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Winter Weather Anomalies and Individual Destination Choice

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Abstract: Recently, several winter seasons in the European Alps have been unexpectedly warm. In the Austrian mountains, December 2015 was the warmest since weather records began, with a temperature deviation of +6.6 °C compared to the long-term average. By use of data on 6200 individual trips from the Austrian travel survey, a multinomial Logit model is employed to estimate if weather anomalies affect the choice of winter trips. A substitution for more distant trips may create additional environmental burdens, given that they require longer travels or alternative transportation modes. Estimation results reveal that the choice of a mountain destination is not yet affected by extreme winter weather conditions. The result is valid for December 2015, as well as for the total winter season 2015/2016. However, December 2015 and 2016 exhibit a separate development with a significant increase in the likelihood of trips to non-mountains in Europe (mostly city breaks), although no traces of a direct substitution effect can be found. Younger and older people, as well as women, are less likely to go on a winter trip to the mountains. Residents with a tertiary degree and students are more interested in this, as well as large travel groups.

Keywords: travel decision; winter destinations; abnormal weather; leisure travel survey; multinomial Logit model

1. Introduction

A well-known ski lift operator states that "Sun and beach holidays and weekend city breaks are our main competitors, not other ski resorts" (Skistar Annual Report 2015/2016, www.skistar.se). In fact, nowadays, sun and beach holidays in Asia or America are affordable alternatives to classic winter trips. The competition from these and from city destinations may intensify in times of extraordinarily warm winters. In recent years, the European Alps have experienced extremely warm temperatures and a lack of snow. December 2015 was the warmest December in the Austrian mountains since the weather started being recorded in the mid-18th century [1]. In large parts of Austria it was too warm even for snow production and the largest cross-country ski resorts in Austria could not start the season until after Christmas. Winter sport trips account for a considerable share of total trips in the winter season made by Austrians, implying that unfavorable weather conditions may affect demand. Almost a fourth of the trips went to winter destinations in the European Alps, while seven percent targeted overseas destinations (source: Austrian travel survey 2013/2014–2015/2016, Statistics Austria).

The aim of this paper is to examine if the demand for winter holidays to the mountains is affected by extreme weather conditions, and if there are signs of a substitution effect for other kinds of trips. A changed demand in travelling might have negative environmental consequences, if for instance it requires longer travelling or more emission-costly transportation modes. Four groups of destinations are distinguished: (1) mountain destinations in Middle Europe; (2) domestic non-mountains;

(3) non-mountains in Europe; and (4) all locations outside Europe. The choice of a trip is analyzed by including socio-demographic and contextual factors such as age, gender, education, labor market status, travel companion and travelling with children. Data is based on 6200 leisure trips undertaken in the winter seasons 2013/2014–2015/2016, originating from the Austrian travel survey. The early winter seasons (December) are investigated separately (1600 trips).

This study contributes to the ongoing discussion of the extent to which the choice of winter holiday destinations is affected by abnormal weather conditions [2]. It presents two main novelties, the first of which relates to the joint modelling of the drivers of winter trips and other destinations. Second, it uses representative data originating from the national travel survey. All winter trips, domestic and international, made by Austrian residents are included in the empirical analysis.

The structure of this paper is as follows: Section 2 outlines the conceptual background, while Section 3 presents the empirical model. Data and descriptive statistics are found in Section 4, the empirical results are revealed in Sections 5 and 6 concludes.

2. Conceptual Background

The choice of a leisure trip is a complex process depending on destination awareness, motivations, expectations, destination preferences as well as characteristics of the travelers [3,4]. Several types of destinations can be distinguished based on the purpose of travel (sun and beach, culture, shopping, sport and outdoor activities, spa, health related, culture and sightseeing, shopping, festivals and events) [5–7], destination country or region [8,9], location (cities, mountain, rural areas and cruising) [10], distance and thus, implicitly, transportation mode [11].

In this study, the probability of choosing a mountain destination in the winter season is modelled. Generally, tourists go to the mountains to take part in common winter sports activities, but they may also go there to seek nature and relaxation. Typical winter sport activities include downhill skiing, cross country skiing, ski mountaineering but also non-snow-based activities [12]. Traditional ski tourism may face increased competition from sun and beach holidays, outdoor trips, and long-distance destinations, as well as from weekend city breaks. City and cultural tourism is one of the fastest growing segments of the leisure travel market, while rural tourism is stagnating [6]. Anecdotal evidence suggests that long-haul destinations and mountain destinations are substitutes. For instance, the FIS president states that the increasing interest for long distance destinations is a threat to classical winter sport destination: "Caribbean is our natural enemy" ("The Standard", 18 February 2007); "Today, many people prefer the Caribbean for their holidays as winter sports regions" ("Die Presse", 20 February 2011). In addition, it is suspected that snow shortage would lead to increased travelling to overseas destinations ("Many were in the Caribbean because there was little or no snow in the Alps and I hope they come back" ("The Standard", 19 November 2007) and "Why should I spend expensive winter holidays in snow-scarce regions, when I can fly cheaply to the Caribbean?" ("Influence.ch", 17 February 2017). Thus, much warmer winter seasons may lead to a change in travel behavior with an increase in overseas trips. This in turn generates more CO_2 emissions than shorter trips that can be undertaken by car or train [13]. The potential substitution of short domestic trips for long-distance travel is thus bad from an environmental point of view, since the ecological footprint of tourists is mainly driven by their choice of transportation mode. Recent calculations [14] show that the disadvantage of air travel reaches a factor 70, compared with train and bus travel (distances between 2000 and 7000 km).

