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Falk, Martin; Vieru, Markku Jaakko

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International Tourism Demand to Finnish Lapland in the Early Winter Season

Martin Falk
Austrian Institute of Economic Research (WIFO), Arsenal Objekt 20
A-1030 Vienna, Austria tel. +43 650 5669808
E-mail: martin.falk@wifo.ac.at
ORCID ID: 0000-0003-0518-6513

Markku Vieru
University of Lapland, Multidimensional Tourism Institute
P.O. Box 122, FI-96101 Rovaniemi, Finland
tel. +358 400 377 641
E-mail: markku.vieru@ulapland.fi
ORCID ID: 0000-0002-8833-5248

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Abstract

This paper investigates the determinants of international overnight stays to Finnish Lapland in the early winter season. The data is based on major winter destinations for the period 1996-2014 and is distinguished by nine major visitor countries. During the sample period, international overnight stays in December increased rapidly with a growth rate of nine per cent per year on average. Dynamic panel data models show that the effect of natural snow conditions on overnight stays varies across countries of origin. The amount of snow in December has a significant impact on overnight stays of visitors coming from neighbouring countries (Russia and Sweden). In contrast, snow conditions do not play a role for visitors from distant countries (the United Kingdom, Germany, France, Italy, Japan, Spain and Switzerland). Economic factors (real income and real exchange rates) play a larger role for these countries.

Keywords: winter tourism demand, accommodation sector, weather, climate change

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1. Introduction

Foreign tourism overnight stays in Finnish Lapland during the winter season have almost tripled over the last 20 years (Visit Finland, 2017). This is a strong contrast to the European Alps where winter tourism inflows are declining (Switzerland, based on BFS data), stagnating (France, INSEE and Italy, ISTAT), or only slightly growing (Austria, STAT Austria). The increase in overnight stays and arrivals is observed not only for the major ski resorts of Levi and Ylläs but also for the capital city of Lapland (Rovaniemi). Overall, the share of total foreign overnight stays in Lapland from November to April has increased from 17 per cent to 40 per cent in the last 20 years. The increase in international tourism demand is mainly due to an increase in visitors from the UK, the Central European countries and Russia (before the depreciation of the rouble in 2014). However, with about 610,000 foreign overnight stays during the winter season (data refers to 2012/2013 November to April), the level of tourism inflows into the major eight tourist destinations in Lapland is still relatively low.

Snow-based winter sport activities are the main motivation to visit Finnish Lapland in the winter season. These activities will be negatively affected by warmer winters and less snowfall. Lack of snow in the early season is particularly problematic for visitors during the December and Christmas period (Hall, 2014). However, this month represents the highest share of total foreign stays during the five winter months in Lapland (32 per cent). The FIS Ski World Cup in Levi was cancelled three times in the last ten years (November 2007, 2011 and 2015) because of extraordinary mild temperatures too warm to produce snow. This may indicate an increase in number of snow poor early winter seasons. Using dynamic panel data methods, this paper investigates the relationship between guest nights in accommodation establishments by visitors' country of residence and snow conditions. The data is based on eight popular winter destinations in Lapland for the early season (December) in the period 1996-2014. We particularly focus on the month of December because a minimum snow depth of 30 cm or more is guaranteed for the other months (January to April), which is regarded as sufficient for most snow-based winter sport activities. For the three weather stations under investigation, the number of days with a snow depth of 30 cm and more is 94 per cent in April, 95 per cent in January, 99 per cent in February and 100 per cent in March (for period 1995-2015 based on the FMI's (Finnish Methodological Institute) weather stations in Inari Saariselkä Matkailukeskus, Muonio Alamuonio/Levitunturi and Rovaniemi Lentoasema).

The main aim of this study is to investigate which visitor countries are most sensitive to a lack of snow in the early winter season. Estimates are computed using visitor countries that represent the highest share of all foreign overnight stays (i.e. Russia, Sweden, Germany, the United Kingdom, France, Italy, Japan, Spain, and Switzerland).

