ski resorts that are farer away from the nearest town have lower lift ticket prices. However, different specifications show that distance is positive although it is not significantly different from zero. When we include both the logarithm of distance and its squared term we again find that both variables are not significantly different from zero (based on a Wald test of joint significance). The sign of coefficient of log distance is positive while the sign of the coefficient of its squared term is negative (although not significant) indicating an inverted u-shaped relationship. As an additional robustness check we split the road distance variable into a set of dummy variables (0 for a distance of 45 km or less, 1 for between 45 km and 65 km, 2 for between 65 km and 90 km and 3 for 90 km and more). We find that lift ticket prices are higher for ski resorts that located between 45 and 65 kilometres but the coefficient is only marginally significant. One explanation of the insignificance of distance might be that very small ski resorts are not included in the sample because of data availability. Similarly, unreported results show that (road) distance to the nearest international airport does not significantly influence prices. The previous literature on the role of distance from the nearest population centre seems to be not clear-cut. Using data for Scottish ski resorts, Riddington et al. (2000) find that the choice of ski resorts destinations is independent of the distance to individual`place of residence. For Swiss ski resorts, Berwert et al. (1996) find that proximity to population centres is positive and significant in three out five specifications. Mulligan and Llinares (2003) use the number of population closely adjacent to ski resorts as measure of the local market and accessibility. Based on 344 ski resorts in the U.S, the authors find that the number of population within 125 miles has a positive effect on ski lift prices.

In the next step, we provide the results of quantile regressions for the 0.25, 0.5, and 0.75 quantile in order to investigate whether the influence of ski resorts' characteristics is different for low- and high-priced ski areas (see Table 6).

Quantile regressions for the 25th and 75th conditional percentile show that the price differential across countries holds for both high-price/high-quality and low-price/low-quality ski areas. However, there are some notable differences between the estimated effects at the mean and those estimated for ski resorts with the highest and lowest (conditional) lift ticket prices. In particular, we find that the impact of the share of fast lifts decreases between the 0.25 to the 0.75 quantile.

Table 5: OLS Estimates of the Impact of Distance to the Nearest Town on Lift Tickets

| | One-day lift tickets | | | | Six-day lift tickets | | | |
| | (i) | | (ii) | | (i) | | (ii) | |
	coeff	t	coeff	t	coeff	t	coeff	t
Ln road distance	0.018	1.62	0.113	1.59	0.009	0.57	0.103	1.08
Ln road distance squared			−0.012	−1.27			−0.012	−0.98
dummy variable Austria	−0.083***	−4.24	−0.080***	−3.99	−0.097***	−4.36	−0.094***	−4.16
dummy variable France	−0.196***	−9.67	−0.191***	−8.82	−0.150***	−6.54	−0.146***	−6.01
characteristics	yes		yes		yes		yes	
constant	−0.304	−0.62	−0.575	−1.07	1.284	1.89	1.011	1.40

Notes: Significance at the 1, 5 or 10% level is denoted by ***, ** and *, respectively. Characteristics of the ski resorts are included but not displayed.

Table 6: Quantile Estimates for the Determinants of One-Day and Six-Day Lift Tickets