The winters of 2013/2014, 2014/2015, and 2015/2016, are particularly suitable for analyses of the influence of abnormal weather conditions on travel behavior since December 2015 was the warmest ever start of the season (Table 1). This December was not only extremely warm, but at the same time also snow scarce: "Below about 1400 m above sea level, Austria remained almost completely free of snow", and the Sonnblick weather station, with an elevation of more than 3000 m received 20 cm of snowfall in December 2015 as compared to the long-term average of 250 cm [1]. The total winter season 2015/2016 can be regarded as a temperature analogue to normal winter conditions in the years

2071–2100, under a medium emission scenario for the European Alps (about +3 °C) (see CORDEX scenarios for Europe SMHI report 116, www.smhi.se).

Table 1. Mountain temperature deviations.

Month	Deviation, Degrees C	Season	Deviation, Degrees C
December 2013	3.1		
December 2014	1.0	2013/2014	2.5
December 2015	6.6	2014/2015	1.0
December 2016	2.8	2015/2016	3.0

Notes: Based on seven weather stations in the Austrian Alps. Source: ZAMG. Season means December to February.

Literature shows that the climate at home is an important determinant of destination choice of travelers [15]. Few studies explore the drivers of domestic winter tourists or mountain tourists (see e.g., [16–18]. In addition, no study so far is available that investigates the impact of extreme weather conditions on the travel decision of winter tourists using individual data. Studies based on narrow segments of downhill skiing show that thin snow coverage or high temperatures lead to a strong decline in the number of skiers [19–21]. December 2015 is particularly extreme since there was hardly any snow in the high mountains until after Christmas, a circumstance that could have led to changed travel plans. City breaks in December, for instance, might be appealing alternatives with a variety of attractions such as shopping and Christmas markets. A recent study finds that the majority of cross-country skiers would change to other outdoor activities if cross-country skiing was no longer possible [22]. This indicates that cross-country skiing and non-snow-based outdoor activities show a high degree of substitutability, but not necessarily among destinations. Because of school holidays or work assignments, the winter vacation may be booked long in advance, making it difficult to change on short notice. Similarly, long-distance trips are also unlikely to be affected by adverse weather conditions because they are planned long in advance. It is suggested that planning for overseas destinations requires more information than other trips [23]. City trips within Europe, for instance could be booked on the spur of the moment to reasonable costs.

It can be assumed that mountain visitors have features in common with nature tourists [24]. This group is relatively wealthy, educated and consist of more men than women. Type of household and size of travel company may also be of importance. Younger families with children often prefer to travel by car, whereas singles and younger couples without children typically choose overseas destinations where air travel is required [25].

Three main hypotheses are formulated based on earlier research: (i) The demand for mountain trips is affected by extremely warm winter weather; (ii) An extreme warm start of the winter season leads to a change in winter travel preferences; and (iii) There is a substitution effect between types of winter holidays.

3. Empirical Approach

The empirical model is based on the microeconomic theory of tourism destination choice [26–28]. Deciding to go on a holiday trip is a complex process that consists of several stages: the decision itself to make a trip, the choice of a destination as well as of the length of stay and the expenditure per day [9,28,29]. It is common to consider socio-demographic characteristics, as well as features of the holiday trip [7,28,30,31] in the analyses. This study makes use of socio-demographic as well as contextual independent variables, such as age, gender, having children, education, labor market status, residence of the traveler, travel company size, departure month and year. The weather impacts in different months are investigated using a set of dummy variables for winter month or season.