The literature shows a significant correlation between climate variability and winter tourism demand. Other studies show that global warming is a major concern for a variety of regions in the world. Evidence is available not only for snow-based winter tourism in the European Alps and in North America (Hamilton et al., 2007; Loomis & Crespi, 1999; Falk, 2010; Töglhofer et al., 2011; Dawson & Scott, 2013; Gilaberte-Búrdalo et al., 2014; Steiger et al., 2017) but also for winter tourism in the Nordic countries (Aall, Hall, & Groven, 2016, for Norway; and Pouta, Neuvonen, & Sievinen, 2009; Hall & Saarinen, 2010; Tervo-Kankare, 2011; Tervo-Kankare, Hall, & Saarinen, 2013; Landauer, Haider, & Pröbstl-Haider, 2013; Kaján, 2014; Haanpää, Juhola, & Landauer, 2015; Neuvonen et al., 2015; Falk & Vieru, 2017a for Finland; see Kaján & Saarinen, 2013 for a survey). Recently, Damm et al. (2017) provide evidence on the relationship between natural snow conditions and winter tourism demand for European regions.

Data provided by FMI shows that there has been a significant decline in the level of snow depth by 1.2 cm per decade during the last 65 years (Aalto, Pirinen, & Jylhä, 2016). Climate change scenarios for the Lapland region predict a decline in maximum snow cover of more than 40 per cent in South of Lapland (latitude of Rovaniemi) and about 10 per cent in middle of Lapland (latitude Kittilä-Kiruna (SMHI, 2015). In addition, the projected increase in the winter temperatures in Finland is almost twice as high as summer warming (Aalto, Pirinen, & Jylhä, 2016; Ruosteenoja, Jylhä, & Kämäräinen, 2016). Therefore, the boundary of the appropriate winter snow coverage in the early season will shift either to the North or to higher elevations.

The main contribution of this study is that it provides a first investigation into the impact of snow conditions on the number of guest nights by visitor countries in the arctic circle region. While there are several studies investigating the relationship between skier visits or overnight stays and snow conditions for downhill skiing in the Nordic countries (Falk & Hagsten, 2016; Falk & Vieru, 2017a), no study has explicitly investigated the wider effects of lack of snowfall in the early season on international winter tourism demand; instead emphasis has been placed on a narrow segment of winter sports such as downhill skiing.

Finnish Lapland is an interesting region in which to study the determinants of winter tourism demand. It is one of the few winter destinations in the world that shows a strong increase in international overnight stays in the early winter season with growth rates of nine per cent per year on average over the period 1995-2014. Thus, this study investigates whether visitors from different countries are affected differently by the lack of snow in the early winter season. Knowledge about this relationship is important for tourism businesses (e.g. tour operators, nature-based tourism service providers and hotels), destination marketing organisations, financiers, and local authorities in predicting tourism flows. It gives a better understanding of the economic impacts of global warming and demonstrates a potential need for adaptation and mitigation in the region.

This paper is structured as follows: Section 2 presents an introduction to the location under study, while section 3 contains the theoretical background and empirical model. Data and descriptive statistics are presented in Section 4. Section 5 contains the main empirical results. Section 6 concludes.

2. Finnish Lapland as a winter destination

The study location mentioned above consists of up to eight popular winter sport destinations in Lapland. These are: Levi (in municipality of Kittilä), Saariselkä (Inari), Olos (Muonio), Pyhä (Pelkosenniemi), Rovaniemi, Salla, Sodankylä and Ylläs (Kolari). The Regional Council of Lapland, strategic planners, local cities and municipalities, and tourism industry have all taken active efforts to develop tourism in the region in Finnish Lapland. High unemployment rates associated with a decline in forest industry (Kortelainen, 2002) in the 1980s were one of the main reasons to invest in tourism and transport infrastructure in order to stimulate national and international tourism (Pretes, 1995; Schmallegger & Carson, 2010). Through these activities and both private and public investments, tourism has achieved a high status by providing opportunities for jobs and wealth in the region (Regional Council of Lapland, 2008). Nowadays, tourism represents an important source of income in the area (Regional Council of Lapland, 2008). According to Satokangas (2013), tourism businesses account for up to 50 per cent of revenues in certain parts of Lapland. For example, in Inari, tourism businesses generate direct revenues of EUR 76 million, representing 41.5 per cent of aggregate business revenues (Table 1). The highest share of revenues of tourism businesses can be observed in Kolari where the ski resort Ylläs is located (48 per cent). Of all the municipalities, tourism infrastructure is most

developed in Levi (Kittilä), Saariselkä (Inari), Rovaniemi, and Yllä (Kolari) (Leinonen, Kauppila, & Saarinen, 2005).

Table 1. Illustrative figures from popular winter sport destinations in Lapland.

