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Willingness to pay for "green skiing"

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ABSTRACT

In this note we provide preliminary empirical evidence on Norwegian alpine skiers' willingness-to-pay for season pass attributes that make alpine skiing more sustainable. We focus on two key attributes; (1) compensating for the CO2 emissions associated with the activity by purchasing CO2 quotas and (2) compulsory use of public transportation to/from the ski resort. The results show that there is a substantial interest in season passes that includes CO2 compensation. However, combining season passes with compulsory use of public transportation (ski bus) does not seem to be attractive to Norwegian alpine skiers/snowboarders. The optimal prices of the two alternatives are approximately 11.5% higher (CO2 version) and 25% lower (ski bus version) when compared to a regular season pass.

1. Introduction

Global warming is a threat to many tourism destinations relying on winter sports (see e.g. Cavallaro et al., 2017). Alpine skiing is no exception, and one may argue that this sector is partly responsible for destroying its own basis for existence (Barrantes et al., 2013; Gössling & Peeters, 2015; Scott et al., 2003; Tsuyuzaki, 1994; Tuppen, 2000). The reason is that lack of snow (or fair of lack of snow) leads most ski resorts around the world to use energy- and water thirsty snow cannons for artificial snow production. They also rely heavily on electricity for lifts, heating, and accommodation facilities (not always based on renewable sources) and the transportation used to get to a ski resort is often the car, or even by airplanes if skiers arrive from other countries. Additionally, the snow groomers used to prepare the slopes are often fueled by diesel. Hence, ski resorts do, directly or indirectly, contribute to CO2 emissions.

Ski resorts can do a lot of environmentally friendly activities themselves to cut the emissions (Goncalves et al., 2016; MacIntosh et al., 2013; Smerecnik & Andersen, 2011; Spector, 2017; Spector et al., 2012). Examples include: (1) ensure energy comes from CO2-neutral sources, (2) use electric snow groomers, (3) make it easier for visitors to travel by environmental-friendly transportation (such as train, bus, electric cars), and more.

Another approach, which of course can be implemented in combination with the ski resorts' own effort to become more sustainable, is to sell ski lift passes which include a "green fee" that can be used to offset the CO2 emissions left by the individual skier over the duration of the skiing period. This can for example be done by the purchase of CO2 quotas which matches the (average) emissions over a given period (for example a season). To the best of our knowledge, there is no previous studies that have examined the interest in, or willingness-to-pay for, such "green ski passes".

The current study aims at filling this gap. Specifically, we have asked Norwegian alpine skiers and snowboarders to reveal their preferences for season passes that either (1) compensate for CO2 emissions associated with the activity, (2) include public transportation (ski bus) or both. We have also asked directly about whether skiers/snowboarders would be willing to pay anything extra for a "climate neutral season pass", and if so, how much extra.

There are around 200 ski areas and over 650 ski lifts in Norway. Approximately 22% of Norwegians participate in alpine skiing (3,4 skier visits per national skier), indicating its high importance culturally and economically for rural mountain regions (Scott et al., 2020; Vanat, 2020). The effects of climate change on ski areas in Norway can therefore have a major financial impact.

Scott et al. (2020) examined how climate change will affect competitiveness of ski destinations in Norway. They point out that the ski season length (days) will decrease, depending on the emission scenario. A considerable shortening of the ski season (21–35 days in the low emission scenario (RCP 4,5) and 21–63 days in high emission scenario (RCP 8,5)) is projected already in the 2030s for ski areas depending only on natural snow. They conclude that comparative climate change risk under high emission mid-century scenario is similar to that projected for many ski areas in the European Alps market (see e.g. Steiger & Abegg, 2018), where major part of the ski areas are projected to be snow

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Fig. 1. Illustration of one choice set used in the survey.

reliable in 2050s, but less than half of these are projected to remain snow reliable in 2080s.

2. Data, methods, and empirical results

The data stems from part of a large survey on Norwegian alpine skiers' (or potential future alpine skiers/snowboarders) preferences when visiting a ski resort. The questions related to sustainable season passes, which we examine in this research note, were only given to those who currently hold a season pass at a Norwegian ski resort. In total 174 respondents answered these questions, and it is their responses we analyze in the current paper.[1]

The respondents were presented with the following case scenario:

A ski resort in your area is considering various measures to make alpine skiing/snowboarding more sustainable. One such measure is to offer season passes which involves a ***compulsory use*** *of public transportation to/from the ski resort. The ski pass will then* ***only work*** *if you go to/from the resort with a so-called* ***ski bus****. The ski bus will have fixed departure- and arrival times matching the opening hours of the ski resort.* ***The ski bus transportation will be included in the season pass****.*

The other measure the ski resort is considering is to offer season passes that compensate for all the CO2 emissions associated with alpine skiing over the entire season. This is made possible by purchasing CO2 quotas that correspond to the average CO2 emissions associated with alpine skiing/snowboarding over an entire season. With this season pass, alpine skiing / snowboarding therefore becomes ***climate neutral****.*

The ski resort is also considering ***combinations*** *of these measures but wants to first examine the preferences of potential future season pass buyers.*

The respondents where then asked if they were able to fully understand the described scenarios. Those responding "yes" to this question were moved to a section where they had to make choices among various alternatives. The key questions in this section were designed as a choice-based conjoint experiment.[2] This means that the respondents were presented with choice sets where the three attributes: (1) Climate neutral skiing (yes/no), (2) compulsory transportation: ski bus (yes/no) and the price for a season pass (2000; 3000; 4000; 5000; 6000; 7000) assumed various values. An example of one choice set is given if Fig. 1. A total of 12 such choice sets were created using the shifting method to ensure that the minimum required number of attribute combinations were reached (see Rao (2014) for details). All respondents had to consider all 12 choice sets.