The individual has many choices for his or her potential trip, i, in winter times. In this study, four alternatives, j, are distinguished: (a) mountain destinations in the European Alps, (b) non-mountains domestically, (c) non-mountains in Europe and (d) overseas destinations. These four alternatives provide the individual with a given utility depending on monetary or non-monetary returns and allow the possible substitutability between destination choices to be investigated. According to the random utility theory [32], it is possible to determine an indirect utility function for each trip and each decision alternative [33] where the utility, U, depends on a systematic part, V and a random part, ε.

$$U_{ij} = V_{ij} + \varepsilon_{ij}.$$

The systematic part of the utility function is modelled as a linear function of observable characteristics including several contextual and socio-demographic factors, as well as departure month and departure season:

$$V_{ij} = \alpha_j + \sum_{M=1}^{4} \beta_{jM} DEPMONTH_{it}^{M} + \sum_{Y=1}^{2} \beta_{jY} DEPSEASON_{it}^{Y} + \sum_{A=1}^{5} \beta_{jA} AGECAT_{it}^{A} +$$
$$+\beta_{jK} CHILDREN_{it} + \sum_{E=1}^{2} \beta_{jE} EDUCATION_{it}^{E} + \beta_{jS} STUDENT_{it} + \sum_{T=1}^{4} \beta_{jT} TCOMPANY_{it}^{T}$$
$$+\beta_{jW} WOMEN_{it} \sum_{R=1}^{8} \beta_{jR} REGION_{it}^{R}$$

where α_j is a constant for the destination choice represented by the four different alternatives. *DEPMONTH* gives information about departure month, *DEPSEASON* denotes the departure season (implicitly capturing temperature deviations) and *AGECAT* reflects the age-class. In addition, *CHILDREN* indicates travel with children, *EDUCATION* gives information on educational level, *STUDENT* includes travelers that are either students or pupils, *TCOMPANY* specifies the size of the travel company, *WOMEN* indicates if the traveler is female and *REGION* relates to the region where the tourist resides. Additional information on the variables can be found in Table 2.

Table 2. Description of independent variables.

Variable	Description
DEPMONTH	Set of dummy variables for the winter months December to April with February as the reference category.
DEPSEASON	Set of dummy variables for the winter seasons 2014/2015 and 2015/2016 with 2013/2014 as the reference category. For the December sample there are three dummy variables included (2014, 2015 and 2016), with 2013 as the reference category.
AGECAT	Encompasses a set of age categories (15–24 years, 25–34 years, 35–44 years, 55–64 years and ≥65 years) with 45–54 years as the reference category.
CHILDREN	Dummy variable for travel with children, zero otherwise.
EDUCATION	A set of dummy variables indicating the education of the tourist (medium-skilled, and tertiary) with primary as the reference category.
STUDENT	Dummy variable if the individual is a student or a pupil and zero otherwise.
TCOMPANY	Includes a set of dummy variables characterizing the size of the travel group with single traveler as the reference category.
WOMEN	Dummy variable equal to one for woman, zero for man.
REGION	Set of country dummy variables for Federal states with the capital city Vienna as the reference category.

Since the categories are unordered, the multinomial Logit model can be derived from the random utility model (e.g., [31]). One destination is chosen as the reference category, in this case the one with largest frequencies: domestic non-mountains. The probability, $P(J|X)$, of alternative $j = 2, \ldots, J$ being chosen by the individual for trip i is calculated as follows:

$$P(J|X) = \frac{\exp(X'\beta_j)}{1 + \sum_{h=2}^{J} \exp(X'\beta_h)}.$$

Vector X represent the explanatory variables introduced above. The model is estimated by Maximum Likelihood. Two samples are used: one for the total winter seasons (December to April) and the other for the December months. In the latter case, variable *DEPMONTH.*

4. Data and Descriptive Statistics

Data for this analysis originates from the Austrian travel survey provided by Statistics Austria. This survey holds information on travel patterns of individuals aged 15 years and older (see [7] for a previous analysis based on the AT travel survey). The dataset includes information on actual travel behavior by destination, length of stay and expenditures. This is accompanied by information on several socio-demographic and contextual factors such as education, gender, age-class, federal state (region) where the traveler resides, travel motivation and travel company size.

Data is available for five waves covering the period 2012–2016 with information on 50,000 trips. However, information on the location of the trip (mountain, beach, city, rural areas, cruising ship) is only available from November 2013 onwards. This leads to a decrease in the sample size to 40,686 trips. By excluding trips related to visiting friends and relatives, business trips and training and educational purposes, the sample is further reduced to a size of 26,744 trips. The three winter seasons 2013/2014 to 2015/2016 encompass information on 6234 trips undertaken by 5040 individuals, while the December sample includes 1588 trips during the period 2013–2016 (see Table A1 in the Appendix for descriptive statistics).

The dependent variables are based on the four response alternatives referring to destination choice: (a) mountains in the European Alps, (b) domestic non-mountains, (c) European non-mountains and (d) overseas destinations. Trips to mountains are constructed using information on location (mountain or non-mountain) and destination country (Austria, Italy, Switzerland, and France). Due to few observations, the mountain trips cannot be separated in Austrian versus other European Alp destinations.