Destination (municipality[1])	Inhabitants[2]	Direct tourism revenue[3] , MEUR	Direct tourism revenue to total firm revenue[3], %	Ranking score of tourism supply[4]
Levi (Kittilä)	6 416	116.0	27.3	A
Saariselkä (Inari)	6 804	76.0	41.5	A
Olos (Muonio)	2 358	27.1	32.5	B
Pyhä (Pelkosenniemi)	958	10.4	45.7	C
Rovaniemi	61 838	174.9	7.8	A
Salla	3 727	8.1	15.1	B
Sodankylä	8 782	27.8	10.9	B
Ylläs (Kolari)	3 848	52,7	48.0	A

1) Based on 31.12.2015 (Source: Statistics of Finland). ased on Satokangas (2013), representing year 2011.

4) Ranking score (ranging from A to D) describes the amount of supply of tourism services, representing the year 2005; A is the highest score (Leinonen, Kauppila, & Saarinen, 2005) http://www.visitfinland.fi/wp-content/uploads/2013/04/A155-Suomen-matkailun-aluerakenne-2005_Raportti.pdf?dl

The sample includes three classic downhill ski resorts: Levi, Ylläs and Pyhä. Levi and Ylläs both have about 30 ski lifts and a maximum of 40 km of slopes; Pyhä is much smaller with only eight ski lifts (based on www.shky.fi). These ski areas are also attractive for visitors because of their large network of cross-country tracks (Konu, Laukkanen, & Komppula, 2011). They offer slopes with a small vertical drop, making skiing not overly demanding. Saariselkä and the region are attractive because of winter skiing activities, wilderness, Sami culture, and the National Park that was established in year 1983. It is near the Russian border, which is not so far from Murmansk with its some 300,000 inhabitants. In Olos, near the Swedish border, there are great possibilities for many kinds of snow-based winter activities.

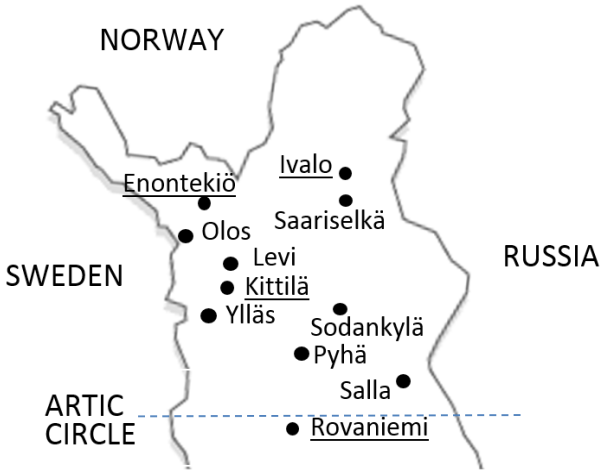
Nature has been recognized as a key driver to attract tourists to Lapland (Regional Council of Lapland, 2011). Wilderness areas include, for example, Finland's most attractive national parks and the country's highest elevations (Vuoristo, 2002). Cross-country skiing is the most popular winter sport activity other than downhill skiing and snowboarding. Flagestad and Hope (2001) confirm that the image of winter destinations in Finnish Lapland is more driven by cross-country skiing, telemark, snow-mobiling, and dog-sledding than downhill skiing or snowboarding. In addition, new outdoor activities that are all more or less dependent on snow, such as snowshoeing, Santa Claus safaris, ice-fishing safaris, reindeer and husky safaris, and sighting of Northern lights, have become increasingly popular among tourists during the sample period. This shows that visitors to Finnish Lapland in the winter season are interested in a mix of snow-based activities rather than downhill skiing only (Tjørve, Lien, & Flognfeldt, 2015).

Travel motivation and preferences for outdoor activities are expected to vary somewhat according to nationality. Shopping is of high priority for Russian tourists, while Japanese tourists are more interested in culture (Vuoristo, 2002). British tourists are especially attracted by the Santa Claus theme park. Rovaniemi is regarded as the 'Home of Santa Claus' (Pretes, 1995; Hall, 2008). The Santa Claus Village is located within the Arctic Circle and can be visited throughout the year. Here, the Christmas period is the key tourist season of the year, and for many local businesses, this period brings the highest share of revenues (Tervo-Kankare, Hall, & Saarinen, 2013). December is also popular among tourists because of Santa Claus package tours. Based on a visitor survey for Rovaniemi, Tervo-Kankare et al. (2013) suggest that Santa Claus is the most important factor for travel choice for many foreign visitors, with somewhat varying timing preferences across countries. Other very important factors of travel motivation to Rovaniemi include the presence of snow and the image of 'real winter'; shopping and Sami culture are considered less important. December alone accounts for almost 30 per cent of total international overnight stays during the winter season in Rovaniemi (data refers to 2013, source: Statistics Finland). The remaining areas under consideration are typical winter sport destinations.