|	Q25		Q50		Q75	
	coeff	t	coeff	t	coeff	t
One-day lift tickets						
ln total length of ski runs in km	0.009	0.38	0.029	1.26	0.019	0.99
ln vertical transport metres per hour	0.078***	3.66	0.074***	3.54	0.074***	3.75
% high-speed chairlifts and gondolas	0.279***	5.04	0.192***	3.50	0.111**	2.20
ln average altitude of uphill stations	0.385***	3.13	0.368***	4.57	0.346***	2.92
ln age of ski area	0.092***	2.80	0.064**	2.17	0.015	0.45
dummy greater ski alliance/network	0.046**	2.34	0.037*	1.90	0.058*	1.93
dummy FIS World Cup venue	0.005	0.22	0.011	0.39	0.030	1.01
% runs with snowmaking facilities	3.162*	1.90	3.260***	2.71	1.811*	1.66
% runs with snowmaking facilities X ln altitude	–0.418*	–1.92	–0.429***	–2.69	–0.238*	–1.66
dummy variable Austria	–0.098***	–3.12	–0.081***	–3.32	–0.088***	–3.26
dummy variable France	–0.213***	–8.20	–0.207***	–7.71	–0.176***	–5.16
constant	–0.644	–0.67	–0.351	–0.53	0.135	0.15
Six-day lift passes						
ln total length of ski runs in km	0.038	1.16	0.055**	2.12	0.022	0.70
ln vertical transport metres per hour	0.073**	2.43	0.056**	2.41	0.049*	1.73
% high-speed chairlifts and gondolas	0.167***	2.87	0.148***	2.67	0.147**	2.13
ln average altitude of uphill stations	0.386***	3.47	0.381***	2.72	0.379**	2.50
ln age of ski area	0.066*	1.95	0.004	0.11	–0.009	–0.19
dummy greater ski alliance/network	0.060**	2.43	0.051	1.64	0.098***	3.48
dummy FIS World Cup venue	0.024	0.69	0.044	1.40	0.047	1.52
% runs with snowmaking facilities	3.421**	2.07	2.925	1.64	1.749	1.04
% runs with snowmaking facilities X ln altitude	–0.441**	–2.01	–0.377	–1.60	–0.226	–1.03
dummy variable Austria	–0.078**	–2.09	–0.102***	–4.27	–0.115***	–2.98
dummy variable France	–0.152**	–5.08	–0.147***	–4.58	–0.149***	–4.16
constant	0.941	1.12	1.398	1.30	1.724	1.40

Notes: Quantile regressions with bootstrapped standards errors and 1,000 replications. Significance at the 1, 5, or 10% level is denoted by ***, ** and *, respectively. Q25, Q50, and Q75 denote quantile regressions at the 0.25, 0.5, and 0.75 quantile.

This indicates that since consumers are willing to pay higher lift ticket prices for fast lifts, investing in fast new lifts is more valuable for low-price/low-quality ski resorts. For high-priced ski areas resort age is also not significant. Furthermore, we find that vertical transport metres, average altitude, and snowmaking capacity do not vary much over the different quantile regressions.

Finally, we investigate whether price differences increase with distance to the border. Figure 2 shows the relationship between the predicted lift ticket prices and the distance to the nearest border ski resort. We provide separate graphs for two estimation samples, one including Austrian and Swiss ski areas and the other including French and Swiss ski areas, where the sample is restricted to all ski areas within 200 kilometres or less of the nearest border ski resort. The results are not clear cut. Overall, it seems that the number of observations is still too small to make strong statements about the type and functional form of the relationship.

Table 7 provides further evidence as to whether price differences increase with distance to the border. The interaction term between French ski areas and distance to the nearest border ski area is negative, indicating that the price difference in absolute terms decreases as distance to the border increases. However, the interaction term between Austrian ski areas and distance to the nearest border resort is not significant, indicating that price differences do not depend on the distance.

We estimate several extensions and robustness checks of the basic price equation. First, we estimate the price regression using a robust regression technique, which is an iterative, weighted least-squares procedure that puts less weight on outliers. However, the magnitude and the significance level are similar to those of the OLS estimates. Second, we re-estimate the price equation including other interaction terms of the explanatory variables. However, unreported results show that adding interaction terms to allow for the heterogeneity of the effects does not improve the explanatory power of the price equation in most of the cases. Third, we account for spatial dependence because the prices of *neighbouring areas* are more likely to be similar to each other than to distant areas. However, the coefficient of spatially lagged prices is never significant when the dummy variable for being part of a greater ski network is controlled for. Fourth, the regressions provided treat each ski area equally. One may argue that larger ski areas should have a higher weight. When the regression is re-estimated using weighted least squares where the weights consist of lift capacity, we find that the results are almost identical.