Descriptive statistics reveal that approximately one fourth of the trips go to the mountain regions during the period of time studied (Table 3). Trips to domestic non-mountain areas are also common, slightly more than every third trip. Least frequent are overseas trips to Asia or America, representing only 7 percent. In December 2015, there is no strong decline in the proportion of mountain trips as compared to the same month in 2014 or 2013. The actual number of trips to the mountains, reflecting the absolute demand, is stable over the period studied, although the total number of trips is ascending. This indicates that demand for winter tours to mountain areas do not change very much over shorter periods of time, despite weather anomalies some years. However, the proportion of travel to non-mountain destinations in Europe increased by 10 percentage points between December 2013 and December 2015, and is still considerably higher in 2016 than in the base period. Total travel expenditures (including transportation) per overnight stay are highest for overseas trips and lowest for trips to domestic non-mountain regions (168 and 136 Euro per night, averaged over three winter seasons, respectively). The length of stay ranges between two days for domestic non-mountain trips and eleven days for overseas trips (median). The duration of a mountain trip is four days (median).

By linking the travel motivation with the choice of destination reveals distinct patterns among the destination categories. Trips to mountains in the winter season are mainly motivated by sport and outdoor activities (81 percent) whereas travelers to European destinations outside Austria are determined by culture and sightseeing (46 percent) (Table 4).

Table 3. Descriptive statistics by destination choice.

	Mountains, European Alps	Non-Mountains		Overseas (Non-Europe)
		Domestic	Europe	
Winter seasons		Proportion of trips (percent)		
2013/2014	26.0	38.5	28.4	7.1
2014/2015	25.7	35.8	31.3	7.2
2015/2016	25.8	37.1	30.9	6.2
		Number of trips		
2013/2014	1,098,222	1,623,210	1,198,490	297,406
2014/2015	1,098,985	1,528,385	1,334,945	309,317
2015/2016	1,218,352	1,749,579	1,457,066	290,231
		Length of stay in days (median)		
2013/2014	4	2	4	12
2014/2015	4	2	4	9
2015/2016	4	2	4	13
		Daily expenditures per overnight stay, Euro (median)		
2013/2014	135.0	125.0	146.1	171.2
2014/2015	138.6	127.3	142.7	166.6
2015/2016	135.0	140.7	142.1	166.6
December months		Proportion of trips (percent)		
2013	24.8	44.9	21.3	8.9
2014	21.2	47.3	24.8	6.8
2015	20.9	40.8	31.0	7.3
2016	21.4	43.4	27.6	7.5
		Number of trips		
2013	194,375	352,114	167,046	69,866
2014	178,611	399,070	209,601	57,167
2015	191,314	374,568	284,351	67,051
2016	188,949	382,365	243,422	66,190
		Length of stay in days (median)		
2013	3	2	3	12
2014	3	2	3	9
2015	3	2	3	11
2016	3	2	3	11
		Daily expenditures per overnight stay, Euro (median)		
2013	116.5	137.5	164.0	133.1
2014	110.0	136.0	133.3	156.1
2015	125.0	152.8	136.4	203.0
2016	140.2	150.0	136.7	223.7

Note: Data is pooled over time and sample weights are used. Source: Statistics Austria.

Overseas travelers are interested in culture and sightseeing (40 percent) and by sea and beach activities (24 percent). Domestic travelers exhibit a mix of interest in seeking recuperation as well as spa and wellness (Table 4). Descriptive statistics show that nine out of ten travelers to the mountain areas arrive by car and the remaining persons by either train or bus. Thus, travelers to nearby mountains have a lower environmental footprint than those who choose overseas destinations, which predominately are undertaken by plane (95 percent) (Table 5). The share of trips to mountain regions varies by age, education and gender (Table 6). For instance, the proportion of mountain trips is at its highest among persons in the age group 35–44 years (32 percent), while persons 65 years and older are far less interested (17 percent). Mountain trips are also more common among men than women (4 percentage points difference) and travelers with tertiary degrees, as compared to those with low or medium educations (a difference of 5 percentage points), something that is possibly also related to the income level of these groups.

Table 4. Contextual factors and destination choice (percent).

	Mountains, European Alps	Non-Mountains		Overseas (Non-Europe)
		Domestic	Europe	
Beach and sea	0.4	1.9	5.1	24.3
Sport and outdoor trips	80.9	25.4	12.6	14.6
Recuperation seeking	10.7	25.2	19.3	18.1
Spa	4.1	20.9	6.8	0.3
Health related motivation	0.8	2.9	1.6	0.6
Culture and sightseeing	1.3	14.7	46.1	40.0
Shopping	0.1	1.0	1.1	0.0
Festival, events	1.2	6.1	5.3	1.1
Other	0.6	2.0	2.1	0.9

Note: Weighted by sample weights. Source: Statistics Austria.