Saariselkä has few ski lifts but offers an extensive network of cross-country ski tracks. Levi is a popular ski area and is well known because it annually hosts the FIS Ski World Cup in November. These winter sport destinations have experienced a strong growth in international overnight stays in the early season and throughout the entire winter season since the mid 1990s. During the period 1995-2014, the growth of overnight stays of the main winter destinations Saariselkä (in Inari), Levi (in Kittilä), Ylläs (in Kolari), Olos (in Muonio), Pyhä (in Pelkosenniemi) and Rovaniemi increased by 9 per year on average, based on data from Statistics Finland.

Lapland's popular winter sport destinations are shown in Figure 1. The capital city of Lapland is Rovaniemi, which lies on the Arctic Circle, has 61,000 inhabitants (year 2015). Rovaniemi, Kittilä, Ivalo and Enontekiö all have an airport. Kittilä airport has is the highest number of foreign passengers: 110,000 in 2016 (Finavia, 2016). Corresponding figures for Rovaniemi are 90,000, for Ivalo 40,000 and for Enontekiö 22,000. The smallest airports are closed for commercial flights during the low season.

Figure 1: Popular winter destinations in Finnish Lapland.



Notes: Levi, Saariselkä, Olos, Pyhä, Rovaniemi, Salla, Sodankylä and Ylläs are winter destinations, and an airport (underlined) is in Rovaniemi, Kittilä, Ivalo and Enontekiö.

Winter tourists visiting Lapland are typically interested in a variety of snow-based winter sport activities, including cross-country skiing, snowmobiling, and both reindeer and husky safaris, the northern lights, and snowshoeing. These winter sport activities are likely to depend more on natural snow, unlike downhill skiing where investment in snow making and other mitigation measures has made skier visits more and more independent of natural snow supply (Dawson & Scott, 2013; Scott, Dawson, & Jones, 2008; Steiger et al., 2017; Rutty et al., 2017). In comparing different snow-based winter sport activities, Loomis and Crespi (1999) find that the sensitivity of visitors to weather conditions is most pronounced for cross-country skiing activities. This can also be expected for reindeer and husky safaris and snowshoeing activities, which are difficult to conduct when there is a lack of natural snow. Overall, sufficient natural snow is considered a necessity for most snow-based winter sport activities. For Finnish Lapland, the first snow (measured as snow depth of 5 cm or more) usually arrives during the first week of November with a probability of 80 per cent based on three weather stations under investigation. Timing of snowfall is important for a successful start of the winter season and tourism demand. Lack of snow in the early season may lead to a delay in the opening of ski resorts (Haanpää, Juhola, & Landauer, 2015) or to a decline in skier visits (Falk & Hagsten, 2016). Brouder and Lundmark (2011) find that the overall effect of unfavourable snow conditions in the early season is relatively negligible. However, the strength of the relationship between winter tourism demand and snow conditions depends on the type of offerings in the destination under investigation. According to a survey, downhill skiing and ice activities are

least dependent on natural snowfall (Tervo, 2008). The reason for this is that downhill skiing resorts are well-equipped with snow making facilities, and average December temperatures of minus 3°C or less are usually guaranteed (Tervo, 2008). Cross-country skiing, snowshoeing, snowmobiling and dog sledding require a minimum snow depth of between 10 and 25 centimetres. Note that the number of snow days with a snow depth larger than a given threshold for a given winter month is often regarded as superior to the mean snow depth (Marty, 2008). We choose the minimum snow depth of 30 cm, which provides comfortable conditions for any of the snow-based winter sport activities. Scott et al. (2015) suggest that a minimum snow depth of 30 cm is sufficient for ski competitions in smooth terrain.