Figure 2: Predicted Lift Ticket Prices and Distance to the Border

Results for FR and CH

Results for AT and CH
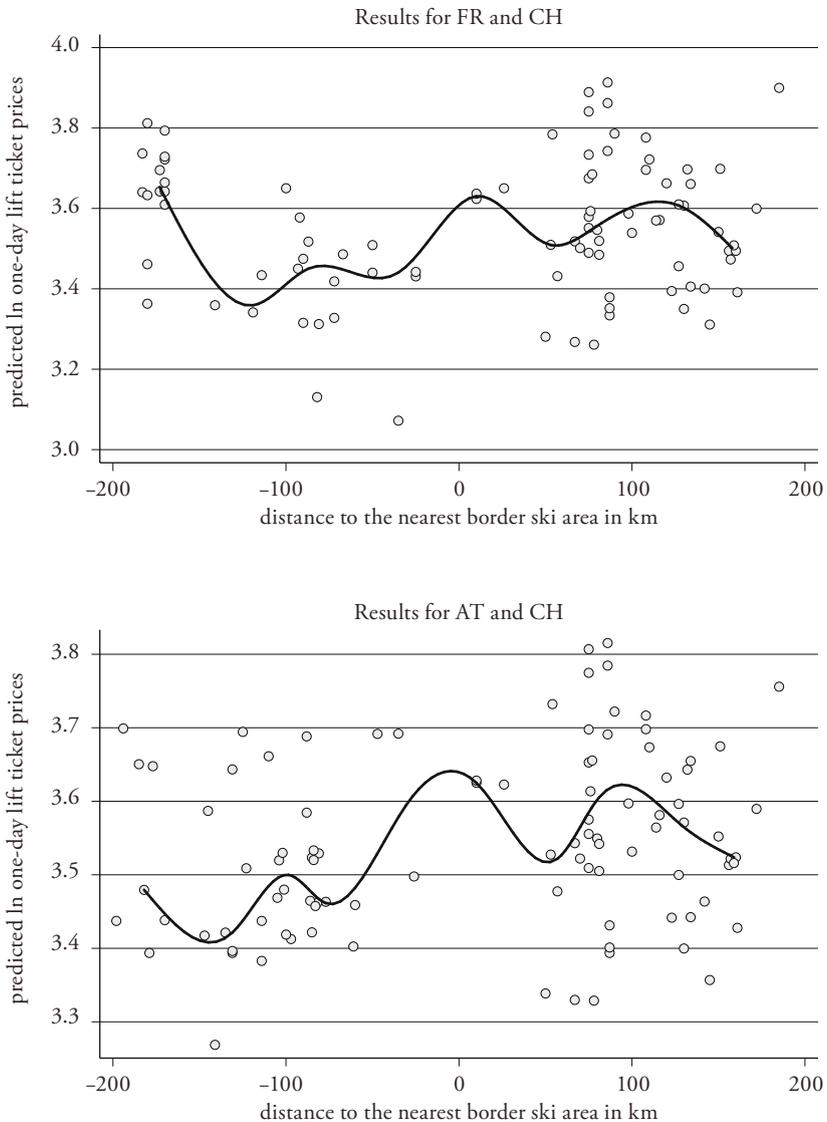
Notes: The solid line represents a cubic spline function where the knots are based on cross medians.

Table 7: OLS and Median Regression Estimates of the Impact of Border Distance on Lift Ticket Differences across Countries

	OLS estimates		Median regression estimates	
	coeff.	t-value	coeff.	t-value
ln total length of ski runs in km	0.022	0.94	0.007	0.22
ln vertical transport metres per hour	0.083***	3.86	0.082***	2.82
share of high-speed chairlifts and gondolas in per cent	0.253***	5.96	0.247***	3.63
ln average altitude of uphill stations in metres (ALT)	0.373***	3.79	0.347**	2.02
ln age of ski resort in years	0.123***	4.05	0.133***	3.23
dummy variable part of larger ski alliance/ network	0.038	1.55	0.023	0.60
share of runs with snowmaking facilities in per cent	3.596**	2.33	3.391	1.08
share of runs with snowmaking facilities X ln altitude	–0.473**	–2.36	–0.447	–1.09
dummy variable Austria	–0.045***	–0.74	0.000	0.01
dummy variable France	–0.230***	–3.61	–0.282***	–2.81
distance to border in km	0.000	1.24	0.000	0.48
dummy variable Austria X distance to border	0.000	–0.82	0.000	0.22
dummy variable France X distance to border	–0.001**	–2.33	–0.001*	–1.85
Constant	–0.725	–0.90	–0.491	–0.34

Notes: Median regressions with bootstrapped standards errors and 1000 replications. Significance at the 1, 5 or 10% level is denoted by ***,** and *, respectively. The estimation sample is restricted to ski areas that are located within the distance of 200 km or less to the nearest border ski area.