Table 5. Transportation mode and destination choice (percent).

	Airplane	Bus or Train	Car	Other
Mountains, European Alps	0.3	8.5	90.6	0.6
Non-mountains, Austria	0.1	17.4	81.4	1.1
Non-mountains, Europe	33.9	22.8	41.8	1.4
Overseas	94.7	2.1	2.3	0.9

Note: Weighted by sample weight. Source: Statistics Austria.

Table 6. Socioeconomic factors and destination choice (percent).

	Mountains, European Alps	Non-Mountains		Overseas (Non-Europe)
		Domestic	Europe	
		Age group		
Age 15–24	25.6	34.7	33.2	6.5
Age 25–34	23.5	35.0	31.8	9.7
Age 35–44	32.9	37.8	25.1	4.2
Age 45–54	28.3	41.7	23.5	6.6
Age 55–64	22.8	39.3	31.5	6.4
Age 65+	17.1	34.1	41.3	7.6
		Education		
ISCED 0–2 (primary)	24.2	36.8	32.0	6.9
ISCED 3–4 (intermediate)	24.3	39.4	29.7	6.5
ISCED 5–6 (tertiary)	29.5	33.0	30.3	7.2
		Gender		
Men	28.0	35.5	29.3	7.2
Women	24.0	38.5	31.0	6.5

Note: Sample weights are used. Source: Statistics Austria.

5. Empirical Results and Discussion

The estimations reveal that abnormally warm winter weather does not directly affect the probability of going to the mountains for the winter holidays. However, there is a separate development: the probability of choosing a trip to non-mountain destinations in Europe was three percentage points higher in the winter season 2014/2015 compared to the base season, and stayed on this level in the season 2015/2016. Despite this, there is no clear indication of substitutes for winter holidays in the mountains.

In addition, estimations of the multinomial Logit model show that the probability of choosing a destination depends significantly on age, education, gender, travel company, travelling with children, and region of residence (see Table 7 for the total season and Table 8 for the early season). The significance and magnitude of the marginal effects of these factors vary over the four types of destination choices investigated, as well as between the early and the total winter season.

Table 7. Probability of choosing a certain destination in the winter season, multinomial Logit estimations (marginal effects).

	Mountains European Alps			Non-Mountains Austria			Non-Mountains Europe			Overseas (Non-Europe)		
	dy/dx		z-stat	dy/dx		z-stat	dy/dx		z-stat	dy/dx		z-stat
December (reference February)	−0.112	***	−7.26	0.080	***	4.32	0.044	**	2.45	−0.011		−1.19
January	0.014		0.91	0.003		0.16	−0.017		−0.83	0.000		−0.04
March	−0.087	***	−6.04	−0.022		−1.21	0.121	***	7.35	−0.012		−1.31
April	−0.286	***	−13.71	0.027		1.35	0.280	***	17.11	−0.021	**	−2.06
Winter season 2014/2015 (reference 2013/2014)	−0.004		−0.28	−0.024		−1.62	0.029	**	2.12	−0.001		−0.15
Winter season 2015/2016	−0.008		−0.59	−0.015		−0.99	0.030	**	2.22	−0.008		−1.03
Age 15–24 (reference 45–54)	−0.065	**	−2.40	−0.027		−0.89	0.089	***	3.24	0.003		0.18
Age 25-34	−0.054	***	−2.72	−0.054	**	−2.39	0.081	***	3.89	0.027	**	2.50
Age 35-44	0.008		0.47	−0.023		−1.10	0.029		1.42	−0.014		−1.16
Age 55-64	−0.017		−1.02	−0.032	*	−1.71	0.053	***	3.04	−0.005		−0.47
Age 65+	−0.053	***	−2.93	−0.078	***	−3.89	0.125	***	7.09	0.006		0.58
Education medium level (reference low)	0.024		1.42	−0.005		−0.28	−0.007		−0.42	−0.012		−1.25
Education tertiary level	0.069	***	3.63	−0.066	***	−3.10	0.009		0.48	−0.011		−1.08
Women	−0.047	***	−4.43	0.033	***	2.66	0.020	*	1.77	−0.005		−0.84
Travel with children	−0.028		−1.33	0.131	***	4.70	-0.066	**	−2.45	−0.037	**	−2.24
Student	0.063	**	2.19	-0.036		−1.08	−0.012		−0.41	−0.015		−0.89
Travel company size 2 (reference: single)	−0.021		−1.56	0.039	***	2.64	−0.025	*	−1.89	0.007		0.89
Travel company size 3	0.124	***	5.83	−0.079	***	−2.81	−0.043	*	−1.68	−0.002		−0.14
Travel company size 4	0.136	***	5.96	−0.095	***	−3.09	−0.035		−1.21	−0.007		−0.44
Travel company size 5+	0.165	***	4.76	−0.063		−1.33	−0.053		−1.13	−0.049		−1.32
Burgenland (reference Vienna)	0.060	*	1.82	−0.006		−0.15	−0.044		−1.21	−0.010		−0.50
Lower Austria	0.061	***	3.68	0.022		1.15	−0.070	***	−3.98	−0.012		−1.31
Carinthia	−0.061	**	−2.18	0.020		0.68	0.054	**	2.20	−0.013		−0.89
Styria	0.034	*	1.78	0.015		0.70	−0.012		−0.64	−0.037	***	−3.09
Upper Austria	0.074	***	4.47	-0.031		−1.58	−0.019		−1.07	−0.025	**	−2.53
Salzburg	−0.007		−0.26	0.004		0.13	−0.008		−0.28	0.011		0.81
Tyrol	0.046	*	1.74	−0.111	***	−3.62	0.057	**	2.32	0.007		0.54
Vorarlberg	0.044		1.35	−0.140	***	−3.52	0.117	***	3.74	−0.022		−1.04
Number of observations	6234			6234			6234			6234		