3. Empirical model

The tourism demand model predicts that the number of visitors depends positively on real income and negatively on prices (Lim, 1997; Song, Witt, & Li, 2009). Cortés-Jiménez and Blake (2011). Lim and Zhu (2017) suggest that the determinants of tourism demand vary widely by nationality, since different tourists from different visitor countries are expected to respond differently to changes in relative prices and real income. In addition to income of the visitor countries and relative prices, natural snow supply is generally considered as an important factor of winter tourism demand (Falk, 2010, 2013; Töglhofer et al., 2011; Damm et al., 2017). These studies find a positive relationship between snow conditions and overnight stays, although the magnitude of this relationship is rather low. A previous study on skiing demand for ski resorts in Finnish Lapland shows that skier visits depend on natural snow depth in the ski area (Falk & Vieru, 2017a). However, again the magnitude of the relationship is rather low. Few studies distinguish winter tourism demand by country of residence. An exception is Falk (2013), whose study is based on Austrian village data that finds that overnight stays of domestic visitors are sensitive to changes in snow conditions, whereas there is no relationship between foreign overnight stays and snow conditions.

Reliable snow conditions are particularly important for activities in the early winter season, while a lack of snow has never been experienced during the high season due to high latitude. However, remote destinations like Finnish Lapland are also highly affected by external demand fluctuations such as the economic and financial crises. Tourism is generally believed to be among the first industries to suffer from global crises (Bonham, Edmonds, & Mak, 2006).

Previous studies confirm that nationality is a significant predictor of travel motivation (Pizam & Sussmann, 1995; You et al., 2000; Kozak, 2002; Thrane & Farstad, 2012; see Li, 2014 for a meta-analysis). In particular, nationalities are diverse in a number of aspects, such as attitudes, perceptions, needs, expectations, beliefs, and norms. Ng, Lee and Soutar (2007) suggest that cultural distance plays an important factor in explaining different travel motivations. This is also suspected to hold true for the importance of snow conditions as a travel motivation.

Here we assume that the amount of snow in the early season is a significant predictor of foreign tourism demand in Lapland especially during the start or early phase of the winter season. Thus, it is hypothesized that visitors from neighbouring countries are more likely to be influenced by variations in natural snow than those from distant countries. The reason for this is that visitors from neighbouring countries come from areas with a long tradition in winter sport activities. Winter sport destinations in Finnish Lapland are relatively easily accessible for visitors from Sweden, Norway and Russia, e.g. by car (Vuoristo, 2002; Lipkina, 2013). Shorter transits to such destinations do not need to be planned as early in advance (Taylor & Ortiz, 2009). Visitors from neighbouring countries also have relatively more flexible travel plans that can be more easily changed if needed than the plans of visitors from more distant countries, most of whom book package tours. In addition to natural snow conditions, tourism demand depends on economic factors. It is assumed that real income has a positive effect on demand and a negative effect on consumer prices. The real bilateral exchange rate is assumed to have a negative effect on demand.

The resulting static winter tourism demand model for a given winter month by visitor country can be specified as follows:

$$ln ONS_{ijt} = \alpha_i + \alpha_{1j} ln RER_{jt} + \alpha_{2j} ln Y_{jt} + \alpha_{3j} SNOW_{it} + \alpha_{4j} t + \varepsilon_{ijt} \quad (1)$$

where i=1,....,8 denotes municipalities in Lapland, j=(1,...,9) the visitor country, and t=the time period of December 1996 - December 2014. *ln( )* denotes the natural logarithm. ONS denotes the number of foreign overnight stays. RER denotes relative prices calculated as real bilateral exchange rates (visitor currency to euro multiplied by the relative price level), Y is a proxy of real income of the visitor countries measured as GDP per capita in constant (local) prices, and t is the yearly time trend. SNOW denotes the percentage of days with a minimum snow depth of 30 cm. Since overnight stays, GDP and prices are transformed into logarithms, the

coefficients can be interpreted as elasticities, with the exception of the coefficient on the share of days with a minimum snow depth of 30 cm, which represents the semi-elasticity.

The static tourism demand model can be estimated by the fixed effects model. However, static panel data models tend to suffer from serial correlation and are likely to be biased because of the negligence of dynamic relationships. Autoregressive Distributed Lag Models (ARDL) models are commonly used when analysing the relationship between tourism flow and climate variability (Rosselló-Nadal, 2014). Here, we use a dynamic panel data model in the form of an ARDL specification. Since the number of time periods (T) is about 20 for a given visitor country and thus higher than the number of destinations (municipalities), we use panel time series estimators. Specifically, we employ the so-called pooled mean group (PMG) estimator introduced by Pesaran et al. (1999). The PMG estimator keeps the long-run coefficients similar among cross-section units but allows the short-run coefficients to vary. Assuming common long-run slopes, the pooled mean group estimator is much more efficient than the mean group estimator. The error correction model can be estimated by a maximum likelihood under the non-linear restrictions. The choice of lag order of the ARDL is restricted by one year because yearly data for December are used. The error-correction models are estimated separately for five visitor groups where visitors from continental Europe are included in one separate group. Relative prices, real GDP and overnight stays are assumed to be integrated of order one while the indicator for the snow conditions is expected to be stationary.