Possible Sources of International Price Differences

The price differences across countries beg the question of why lift ticket prices (net of VAT) are cheaper in France than in both Austria and Switzerland. Several factors may have an influence on the differences in ski lift ticket prices. Possible explanations include exchange rate movements; differences in cost factors, such as local wages and costs of (non-tradable) intermediate inputs; and firms' mark-

ups. The latter depends on market structure factors such as the number and concentration of competitors. The first obvious explanation is current exchange rate movements. The CHF/EUR exchange rate has been very volatile since 2008; in particular, the appreciation of the CHF against the EUR in 2009 and 2010 has led to a rise in Swiss ski lift ticket prices when expressed in Euros. However, the price differential between Swiss and French lift tickets still exists, albeit with a smaller magnitude of about 6 per cent when the average nominal exchange rate of CHF1.54/1€ over the period 2000–2009 is used to convert Swiss lift ticket prices into Euros. It is interesting to wonder how much the euro would have to appreciate (against the Swiss franc) to restore uniform prices. The calculations show that the difference in lift ticket prices between France and Switzerland disappears when the exchange rate of CHF1.64/1€ is used to convert lift ticket prices into Euros. However, exchange rates are not relevant in explaining the difference between French and Austrian lift ticket prices.

Non-tradable cost components and wage costs, which can vary across countries, offer another explanation of the price differences. Estimates made by the Swiss Statistical Office show that for total industries, average wage costs per hour are 12 per cent higher in Switzerland than in France and 23 per cent higher than in Austria based on data for 2006. With the recent depreciation of the euro against the Swiss franc (data refers to the period summer 2010), these wage differences might increase to 23 and 40 per cent, respectively. But even when wages are significantly higher in Switzerland than those in Austria and France, this is unlikely to lead to large differences in factor costs. The reason is that lift companies are characterized by high capital intensity with a low share of labour costs in total sales or net output. Although we do not have complete information for all ski areas, calculations based on the reports of the largest ski lift companies in the three countries reveals that the share of wage costs in total output is only about 20 per cent on average. Thus, the relatively high wages in Switzerland translate into production costs that are only 5 per cent higher than in France. When wage costs are measured as labour costs per full-time employee in the sectors transport, storage, and communication, we find that wage costs per employee are higher in France than in Austria (€38,385 and €36,610 for 2007, respectively[5]). Similarly, based on EUKLEMS data for the same industry, we find that the hourly wage in 2006 was €21.20 for Austria and €28.10 for France. This indicates that cost differences are unable to explain the difference between French and Austrian lift ticket prices, but may play a moderate role in the difference between

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5   Source: National Accounts by Industry. Eurostat new cronos.

Swiss and French lift ticket prices. One should also take into account that user costs of capital are lower in Switzerland than in the other two countries because of lower interest rates.

Price differences are caused not only by differences in wage costs, but by differences in non-traded inputs, as well: For ski lift companies, the main non-traded inputs are electricity and water, followed by marketing and insurance expenditures. The prices of these non-tradable inputs are likely to be lower in France and Austria than in Switzerland because the latter country's local wage costs are higher than those of both competitors. Based on reports from the five largest ski lift companies for each country, our calculations suggest that the share of these factors in total output is very small. We thus conclude that differences in the non-traded cost share are unlikely to explain a large part of observed price differences.

Given that cost differences are of minor importance in determining the cause of the price differences, one would expect differences in mark-ups to offer an explanation. In general, mark-ups over marginal costs are inversely related to the price elasticity of demand. Ski lift companies can charge different mark-ups depending on the local demand structure. Monopolists are able to charge high mark-ups when the price elasticity of demand is low (see ENGEL and ROGERS, 2004; KRUGMAN, 1987). However, the four-firm concentration ratio is quite low in Switzerland and Austria. In Switzerland, the four largest ski lift companies accounted for 16 per cent of all skier visits in the winter season 2007/2008.[6] In Austria, the largest ski network (Ski amadé) accounted for 13 per cent of all skier days in the same season. Compagnie des Alpes, however – France's largest ski lift company – accounted for almost 40 per cent of lift ticket sales in the winter season 2008/2009.[7] This rules out market structure as a possible explanation because the country with the lowest lift ticket prices exhibits the largest market concentration.