Note: Asterisks ***, ** and * denote statistical significance at the 1, 5, and 10 percent level. The marginal effect (dy/dx) measures the change in the probability of choosing a destination following a discrete alteration in every single independent variable.

There is also no significant decrease of the probability of traveling to the European Alps compared with December 2014, resulting from the estimations on the early season sub-sample. However, simultaneously, the likelihood of trips to non-mountains in Europe is 8 percentage points higher in December 2015 than in December 2014 and stays on this level in December 2016. This reveals an alternative development, presumably following the general trend of increased travelling, but not yet with any indication of a substitution effect, with direct negative implications for the environment. In the longer term, the rising attractiveness of city and cultural tourism [6] might lead to changed travel behavior, if the winter weather continues to be extraordinarily unpredictable. The decision to travel far—to America or to Asia—does not vary over the December months investigated, contradicting claims in the media about who the competitors to mountain destinations are.

Several possible explanations could lie behind the absence of an altered travel behavior in the short term. Trips to the mountains are expensive, need to be booked long in advance, and are difficult to re-book on short notice because of high costs, school terms and work assignments. Climate change cannot be detected in the short run, so a few bad winters may not threaten long-rooted traditions of spending the winter holiday in the mountains. A general increase of non-mountain trips outside the country, may of course be less environmentally friendly, even if they are not driven by a reduced probability to spend the winter holiday in the European alps. Trips to the Alps are often undertaken by car, while longer European journeys may need air transportation. The results imply that all three hypotheses are rejected and up to now there is no clear change in travel patterns due to winter weather anomalies and thus also no evidence of a direct substitution effect.

Age, gender, higher education and travel companions have the largest impact on the destination choice. The role of these socio-demographic and contextual factors in determining the choice of trips differs across destinations. Age is one of the most significant factors for the choice of mountain trips. Young travelers in the age groups 15–24 and 25–34 years have a 6- and 5-percent lower probability of choosing a mountain trip in the winter season than the benchmark group of persons aged 45–54 (Table 7). There is also a relatively low interest for mountain trips among persons 65 years or older (5 percentage points lower than the reference group). Women are less likely than men to choose a mountain trip in the winter season, with marginal effects of four percentage points. Instead, they are more interested in going on domestic non-mountain trips (+3 percentage points). Travelers with a tertiary degree are 6 percentage points more common visitors to the mountains; so are students. The latter may reflect the availability of more leisure time. Travelers living in Lower Austria and Upper Austria have the highest probability of travelling to the mountain while residents from Carinthia have the lowest possibly because they have several ski resorts within day-trip distances). Results for the December month are slightly different. In that case, education and gender are not significant, while travel company, size and age still matter (Table 8).

Several robustness analyses were conducted. A critical issue of the multinomial Logit model is the violation of the independence of irrelevant alternatives (IIA) property. The model assumes that the choice between two alternatives is independent of the remaining alternatives. In reality, this assumption might be violated because certain individuals would never consider all alternatives displayed in the questionnaire. In principle the nested Logit model can be used to overcome the independence of irrelevant alternatives property.

Table 8. Probability of choosing a certain destination in the early season (December), multinomial Logit estimations (marginal effects).