4. Data and descriptive statistics

Data is drawn from different sources. The Regional Council of Lapland has collected and stored monthly overnight stays in municipalities by visitor country based on data from Statistics Finland. We choose following municipalities: Inari, Kittilä, Muonio, Pelkosenniemi, Rovaniemi, Salla, Sodankylä and Kolari. The reason for choosing these municipalities is their size measured by the number of registered accommodations and availability of long time data series. For some visitors countries only five municipalities can be used because of the small number of overnight stays with gaps. Unregistered overnight stays are not included. In the vicinity of these municipalities, there is a large number of second home estates owned by individuals, associations, foundations or businesses. Visitors can rent these facilities, but there is unfortunately no direct method to compute or collect the number of overnight stays in these

estates. Since foreign visitors are most likely to stay in registered accommodation facilities, the bias of neglecting unregistered overnight stays is unlikely to be severe.

We use monthly information on overnight stays for the major nine visitor countries (France, Germany, Italy, Japan, Russia, Spain, Sweden, the United Kingdom, France, and Switzerland). Visitors from these countries have traditionally come to Lapland, thus long time series of data are available. However, visitors from China must be excluded because the number of Chinese tourists was extremely low during the 1990s, unlike it has been in recent years. Data covers the month of December from 1996 to 2014.

Daily snow depth figures from different weather stations are collected by the FMI and matched to the nearest ski resort. Snow depth data from the following stations are used: Inari Saariselkä Matkailukeskus, Muonio Alamuonio/Levitunturi, and Rovaniemi Lentoasema. Two snow depth indicators are used. The first is the percentage of days with a snow depth of 30 cm or more, and the second is average snow depth. Snow depth data for December for the three weather stations under investigation does not show a clear trend. A regression of snow depth on the yearly trend results in an insignificant relationship (at even the 10 per cent level). A similar finding can be observed for the percentage of days with 30 cm. Overall, it seems to be that the time period is too short to draw conclusions about the long term evolution of snow conditions.

The monthly consumer prices index for the visitor countries is drawn from the OECD STATS database. The annual GDP in constant prices (unchained) is drawn from the World Bank database. Alternatively, we use the retail sales volume for December drawn from the OECD STATS database.

Descriptive statistics are shown in Table 3 in the Appendix. The change in overnight stays is highest for visitors from the United Kingdom, followed by those from Russia. The highest variation in growth can be observed by Russian visitors. Visitors from the United Kingdom exhibit the most stable growth figures, followed by those from Japan. Table 4 in the Appendix illustrates the evolution of snow conditions and international overnight stays by visitor country.

5. Empirical results

Table 2 shows the results for the dynamic panel data model by five groups of visitor countries: i) the UK, ii) Japan, iii) Sweden, iv) Russia, and v) Switzerland (CH), Germany (DE), Spain (ES), France (FR), and Italy (IT). The table shows the long-run coefficients and the error-correction coefficient. The share of days with snow depth of 30 cm or more in December is positive and significant ($p<0.05$) for overnight stays of visitors from the neighbouring countries of Russia and Sweden. The long run coefficients are 0.45 and 0.70, respectively. This indicates that an increase in the share of days with snow depth of 30 cm or more by 10 percentage points (from the sample average of 57 to 67 per cent) leads to an increase in overnight stays of between five and seven per cent. This clearly shows that tourism demand from the neighbouring countries is highly sensitive to snow conditions in the early season.

Table 2: Dynamic panel data estimates of the determinants of overnight stays by visitor country in Lapland in the early season (December)

	United Kingdom			Japan		
	coeff.		t	coeff.		t
share of days with 30 cm or more	-0.05		-0.29	0.21	*	1.83
ln GDP constant prices	6.96	***	4.06	7.80	***	3.05
ln relative prices	-2.27	**	-2.09	-2.03	***	-5.84
time trend	-0.03		-0.81	-0.01		-0.46
error-correction coefficient	-0.38	***	-8.44	-0.66		-3.76
short run coefficients	yes			yes		
Constant	-69.53	***	-8.49	-162.71		-3.76
Log Likelihood	-5.19			-15.0		
# of observations	129			76		
# groups[a]	7			4		
# municipalities	7			4		

