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ESTIMATING CLIMATIC AND ECONOMIC IMPACTS ON TOURISM DEMAND IN AUSTRIAN SKI AREAS

Christoph Töglhofer,[1,2] Franz Prettenthaler[1,2]

[1] Wegener Zentrum für Klima und globalen Wandel, Universität Graz
[2] Institut für Technologie- und Regionalpolitik, Joanneum Research Graz
[3] Radon Institute for Computational and Applied Mathematics, Austrian Academy of Sciences
[4] Zentralanstalt für Meteorologie und Geodynamik (ZAMG)

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Abstract

In this paper we introduce an approach for determining the year-to-year snow sensitivity of tourism demand in Austrian ski areas. The estimation is done based on an extensive dataset containing regionalized tourism, economic and meteorological data, which allows considerations both for a high number of ski areas (n=185) and a considerable number of seasons (t=34). A general-to-specific modeling approach is applied, starting from an autoregressive distributed lag model (ADLM). Final models are selected by the Bayesian information criterion (BIC) and are then tested for autocorrelation, misspecification, heteroscedasticity and normality. We find that in the examined period 1973 to 2006 the number of tourist nights in the ski areas is highly dependent on snow conditions, measured in days with more than 1 cm of snow height in the mean altitude of the corresponding ski area. Same year snow estimates are positive in 139 models (44 significant under the 95 percent confidence interval), and negative in 46 models (3 significant). It can be seen that in the median ski area (with a significant snow coefficient) a change in snow days by the standard deviation results in a four percent change, whereby estimates vary from up to ten percent in some lower lying area to minus four percent in some higher lying area. Notably, for some areas like Soelden and Hochzeiger the results also indicate that tourist nights are rather dependent on the general Austrian than the area specific snow conditions.

1 Introduction

Tourism plays a fundamental role in the Austrian economy. In 2005, 40 billion Euro in direct and indirect value added (16.5 percent of the GDP) can be attributed to tourist activities, with more than 30 million arrivals and 120 million tourist nights (Laimer and Smeral, 2006). As is well-known, a large share of tourist activities is dependent on the snow conditions in Austrian ski areas in winter. Therefore, in recent years researchers and the public became increasingly concerned about the consequences of global warming on the tourism industry. Numerous studies focused on understanding the past changes in winter temperature and precipitation patterns and interpreting future scenarios. However, little efforts have been spent on systematically examining the relationship between past weather conditions and the performance of Austrian ski areas. In other words, while the climate is recognized to be an important component of tourism supply, it is hardly understood to what extent the variability in climate has affected tourism demand in recent decades.

On the international level, some studies have been devoted to determining the sensitivity of tourism demand on short-term climate variability.[5] These studies have mainly focused on the national scale (e.g. Subak et al. 2000, Lise and Tol, 2002, or Agnew and Palutikof, 2006). While this might be helpful for finding dependencies for climatic parameters with rather homogenous regional patterns (such as temperature), it is more difficult for parameters where the weather exposure is supposed to vary substantially amongst regions (such as snow). For these parameters the varying impacts on different regions are seen to be more interesting than the overall national effects. Hence studies, which analyze the snow dependency of the ski tourism industry, usually operate on the local scale and use case study data for ski areas (e.g. Hamilton, Brown and Keim, 2007, or Shih, Nicholls and Holecek, 2009).

This paper aims at combining the strengths of both approaches, in that a dataset is created, which allows to work on a local scale, but also with a large number of cases (ski areas). A large number of cases are beneficial, for that comparisons between the sensitivities of different regions are possible and the generality of the results is higher compared to examinations on the case study level. Indeed, for generating regionalized data detailed information is needed about the location of ski areas, and respective indicators for tourism demand, tourism supply and meteorological conditions in the past. This extensive data processing is described in Chapter 2.