	Mountains			**Non-Mountains**			**Non-Mountains**			**Overseas**		
	European Alps			**Austria**			**Europe**			**(Non-Europe)**		
	dy/dx		**z-stat**	**dy/dx**		**z-stat**	**dy/dx**		**z-stat**	**dy/dx**		**z-stat**
December 2014 (reference December 2013)	−0.035		−1.18	0.007		0.20	0.047		1.45	−0.020		−1.09
December2015	−0.028		−0.97	−0.050		−1.42	0.083	***	2.69	−0.006		−0.33
December 2016	−0.031		−1.06	−0.040		−1.11	0.077	**	2.43	−0.006		−0.34
Age 15–24 (reference 45–54)	0.027		0.62	−0.134	**	−2.28	0.115	**	2.37	−0.009		−0.29
Age 25–34	−0.013		−0.36	−0.096	**	−2.14	0.072	*	1.86	0.036	*	1.86
Age 35–44	−0.001		−0.03	−0.028		−0.64	0.029		0.72	0.000		−0.01
Age 55–64	−0.030		−0.91	0.043		1.07	0.008		0.21	−0.020		−0.97
Age 65+	−0.103	***	−2.63	−0.005		−0.12	0.129	***	3.59	−0.021		−0.95
Education medium (ref low)	−0.008		−0.24	0.017		0.42	0.015		0.43	−0.025		−1.26
Education tertiary	−0.021		−0.56	−0.023		−0.49	0.034		0.84	0.010		0.49
Women	−0.017		−0.80	−0.010		−0.39	0.034		1.53	−0.007		−0.58
Travel with children	0.005		0.11	0.074		1.25	−0.021		−0.39	−0.057	*	−1.85
Student	−0.049		−0.98	0.058		0.90	−0.029		−0.56	0.021		0.70
Travel company size 2 (reference single)	0.033		1.20	0.025		0.81	−0.067	***	−2.67	0.010		0.66
Travel company size 3	0.178	***	4.36	0.006		0.10	−0.181	***	−3.24	−0.002		−0.08
Travel company size 4	0.176	***	3.98	−0.106	*	−1.65	−0.083		−1.48	0.013		0.42
Travel company size 5+	0.193	***	3.04	−0.094		−0.97	−0.163	*	−1.74	0.065		1.61
Burgenland (reference Vienna)	0.048		0.86	0.062		0.89	−0.104		−1.52	−0.006		−0.20
Lower Austria	0.040		1.24	0.011		0.27	−0.022		−0.65	−0.029		−1.58
Carinthia	−0.046		−0.83	−0.007		−0.11	0.084	*	1.68	−0.031		−1.04
Styria	0.044		1.19	0.021		0.47	0.036		0.98	−0.101	***	−3.12
Upper Austria	0.045		1.38	−0.010		−0.25	−0.016		−0.46	−0.019		−1.13
Salzburg	0.060		1.07	−0.103		−1.42	0.041		0.69	0.002		0.08
Tyrol	−0.038		−0.65	−0.053		−0.80	0.100	**	1.96	−0.009		−0.32
Vorarlberg	0.002		0.03	−0.042		−0.55	0.139	**	2.42	−0.099		−1.63
Number of observations	1588			1588			1588			1588		

Notes: Asterisks ***, ** and * denote statistical significance at the 1, 5, and 10 percent level. The marginal effect (dy/dx) measures the change in the probability of choosing a destination following a discrete alteration in every single independent variable.

This model is more general than the multinomial Logit, because it assumes that the choices are only independent within a subgroup of alternatives [9]. For example, in a first stage, the traveler might consider whether to go on a domestic trip or travel abroad, and then, if he or she has chosen to travel abroad, the next decision to make is about Europe or overseas. Unfortunately, the nested Logit model requires separate exogenous variables for the first layer of the tree (for instance travelling domestically or abroad) that are not relevant in the second layer of the decision. In the dataset at hand, there are no such variables. However, the sensitivity of the results to violation of the IIA property can be investigated by estimating a series of multinomial logit models based on different definitions of the categories.

Re-estimations of the model with more or fewer destination categories (either through discerning the European trips by air and land travel, or by using only three categories: mountains, non-mountains and overseas), lead to similar results for the marginal effect of winter mountain trips. The estimation results are also robust to the exclusion of overseas destinations, which does not change the pattern of the results.

Another estimation issue is parameter heterogeneity. The multinomial Logit model assumes that the magnitude of all coefficients is the same and do not differ across individual trips. The assumption that the slopes and the constants are the same is questionable. Travelers can make multiple trips in a given winter season, implying that the choice of the trip is not necessarily independent. A solution would be to estimate a mixed multinomial Logit model, allowing the constants or certain slope parameters to vary across individuals [34,35]. Regrettably, due to the rotating design of the survey, individuals cannot be linked over time. Thus, a mixed multinomial Logit model can only be estimated for calendar years, which does not make sense when the study focuses on other time periods like December months only, or whole winter seasons. In addition, the rotating design of the survey does not allow standard errors to be cluster-adjusted across individuals.