	Russia			Sweden			CH, DE, ES, FR, and IT		
	coeff.		t	coeff.		t	coeff.		t
share of days with 30 cm or more	0.45	**	2.14	0.70	**	2.24	0.13	***	1.30
ln GDP constant prices	-0.18		-0.17	-3.46		-1.21	4.31	***	7.07
ln relative prices	-1.22	**	-2.03	1.69		0.63	-2.30	***	-2.88
time trend	0.03		0.56	0.23	***	3.59	-0.03	***	-2.73
error-correction coefficient	-0.49	***	-8.64	-0.55	**	-2.34	-0.62	***	-11.26
short run coefficients	yes			yes			yes		
Constant	7.82	***	7.55	52.98	**	2.35	-69.67	***	-11.28
Log Likelihood	-96.07			-73.07			-277.37		
# of observations	142			93			461		
# groups[a]	8			5			25		
# municipalities	8			5			5		

Notes: The dependent variable is the change in the logarithm of overnight stays. ***, ** and * denote significance at the 1 %, 5 % and 10 % level. t-values are based on robust standard errors.

a) groups consist of municipalities cross-classified by country of origin. The UK sample includes the following municipalities: Inari, Kittilä, Muonio, Rovaniemi, Salla, Sodankylä and Kolari. The Japanese sample includes: Inari, Kittilä, Rovaniemi, Sodankylä and Kolari; Russian sample includes Inari, Kittilä, Muonio, Pelkosenniemi, Rovaniemi, Salla, Sodankylä and Kolari and the Swedish sample consists of five municipalities: Inari, Kittilä, Rovaniemi, Sodankylä and Kolari. The remaining sample (CH, DE, ES, FR, and IT) includes the same municipalities.

In contrast, winter tourism demand from distant countries (the United Kingdom, other Western European countries in the pooled sample, and Japan) does not depend on snow conditions in the early season. However, visitors from the neighbouring countries represent less than 10 per cent of total international overnight stays in December (data refers to 2014). Therefore, we conclude that December months with poor snow conditions have led to relatively small declines in total international overnight stays in our sample period.

As expected, winter tourism demand in the early season depends not only on snow conditions but also on economic factors. In particular, relative prices are highly significant, exceeding one in absolute terms in four out of five cases. For example, British tourists and those from Central and Southern Europe are especially sensitive to changes in relative prices with elasticities exceeding 2.0 in absolute terms. The price elasticity for Russian tourists is about 1.2 in absolute terms and consistent with earlier studies (Falk & Vieru, 2107b). Real income plays a significant and important role for winter tourism demand in three out of five estimation samples. This contrasts with neighbouring countries, where it is not significant.

Several robustness checks are performed to assess the sensitivity of the estimates. First, we use average snow depth for December as an alternative measure for snow conditions. Unreported results again show that snow conditions matter for overnight stays for Swedish and Russian tourists. Second, we re-estimate the tourism demand model with the squared term of the snow conditions indicator. However, the squared term is not significant at conventional significance levels.

6. Conclusions

In Finnish Lapland, international tourism demand during the winter season has strongly increased over the last two decades. However, climate change is seen as a threat to the start of future winter seasons. Climate change scenarios suggest that the Arctic Circle region is particularly affected by global warming during the winter season, resulting in less natural snow. Therefore, it is important to study the historical relationship between snow conditions and tourism demand in the winter season. This paper provides further evidence on the link between snow conditions in the early winter season (December) and international tourism demand by distinguishing between various types of visitor countries. This is important because both the travel behaviour and preference for snow-based winter activities vary widely across countries.

Using dynamic panel data estimations based on five destinations in Finnish Lapland, we find that Russian and Swedish tourists are sensitive to snow conditions in the early season. However, these visitors represent less than 10 per cent of total international overnight stays in the eight winter destinations in Lapland during the December season. Tourism to Finnish Lapland is likely to be more affected by changes in economic factors, such as relative price changes, which are particularly relevant e.g. for British tourists. In general, economic factors are more relevant than changes in snow conditions for visitors from distant countries. New, more frequent, and cheaper direct flight connections to Lapland and marketing activities have contributed to these favourable developments (Pretes, 1995; Halpern, 2008). Different tourist motivations may also play a role in the tourism increase. Tourists are often interested in experiencing new destinations with authentic natural environments.