Furthermore, the methods, which are currently prevailing for examining the impact of climate variability on economic activities, are complemented by econometric methods in Chapters 3 and 4 of this paper. While economic impacts on tourism demand, such as changes in tourist income, relative price levels and exchange rates have been well examined by economists (see e.g. Song and Li, 2008), the related econometric methods have not been used for examining climatic impacts so far. Based on a detailed discussion of the different modeling approaches given in Toeglhofer and Prettenthaler (2009), the snow sensitivity of 185 Austrian ski areas is estimated by a general-to-specific modeling approach, starting from an autoregressive distributed lag model.

5 A more detailed overview of these studies is given in Toeglhofer and Prettenthaler (2009).

2 Data Manipulation

Trying to understand the impacts of weather and economic variability on tourism demand in Austria requires the manipulation of several datasets, all given for different time horizons, regional scales and in different formats. A range of steps is needed to rearrange the different kind of data inputs for using them in the autoregressive distributed lag (ADL) models in Chapter 3. In addition, new data sets are created to run a localized snow model, which in turn provides snow indices for the ADL-models. All of this data management steps as well as the visualizations and statistical modeling presented in Chapter 4 are done using the freely available programming language and software environment for statistical computing and graphics "R".

Figure 1 gives an overview of the data inputs and their sources, the data processing and the data generation. All steps are explained in more detail in the subsequent chapters.