6. Conclusions

This study investigates whether demand for winter holidays to the European Alps is affected by weather anomalies. Between the winter seasons 2013/2014 and 2015/2016, about one fourth of trips by Austrian residents went to the mountain regions in the European Alps. A multinomial Logit model is used to estimate the probability of choosing a mountain destination for the winter holiday, including several socio-demographic and contextual factors. Data originates from the Austrian travel survey, of which 6200 trips over the three winter seasons and 1600 trips during the four December months are used for the estimations.

Results show that the decision to go on a winter trip to the mountains is independent of the given winter season. Not even the extremely warm December temperatures of the winter season 2015/2016 led to a reduced probability of choosing a trip to the mountain regions compared with the previous season. Separate estimations for the sample consisting of December trips only strengthen the conclusions. Overall, the results show that a green start of the winter is not accompanied by a decrease in the likelihood to spend December holidays in the European Alps. This indicates that travel behavior does not change in the short term due to abnormal winter weather conditions on average and thus no direct substitution effect can be found for less environmentally friendly trips. Possible reasons behind this are the need for long-term planning related to school terms and work assignments and high costs for cancellations. Winter trips to the mountains might also be part of family traditions, which maybe need more than a few bad winters to break. There is also no substance to the claim that overseas destinations such as the Caribbean compete with the European Alps in the winter season.

The main determinants of choosing a winter destination are gender, age, education, size of the travel company, and region of residence. Individuals with a tertiary degree, men and larger travel groups are more likely to spend their holiday in the mountains.

Despite the non-decreasing probability of choosing (or absolute demand for) a mountain destination for the winter holiday, there is an ongoing separate development where the popularity of trips to non-mountain destinations in Europe rises during the winter season, following the general trend of increased travel, enabled for instance by more and cheaper flight connections. This development is particularly apparent for the December month, with an increase of 8 percentage points in December 2015, continuing at the same level in December 2016, compared with two years earlier. Even if the surge in travel to other destinations is not directly related to the winter weather, the development may affect the environment in an unfriendly way because longer journeys in Europe often require air transportation instead of cars (which are the most common mode of transportation to the mountains).

Thus, the non-apparent direct substitution effect allows both policy makers, on the one hand, and hotel managers and destination marketing organizations, on the other, to develop long-term strategies to meet abnormal weather conditions in the alps and increase the environmental awareness. An increased variety of alternative activities, should the weather go bad, is one approach to maintaining demand. The distinction between different sub-groups of what factors are most important for the choice of a mountain trip may also be useful in attempts to keep old clients and target new ones. Educated and middle-aged persons as well as men, students and larger groups are more prone to spend their holidays in the mountains.

This study is affected by several limitations. One is the lack of panel data. This means that individuals cannot be traced over time. Statistical laws in some European countries allow the merging of register data with individual travel survey information collected by the statistical office. This is not yet the case in Austria. Another limitation is that the departure day is not available. Using information on the departure day would allow for a more detailed analysis of the relationships. The short time period is an additional weakness of the study. However, detailed information on location is only available from November 2013 onwards. The other main limitation is that the survey is restricted to travelers. Thus, the factors underlying the decision not to travel cannot be studied.

The study offers several ideas for future work. For instance, two-part models can be used to estimate both the travel decision, length of stay or the expenditures per day (see e.g., [36]. Also, a cross-country analysis with comparable travel surveys for other European countries would be promising, since data availability has increased in recent years [37].

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Appendix A

Table A1. Descriptive statistics for the distribution of the two estimation samples (percent).

	Winter Season Sample (2013/2014 to 2015/2016)	December Sample (2013 to 2016)
December	19	
January	16	
February	23	
March	24	
April	18	
Winter season 2013/2014	32	
Winter season 2014/2015	32	
Winter season 2015/2016	36	
December 2013		24

Table A1. *Cont.*

	Winter Season Sample (2013/2014 to 2015/2016)	December Sample (2013 to 2016)
December 2014		24
December 2015		27
December-2016		25
Age 15–24	13	16
Age 25–34	11	13
Age 35–44	15	15
Age 45–54	23	21
Age 55–64	20	19
Age 65+	18	16
Education primary	15	13
Education medium level	58	60
Education tertiary level	27	27
Women	55	54
Travelers with children	15	15
Student	10	11
Travel company size 1	29	28
Travel company size 2	49	50
Travel company size 3	9	10
Travel company size 4	10	10
Travel company size 5+	3	3
Burgenland	3	4
Lower Austria	22	23
Vienna	20	20
Carinthia	6	5
Styria	14	14
Upper Austria	21	22
Salzburg	5	4
Tyrol	6	5
Vorarlberg	3	4
Number of observations	6234	1588

Note: Sample weights are used. Source: Statistics Austria.

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