Given the results in the relationship between snow conditions and international tourism demand in Finnish Lapland, it is natural to ask their implications to climate change for winter tourism. Climate change is expected to bring substantially higher temperatures as well as a decline in the amount of snow, the duration of snow, and number of days with snowfall. Ski resorts have tried to mitigate the problem e.g. by making and storing snow. Winters with less snow will lead to a decrease in overnight stays of Russian and Swedish tourists in the short run. Although long distance travellers have not been sensitive to variations in snow depth in the last twenty years, this does not mean that they will remain insensitive in the future. In any case, both comprehensive adaptation and mitigation strategy for climate change are needed (Scott, Hall, & Gössling, 2012). This includes the development of new non-snow-based activities. At present, the higher risk is that the strong growth of tourist inflows could lead to concerns about tourism among the local population.

Tourism business in Finnish Lapland is becoming increasingly dependent on visitors from distant countries who arrive by plane. This is undesirable from an environmental point of view and makes it more difficult for the region to achieve the Paris agreement to reduce greenhouse gas emissions (Scott, Hall and Gössling, 2016). Given the estimated price elasticities, a flight departure tax would have a large negative impact on international tourist flows to Finnish Lapland for the majority of visitor countries. However, due to its comparative remoteness, Finland does not have the advantage of train or road accessibility that other winter sport destinations in Europe have. Therefore, either a flight departure tax or an airline climate tax would be problematic.

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Table 3: Descriptive statistics of overnights, GDPs and relative prices.

	Mean	Std.
	UK sample (# obs 129)	
change in ln overnight stays	0.151	0.608
change in ln GDP per capita in constant prices	0.020	0.019
change in ln relative prices	-0.004	0.068
	Japan sample (# obs 76)	
change in ln overnight stays	0.074	0.690
change in ln GDP per capita in constant prices	0.008	0.021
change in ln relative prices	0.023	0.110
	Russia sample (# obs 142)	
change in ln overnight stays	0.128	0.942
change in ln GDP per capita in constant prices	0.035	0.046
change in ln relative prices	-0.017	0.124
	Sweden sample (# obs 93)	
change in ln overnight stays	0.092	0.986
change in ln GDP per capita in constant prices	0.023	0.025
change in ln relative prices	0.004	0.053
	CH, DE, ES, FR, and IT (# 461)	
change in ln overnight stays	0.081	0.826
change in ln GDP per capita in constant prices	0.014	0.020
change in ln relative prices	-0.002	0.023

Source: see Section 4.

Table 4: Descriptive statistics: overnight stay and snow evolution over time.

	UK		Japan		Russia		Sweden		CH, DE, ES, FR, and IT	
	growth of NS	% days w.SD>=30	growth of NS	% days w. SD>=30	growth of NS	% days w. SD>=30	growth of NS	% days w. SD>=30	growth of NS	% days w. SD>=30
1996	12.4	76	36.7	75	72.6	75	-17.8	71	-2.8	70
1997	28.0	70	-4.7	66	72.5	70	-81.1	68	3.9	67
1998	49.7	45	-11.3	40	-46.8	53	0.0	50	29.0	51
1999	47.8	53	18.4	57	31.7	55	-127.3	59	2.3	61
2000	44.8	4	37.1	5	48.2	4	23.9	5	20.0	4
2001	13.8	67	-38.9	94	5.6	67	10.5	76	-6.1	79
2002	20.8	38	20.2	50	-6.0	33	-4.7	40	-11.7	42
2003	22.2	19	5.2	20	-85.3	19	35.7	21	42.2	21
2004	14.1	42	-20.6	45	-9.4	42	-55.3	45	7.0	44
2005	5.4	58	15.2	49	24.3	57	46.9	49	-1.6	58
2006	22.0	55	18.8	51	59.6	60	0.0	41	-2.9	41
2007	8.7	61	-8.0	71	30.0	66	23.2	65	1.9	65
2008	-11.1	89	-2.0	81	12.3	91	-24.7	85	-4.5	85
2009	-27.8	43	13.6	27	-27.7	39	21.7	37	7.4	37
2010	-8.3	48	-15.7	49	12.2	48	43.4	43	4.9	43
2011	-7.6	44	51.0	42	31.1	44	16.9	42	3.5	42
2012	15.3	81	-13.1	75	32.3	82	16.9	75	21.3	75
2013	10.5	95	0.9	95	-25.7	96	11.1	93	-6.9	93
2014	5.3	66	-25.2	60	-56.2	67	-6.0	61	18.7	61
mean	14.0	55.5	4.1	55.4	9.2	56.2	-3.5	54.0	6.6	54.7

Source: see Section 4.