



Importance of early snowfall for Swedish ski resorts: Evidence based on monthly data



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HIGHLIGHTS

- Snow conditions in the early season are crucial for lift ticket sales.
- Snow effect is much more pronounced than the impact of prices and income.
- Downhill skiing is characterised by low income and price elasticities.
- Prices of lift tickets grow faster than the inflation rate.
- Significant decline in skiing demand from 2010/11 onwards.

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ABSTRACT

Since the early 1970s, Sweden has experienced an almost uninterrupted surge in demand for downhill skiing. However, from the 2009/2010 season, lift ticket sales have stagnated. With the use of monthly data, this study investigates the role of snow depth and economic factors in the demand for downhill skiing in Sweden. The empirical approach is based on a seemingly unrelated regression model, allowing snow conditions, but not economic factors to differ during the season. The estimates show that an early season increase in natural snow depth by 10 cm raises the growth rate of lift ticket sales by 9 percentage points in the same period. Further, the results indicate that downhill skiing is characterised by low income and price elasticities, implying weak impacts on demand for such changes. The price increase of lift tickets exceeds that of the inflation rate. The recent decline in demand might indicate changed leisure preferences.

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1. Introduction

The major ski markets of the world are reaching a point of stagnation or decline (Vanat, 2014). After a long period of increased demand and expansion (Bodén, 2010; Heberlein, Fredman, & Vuorio, 2002; Nilsson, 2001) this trend also holds true for Swedish ski resorts. These resorts are small players in the worldwide downhill market, mainly serving the domestic demand with only approximately 10% of skiers coming from abroad (Fredman, 2008; SLAO –Swedish Association of Ski Lift Companies). Following the historical winter seasons of 2008/2009 and 2009/2010, the number

of skier visits declined according to the SLAO (see Fig. 1 in the Appendix). A similar picture is obtained when the output of ski lift companies is measured as the volume of lift ticket sales (constant prices). Overall, this may indicate that the Swedish alpine industry has followed the international pattern and entered the stagnation stage of the tourism life cycle as described by Butler (1980).

Although stagnation is apparent, the main factors influencing the demand for skiing in Sweden are not fully disentangled. One hypothetical explanation is the cost of skiing. In the last 20 years the increase in lift ticket prices has exceeded the inflation rate (see Fig. 2 in the Appendix). Another explanation is that skiing is no longer a growth activity, with lift ticket sales rising less than proportionally with economic growth. This may imply low income elasticity. Tourism demand is generally characterised by high income elasticities, indicating that tourism is a luxury good (Peng, Song, Crouch, & Witt, 2014). In particular, this is valid for

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international rather than domestic tourism demand. Climate change with increasing occurrence of snow poor winters, especially in the early season, may contribute to the stagnation of lift ticket sales. Snow depth observations for the two largest downhill areas in Sweden, Sälen and Åre reveal a clear downward trend during the last three decades (Fig. 3 in Appendix).¹ Besides economic factors and weather conditions, a general shift in leisure preferences towards other activities over time may also have an impact on lift ticket sales.

In this study we examine the relationship between the inter-annual variation of lift ticket sales and snow depth using monthly data for the 24 largest ski lift operators in Sweden, covering 80% of the market (SLAO Skiddata). This data is combined with detailed information on snow depth from a group of mountain weather stations. The model is estimated using seemingly unrelated regressions (SUR), applied to a first difference specification. This approach makes it possible to account for the correlation of the error terms across the different winter months. In the empirical model the change in lift ticket sales relative to the same period the previous winter season is related to the corresponding changes in snow conditions, real GDP, relative prices and control variables (e.g., early Easter holidays). An important feature of the model is that the economic factors are restricted to be identical across the winter months in a given year while the snow conditions and calendar effects are allowed to differ.

Currently, there are 370 downhill ski areas or facilities in operation in Sweden, many of them small. These ski areas are concentrated to the West and to the North (see Fig. 4 in Appendix for a map of the larger resorts). With about 6.6 million skier visits in the winter season of 2013/2014 (based on the 50 most-visited ski establishments, SLAO), Sweden is much below the leading countries in Alpine skiing - the United States, France, Austria, Japan, Italy and Switzerland (Vanat, 2014). The five most frequented areas - Åre, Sälen, Vemdalen, Idre Fjäll and Funäsdalen - account for 72% of lift ticket sales during the 2013/2014 season.