Aggregating the choices of each respondent enable us to illustrate how the empirical demand for all the choice alternatives ($2 \times 12 = 24$) looks like for the various price levels. This is done in Fig. 2. The variation in the demanded quantity at each price level suggest that some of the alternatives are more attractive than others.

To formally examine this, we use these data to estimate a price-response function. We choose to focus on the logit specification as it is very flexible and has some other desired properties when modelling demand (see Phillips, 2005).

The model including the two attributes can den be defined by

$$d(p) = \frac{Ce^{a+\beta_1 p+\beta_2 C02+\beta_3 Bus}}{1 + e^{a+\beta_1 p+\beta_2 C02+\beta_3 Bus}} \tag{1}$$

where p is the price [2000; 3000; 4000; 5000; 6000], $C02$ is whether the season pass includes CO2 compensation or not [0; 1] and Bus is whether the season pass includes compulsory use of a ski bus to/from the resort or not [0; 1]. The results of the estimations are illustrated in Fig. 3. To save space, we include the parameter estimates in the figure caption. The solid black line shows the price-response function for a season pass that includes CO2 compensation. This alternative is clearly most attractive. The dashed black line illustrates the price-response function for a season pass that includes compulsory use of bus to/from the resort. This alternative is substantially less attractive compared both to the CO2- and regular (dashed grey line) season passes. A season pass which incorporates both CO2 compensation and compulsory use of bus to/from the resort falls somewhere in between, but is still less attractive than a

[1] The complete survey was carried out on a representative sample of the adult population (18+ years) in the Norwegian regions with the highest density of skiers (Lillehammer, Asker, Bærum, Oslo) and smaller municipalities in Norway with one or more ski resorts in the local area. The sub-sample of season pass holders, which we analyze in this study, consists of 66% men and 34% women with an average age of approximately 40 years. These sample characteristics corresponds well with previous studies from Norway (see e.g. Haugom and Malasevska, 2019; Malasevska & Haugom, 2018) and official statistics from Statistics Norway (see https://www.ssb.no/en/statbank/table/09100/tableViewLayout1/).

[2] We used multinominal choice experiments design to create the choice sets, see Rao (2014).

Fig. 2. Illustration of one choice set used in the survey. Each choice set contains two choice alternatives and the total number of combinations therefore amounts to 24.

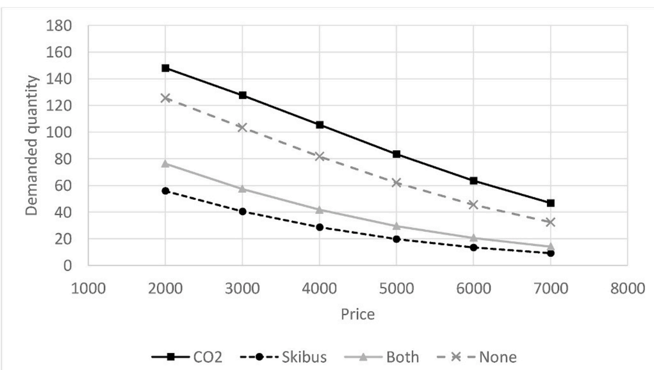

Fig. 3. *Estimated Price-response functions for various types of alpine skiing season passes. "CO2" means that the season pass compensates for all CO2 emissions by buying CO2 quotas, Ski bus means that the season pass is only valid in combination with the use of a ski bus to/from the resort. "Both" means that both CO2 compensation and ski bus are included in the season pass. The estimated parameters from the model presented in* Equation (1) *are as follows:* $C = 217.24$, $a = 1.14$, β_1=-0.0004, β_2=0.45, β_3=-1.38.

regular season pass.

2.1. Price optimization

The estimated price-response functions from Fig. 3 can be used directly to calculate the profit maximizing prices of the various season passes. This is done by solving the simple optimization problem:

$$\max_{p} \; Z = (p - c_v)d(p) - c_f \tag{2}$$

where Z is the profit, p is the price, c_v is the variable costs, and c_f is the fixed costs. I.e., the objective is to maximize the profit by changing the price. For simplicity, we assume that c_v and c_f are equal to zero, such that the optimization problem reduces to maximizing revenues from selling the various season passes (this assumption will generally not affect results). The results from the optimization model presented in Equation (2) is given in Fig. 4.