The price elasticities of domestic and foreign demand are key factors that determine the degree of price discrimination. The large price gap between Switzerland and France may be due to the lower elasticity of demand in Switzerland as compared to France. In general, tourism demand is relatively responsive to price factors (CROUCH, 1994; LIM, 2006). Price elasticities may, however, well differ across countries because the structure of international tourists varies by country of

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6   The largest ski areas are Davos-Klosters, Zermatt, St. Moritz, and Jungfrau (i.e. Grindelwald, Mürren, and Wengen).
7   The source is *Montagne Leaders*, October 2009.

origin. French ski areas have a much lower share of foreign tourists than the two other countries (Vanat, 2011). One tentative explanation is that foreign tourists are less price-sensitive than their domestic counterparts. This may hold in particular for German tourists travelling to Austria (and to the German-speaking part of Switzerland) because these countries are often geographically closer than France and share a similar language. Another factor influencing the relatively high lift ticket prices in Switzerland is the fact that domestic consumers demonstrate a higher marginal willingness to pay because of the much higher GDP per capita and the generally high price level in Switzerland as compared to Austria and France. However, this is only relevant to domestic skiers and is of minor importance for foreign tourists, who represent 50 per cent of the tourists in Switzerland and 75 per cent in Austria (Vanat, 2011).

Productivity and economics of scale are other factors. The more productive a firm is the lower output prices will be given the firm's input prices (Forsyth and Dwyer, 2009). It is also often suggested that ski lift companies are characterized by increasing returns to scale. This means that costs less than double when output doubles, leading to falling average costs. Indeed, Falk (2009) finds some evidence that ski areas representing part of greater ski network – such as Compagnie des Alpes – are significantly more productive. Given that French lift companies are much larger on average, this may explain part of the price differences between Swiss and French lift tickets. Finally, consumer search costs stemming from a lack of information are unlikely to play a role because price differences can be easily checked on the homepages of the ski lift companies.

Overall, we conclude that cost factors are not the main reason behind these price differences. Instead, these differences are most probably demand-driven such that skiers are willing to pay a price premium for Swiss ski resorts.

5. Conclusion

Based on a representative data set covering 214 ski resorts in the 2010/2011 season, this study empirically shows that ski lift tickets measured as both one-day and six-day lift tickets (net of VAT) are significantly lower in France than in both Austria and Switzerland. The price differences are 17 per cent between Swiss and French one-day lift ticket prices and 10 per cent between French and Austrian prices after controlling for size, lift capacity (adjusted for vertical transport metres), altitude of uphill lift stations, share of fast lifts, snowmaking facilities, resort age, whether or not each ski lift company belongs to a greater ski network and have been a venue of the FIS Alpine Ski World Cup in the past 15 years. The

price differential is less pronounced when measured as six-day lift passes with price gap of 14 per cent on average between France and Switzerland and 9 per cent between France and Austria.

Quantile regressions for the 25th and 75th conditional percentile show that the price differential across countries holds for both high-price/high-quality and low-price/low-quality ski resorts. In addition, the determinants of lift ticket prices are quite similar across the different quantile regressions except for the impact of the share of high-speed lifts, which is less significant for the 75th quantile, i.e. high-price/high-quality ski resorts. Furthermore, we demonstrate that differences in cost factors are not large enough to explain the observed differences in ski lift ticket prices. One obvious factor is the appreciation of the Swiss franc against the euro starting in 2009 starting in 2009 (and continuing into 2011). The price differential between Swiss and French lift ticket prices decreases to 6 per cent when the average CHF/EUR exchange rate of CHF1.54/1€ between the period 2000–2009 is used to convert Swiss lift ticket prices into EUR prices. However, exchange rates are obviously not relevant in explaining the difference between French and Austrian lift ticket prices. Furthermore, we find that the absolute percentage price differences do not increase with the distance to the nearest border ski area.