The Swedish ski industry has followed international trends of increased concentration with fewer, but larger operators. Skistar is the largest. Unique features of Swedish mountains and ski resorts are the small vertical drop (Fredman, Reinius, Sandell, & Lundberg, 2014; Moen & Fredman, 2007) - making skiing not overly demanding - and the climate, defined as Köppen zone D (moist mid-latitude climate with cold winters), implying that elevation is less an issue for the availability of snow than latitude.²

Numerous studies have examined the determinants of snow based winter tourism (for Australia Pickering, 2011; for Austria Steiger, 2011 and Damm, Köberl, & Prettenthaler, 2014; for France Falk, 2015; for Japan Fukushima, Kureha, Ozaki, Fujimori, & Harasawa, 2002; for Switzerland Gonseth, 2013; for the United States Hamilton, Brown, & Keim, 2007, Shih, Nicholls, & Holecek, 2009; Dawson, Scott, & McBoyle, 2009 and Holmgren & McCracken, 2014). Lift ticket sales, skier visits or number of passengers transported uphill are commonly employed as measures of winter tourism demand.³ Income, relative prices, temperatures and

snow depth are found to be significant determinants of winter tourism demand.

Unfortunately, available studies are not fully comparable because of the use of different time scales (daily, monthly or annual data), various definitions of the dependent variable (skier visits, lift ticket sales or number of passengers), inclusion or exclusion of prices and real income, and different methods (regression models, descriptive statistics). The majority of studies focus on the relationship between weather conditions (e.g., temperatures and snow conditions) and skier visits or lift ticket sales, neglecting the role of lift ticket prices and real income (for exceptions see Falk, 2015; Holmgren & McCracken, 2014). It should be emphasised that relative prices and real income are the central determinants of tourism demand (see Song & Li, 2008 for a survey; see Peng et al., 2014 for a meta-analysis). Currently, there is no consensus about the role of weather conditions for skiing demand, specifically when it comes to the impact of natural snowfall in the early winter season. This is the first study investigating the impact of snow conditions on lift tickets sales for the economically important Christmas and New Year holiday season.

The main contribution of this study is the investigation of the impact of snow conditions on skiing demand for the early, mid and late winter seasons, based on a new and unique dataset. We argue that the use of monthly data gives a more detailed picture of the relationship between weather and snow based winter tourism demand. Another contribution of the paper is that we use the price of lift tickets as a measure of the price variable rather than proxy variables such as the consumer price index. Previous tourism demand studies for Sweden do not distinguish between different seasons or tourism activities (Coenen & van Eekeren, 2003), or focus on international tourism demand (Khalik Salman, 2003; Khalik Salman, Arnesson, Sörensson, & Shukur, 2010; Nordström, 2004). For domestic tourism demand in Sweden, Khalik Salman et al., (2007) find high price elasticities in absolute terms and insignificant income elasticities.

The paper is structured as follows: Section two introduces the empirical model. Section three provides the data and descriptive statistics. Section four presents the empirical results, and section five concludes.

2. Empirical model

Snow based winter tourism is weather sensitive. Despite large investments in snowmaking facilities in the last decades, the recent literature shows that skier visits strongly depend on natural snow depth. However, the strength of the relationship is not conclusive. For Swiss ski resorts, Gonseth (2013) reports that snow depth is particularly important for ski areas with poor snowmaking facilities. In a study of high elevation ski resorts in the French Alps, Falk (2015) shows that variations in natural snow depth only explain a small proportion of the change in skier visits over time. A limitation of these studies is that they explore skier visits for the total winter season and thus are not able to account for the timing of snowfall.

Rather than the average snow depth for a total season, the distribution of snow during the winter is of high importance (Burroughs, 2000). A poor start to the winter season with a lack of snow during the Christmas and New Year holiday period may have a disproportionately negative impact on the output and profits of the industry (Elsasser & Bürki, 2002). Therefore, an open question is whether and to what extent the number of visitors to ski areas is affected by snow conditions in the economically important Christmas and New Year holiday season.

The choice of the time scale of the weather data (e.g., monthly, daily or total season) is crucial when modelling the relationship

¹ Pre-season snow depth in Sälen (Särna) and Åre (Storlien) decreased by about 15 cm on average between the early 1980s and 2014. For January the downward trend is even more pronounced, although the snow coverage for this month still has a more comfortable distance to 0. The average snow-depth in Sälen, the southernmost of the large resorts, is much lower than that of the Åre (Storlien) area.

² See SMHI (Jordens huvudklimattyper).

³ Other studies use overnight stays in ski resorts as a proxy of winter tourism demand (see, e.g., Töglhofer, Eigner, & Prettenthaler, 2011; Falk, 2013b). However, day-trippers are not captured by overnight stays and there might be under-reporting in the official accommodation statistics. In addition to lift ticket sales, performance measures such as cash flow are also used (Tang & Jang, 2011, 2012).

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