The main findings here are as follows. First, the optimal (profit maximizing) price for a season pass that includes CO2 compensation is NOK 451.40 higher than a regular season pass (11.46%).[3] Second, a season pass that includes (compulsory) public transportation has an optimal price that is almost NOK 1000,- below that of a regular season pass (2995.53 vs. 3939.27, which amounts to 23.96%). This finding is in line with Nerhagen (2003) and suggests that Norwegian alpine skiers are willing to pay a lot to keep the flexibility of being allowed to use the car.

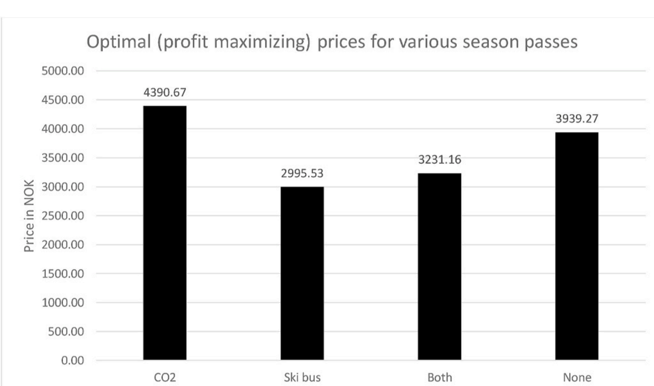

Fig. 4. Optimal prices for various alpine skiing season passes.

3. Implications and future research

Our result show that there is a substantial interest in ski passes that compensates for the CO2 emissions associated with the activity. Ski resorts managers can use this finding directly to offer "green ski passes" that offset emissions associated with the activity at a higher price than regular season passes. There are currently many businesses offering so-called personal carbon offsets, and the price per metric ton (1000 kg) depends somewhat on how expensive it is to run a given program. In general, though, the prices are well within what skiers and snowboarders in this study are prepared to pay to offset their emissions. As an example, if a skier drives a SUV, lives 25 km from the resort, and makes 15 trips over the entire season, the total emissions from driving to and from the ski area are calculated to 249 kg (0.249 ton) of CO2 by a company called *cooleffect*[4]. To offset these CO2 emissions they estimate a price of \$2.09. Then the other areas which contributes to the total emissions shall be added (electricity usage, snow groomers, waste, and more). The ski resort has the option to make individual adjustments (by activity-based allocation), or it can calculate some sort of averages and split the "indirect" CO2 emissions on all (CO2 offset-) season pass holders. Either way, it is unlikely that many skiers will exceed the CO2 emissions associated with the optimal *extra* price to compensate for emissions (~NOK 500) found in this study. As such season passes would be based on a "self-selection" criterium, customer acceptance should not be a problem either. To create some sort of social recognition associated with the "green" season passes, they could be presented with a certain design (for example a completely green color design). By doing so, other skiers and snowboarders will notice that this season pass holder is aware of sustainable issues when it comes to alpine skiing.

If ski resort managers want to use price to change the way skiers travel to/from the resort – from using the car to the use of public transportation for example – they must be prepared to reduce the prices for such passes. The reason is that skiers/snowboarders are ready to pay a lot to keep the flexibility of being allowed to use the car when visiting the resort. An alternative is to make non-car accessibility more convenient. Such efforts could be costly, however, and a thorough cost-benefit analysis should be carried out before implementing them.

[3] We also asked the season pass holders directly of their willingness-to-pay something extra for a season pass that fully compensates for the CO2 emissions. 26% answered that they are willing to pay at least something extra and the average reservation price among these is NOK 613.20. We also used these data to calculate the optimal *extra* price for the CO2 compensation part of the season pass of 585.23 NOK. This is very similar to the estimates we got when using the indirect approach.

[4] See https://www.cooleffect.org/.

It is likely that the general findings of this study also hold for other segments of the hospitality- and tourism industry wanting to use price as mechanism to make their services more sustainable. Though willingness-to-pay distribution is likely to vary across services and countries/regions examined (see e.g. Landauer et al., 2012; Landauer et al., 2014), managers can adopt the framework presented here to map the interest among their current (and potential future) customers. It is important to note, however, that stated willingness to pay behavior does not always align with actual behavior (see e.g. Miller et al., 2011). This bias is even likely to be more prominent when it comes to environmental issues and is then known as *social desirability bias* in the literature (Fisher, 1993). In such cases the respondents have a (higher) tendence to give positive self-descriptions and/or avoid looking bad. This can in turn result in a (bigger than usual) gap between respondents' explicit attitudes towards environmentally friendly products or services and their actual purchase behavior (see e.g. Luchs et al., 2010). Though the choice-based conjoint (which we use in this study) has been found to perform well among the various survey-based methods to measure willingness to pay (Miller et al., 2011), future research should scrutinize this further, preferably using real-life experiments or data of actual purchases of Co2-neutral lift passes or something similar. Future academic research should also investigate differences in attitudes towards- and willingness-to-pay for sustainable skiing across sub-groups and markets and examine more tourism-, recreational-, and service industries. It would also be interesting to study more attributes related to sustainability, for example the willingness to pay for environmental certification, and how the approach presented here can be integrated in sustainable tourism and hospitality management and reporting more generally (see Guix & Font, 2020).

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