Given these findings, one might wonder about the implications for policy-makers. Consumers are willing to pay a price premium for Swiss ski areas; on the other hand, our results suggest that Swiss ski areas are relatively less price-competitive compared to the country's two neighbours given the exchange rate of CHF 1.36/1€ during the 2010 summer period. This would suggest that Swiss ski lift companies need to make further efforts to increase their productivity. It is impossible to determine conclusively which of the two explanations is more relevant. This would require future work, such as an analysis of the subsequent evolution of Swiss ski lift companies' worldwide market share. In particular, it is important to estimate the price elasticity of demand. However, output data is generally only available for large ski lift companies that are legally required to provide annual reports. Governments can also lower their VAT rates. This would be possible in principle for the Swiss authorities, but France and Austria would have limited possibilities to do so because of the European Commission's aim to prevent a growing divergence of VAT rates across EU countries.

Since this study uses data on three Alpine countries, the results should not be over-generalized. In future work, the sample should be extended to other countries – Italy in particular, but also Bulgaria, the Czech Republic, Germany, the Scandinavian countries, Slovakia, Spain, and other countries overseas. Another interesting possible direction for future research is to use discrete choice models to

estimate the consumers` willingness to pay for different ski destinations. According to the random utility theory consumers choose the alternative that yield the greatest net benefit. In these models utility is a function of ski resorts characteristics and individual characteristics (e.g. age, education, gender, income and location). The advantage of the use of destination choice models is that the willingness to pay can be estimated accurately for different types of consumers. For instance, it would be possible to distinguish between foreign and domestic skiers and snowboarders as well as between day-trippers and those staying in the resort. For the Rocky Mountains and Scotland there are already studies available that investigate the probability of ski resort choice (Moeltner and Englin, 2004; Riddington, Sinclair, and Milne, 2000). However, to my knowledge, there are no studies available for the European Alps. Such analysis requires individual data on social economic characteristics and resort data which are rarely available.

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Appendix

Table 8: List of Ski Areas (Based on Ski Resorts with Data on One-Day Lift Tickets)

Austria	France	Switzerland
Alpbach	Alpe d'Huez Auris en Oisans	Adelboden-Lenk
Annaberg-Reidllifte	Avoriaz (Portes du Soleil)	Anzère
Axamer Lizum	Ax Les Thermes-Bonascre	Arolla
Bad Kleinkirchheim	Barèges-La Mongie	Arosa
Bergeralm	Cauterets	Bellwald
Berwang	Chamonix	Bivio
Brandnertal	Chamrousse	Blatten-Belalp
Brunnalm	Châtel (Portes du Soleil)	Braunwald
Christlum	Combloux-JAILLET-La Giettaz	Brigels-Waltensburg
Dachstein-West	Courchevel	Bruson

Austria	France	Switzerland
Damüls-Mellau	Espace Killy Tignes, Val d'Isère	Champéry-LesCrosets-Morgins-Torgon
Diedamskopf	FLAINE (Grand Massif)	Chandolin-St-Luc
Dorfgastein-Grossarl	FLAINE-Les Carroz d Arâches	Crans-Montana
Ehrwalder Alm	Font-Romeu, Bolquère-Pyrénées 2000	Davos (Jakobshorn)
Fanningberg	Gourette	Davos (Pischa)
Fieberbrunn	ISOLA2000	Davos (Rinerhorn)
Filzmoos (Sportwelt)	La Clusaz Manigod – La Croix Fry	Davos-Klosters
Flachau-Wagrein-St.Johann	La Plagne	Davos-Klosters (Madrisa)
Gaissau Hintersee	La Rosière	Davos-Klosters (Parsenn)
Galtür	La Toussuire (LES SYBELLES)	Elm Sernftal
Gargellen Schafberg	Le Corbier (st. D'Arves)	Engelberg
Gastein	Le Grand Bornand	Evolène
Gerlitzen-Alpe	Le Grand Domaine	Flims-Laax-Falera
Glungezer	Les Angles	Flumserberge
Golm	Les Arcs	Grächen
Grosseck-Speiereck	Les Contamines-Montjoie	Grimentz
Grünau-Kasberg	Les Deux-Alpes	Grindelwald all sections
Heiligenblut	Les Gets-Morzine (Portes du Soleil)	Grindelwald-Mannlichen, Kleine-Scheidegg – Wengen
Hinterstoder	Les Houches	Grindelwald-Mürren
Hintertuxer Gletscher	Les Menuires	gstaad-Saanenmöser
Hochficht	Les Orres	Hoch-Ybrig
Hochjoch	Les Saisies	Klewenalp
Hochkar	Les Sept Laux	LenzerheideRothorn-Schwarzhorn
Hochkönig	Megève Combloux-JAILLET-La Giettaz	Leysin
Hochötz	Méribel-Mottaret	Meiringen – Hasliberg
Hochzeiger	Montgenevre Cesana – Clavière	Melchsee-Frutt
Hochzillertal-Hochfügen-Kaltenbach	Monts Jura Mijoux	Morgins

Austria	France	Switzerland
Innerkrems	Orcieres 1850 Merlette	Nax – Mont-Noble
Ischgl-Samnaun	Paradeski Les Arcs La Plagne	Nendaz-Veysonnaz-Thyon
Kals-Matrei	Peyragudes	Obersaxen
Kappl	Praz de Lys Sommand	Ovronnaz
Katschberg	Puy Saint Vincent	Pizol
Kaunertaler Gletscher	Risoul 1850 (Domaine de la Forêt Blanc)	Riederalp
Kitzbühel	Saint Lary Soulan	Rosswald
Kitzsteinhorn	Serre-Chevalier	Saas Fee
Kössen	St. Francois longchamp (Le Grand Domaine)	San Bernardino
Kreischberg	St. Sorlin d'Arves	Savognin
Kühtai	Super besse (Le Mont-Dore)	Scuol-Ftan
Lech-Zürs (Ski Arlberg)	Superdevoluy La joue du Loup	Sedrun-Disentis
Lermoos-Biberwier	TIGNES (espace killy)	Sörenberg
Lofer	trois vallée	Splügen
Loser-Sandling	Val Cenis	St. Moritz Corvatsch-Silvaplana
Mayrhofen (Zillertal 3000)	Val d Isère (Espace Killy)	St. Moritz-Zuoz
Mölltaler Gletscher	Val D'Allos – Le Seignus	St. Moritz
Naßfeld-Hermagor	Val Thorens	St. Moritz-Diavolezza
Nauders	Vallée des Belleville, Val-Thorens, Orelle, Les Ménuires, Saint-Martin de Belleville	St. Moritz-Celerina
Obergurgl-Hochgurgl	Valloire-Valmeinier	Stoos
Obertauern	Villard de Lans	Val Müstair
Patscherkofel		Verbier
Pitztaler Gletscher		Vercorin
Planai-Hochwurzen-Hauser Kaibling-Reiteralm		Villars-Gryon
Radstadt/Altenmark (Sportwelt)		Wildhaus
Rauris		Wiler-Lauchernalp

Austria	France	Switzerland
Riesneralm		Zermatt
Saalbach-Hinterglemm-Leogang (Skicirkus)		Zinal (Val d'Anniviers)
Schmittenhöhe		
See		
Seefeld-Rosshütte		
Semmering (Hirschenkogel)		
Serfaus-Fiss-Ladis		
Sillian (Hochpustertal)		
Silvretta Nova		
Skiwelt		
Sölden		
Sonnenkopf		
Spieljoch-Fügen		
Sportgastein		
St. Anton		
Steinplatte		
Stubaier Gletscher		
Stuhleck (Semmering)		
Tauplitz		
Turracher Höhe		
Venet		
Warth-Schröcken		
Werfenweng		
Wildkogel		
Wildschönau-Auffach		
Zauchensee-Flachauwinkl-Kleinarl		
Zettersfeld		
Zillertal Arena		

SUMMARY

This paper provides empirical evidence on international price differences in ski lift tickets based on 214 ski areas in Austria, France, and Switzerland for the winter season 2010/2011. We find that French and Austrian one-day lift tickets (net of VAT) are an average of 17 and 7 per cent lower, respectively, than Swiss ticket prices after controlling for ski areas' characteristics. The results of quantile regressions show that the magnitude of the international price differences is quite similar for low- and high-priced ski areas. Furthermore, price differences across countries do not increase with distance to the nearest border ski area.