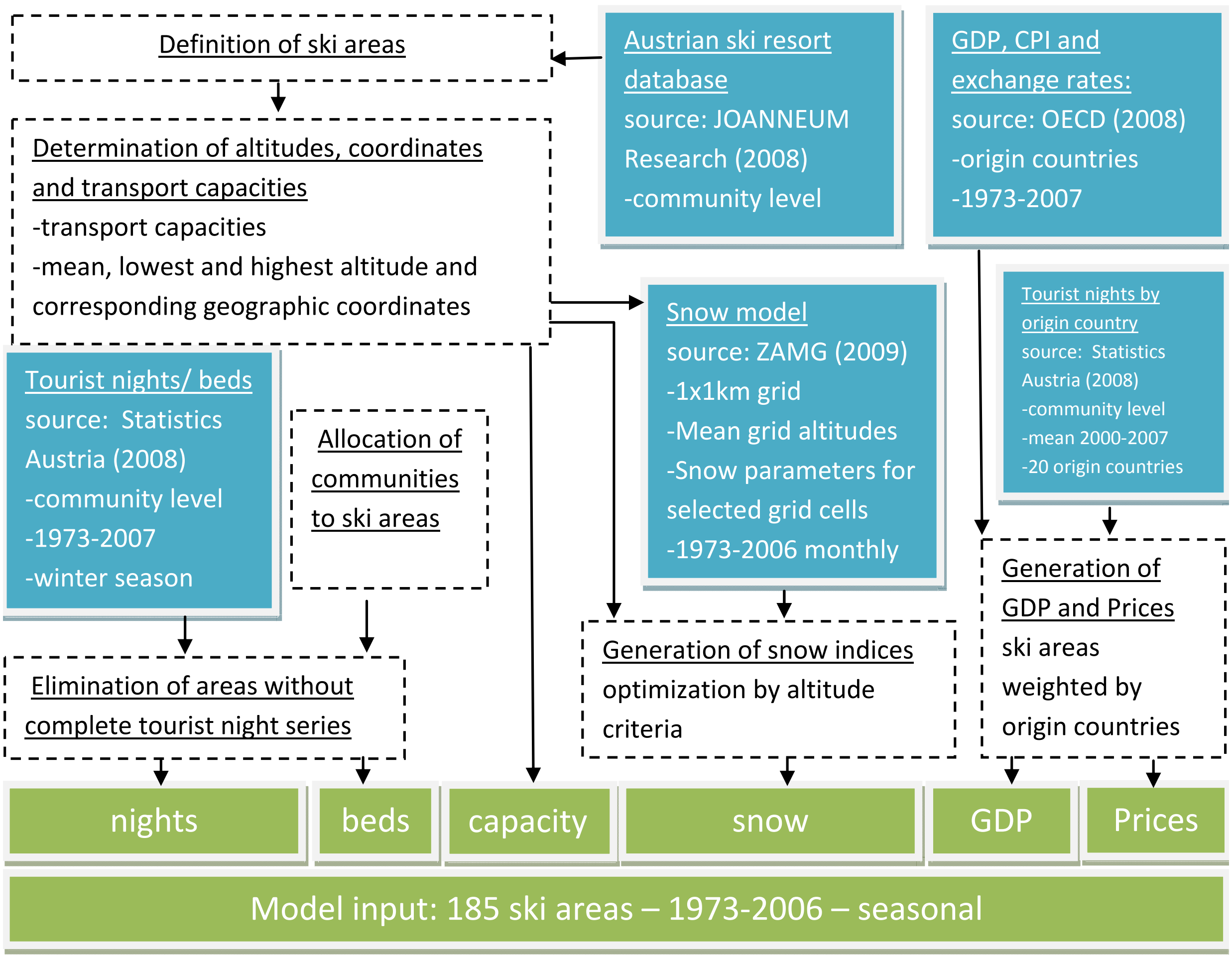

Figure 1: Data inputs (blue boxes), data processing and generation (dashed boxes), and model input (green)

2.1 DEFINITION OF SKI AREAS

The definition of the ski areas has been done using several datasets and web platforms. The main purpose was to define homogenous ski areas in such a way, that the availability of snow data for each of the ski areas as well as the availability of the number of tourist nights in the corresponding communities is ensured. Therefore, two tasks were carried out at the same time, namely the attribution of the communities with skiing activities to ski areas, and the determination of the ski areas' coordinates as an input for the meteorological model to provide localized snow data. For the former task the following principles have been applied:

- Similarly to Abegg et al. (2007) the most comprehensive skiing website www.bergfex.at has been used to classify ski areas. If skiing communities have a common web presence on this platform, they are counted as one ski area (e.g. Serfaus-Fiss-Ladis). Areas are only counted if the area includes more than five transport facilities or at least one cable car, while Abegg et al. (2007) use a threshold of three transport facilities and at least 5 km of ski runs.
- Exemptions from the common web presence criteria are made for large areas with a wide geographic spread (e.g. Skiwelt Wilder Kaiser Brixental), as in those cases homogeneity may not be given among communities. These areas are subdivided, depending on the interconnections within the area.
- Communities with more than one independent ski area (e.g. Soelden and Hochgurgl/ Obergurgl) have been considered to be a single ski area, as the tourist nights are not separately provided and guests generally have the possibility to choose between areas anyway, dependent on weather and snow conditions.

This approach led to a total number of 202 selected ski areas (compared to 228 areas selected by Abegg et al. 2007). A detailed list of the ski areas and the corresponding communities is given in the appendix.

2.2 DETERMINATION OF ALTITUDES AND COORDINATES

For the determination of the altitudes and coordinates of the defined ski areas a more comprehensive dataset has been taken, which was created by JOANNEUM Research (2008). In this dataset information about cable cars and drag lifts from data collections as well as the public cable car statistics has been allocated to each of the Austrian communities. It includes information about the number of transport facilities, their transport capacities, and, except for drag lifts, also the altitude of the valley and mountain stations of each transport facility.

The transport capacity, measured in 'person altitude meters per hour', is taken as an indicator for the size of the ski areas. The transport capacity refers to the maximum number of persons, which can be transported within one hour, multiplied by the altitude difference of the transport facility. The inclusion of the altitude difference is particularly useful for comparing the size of ski areas. However, the transport capacity does not indicate the actual capacity utilization of the ski areas. The distribution of transport capacities in Austrian ski areas in the year 2006 is shown in Figure 2.

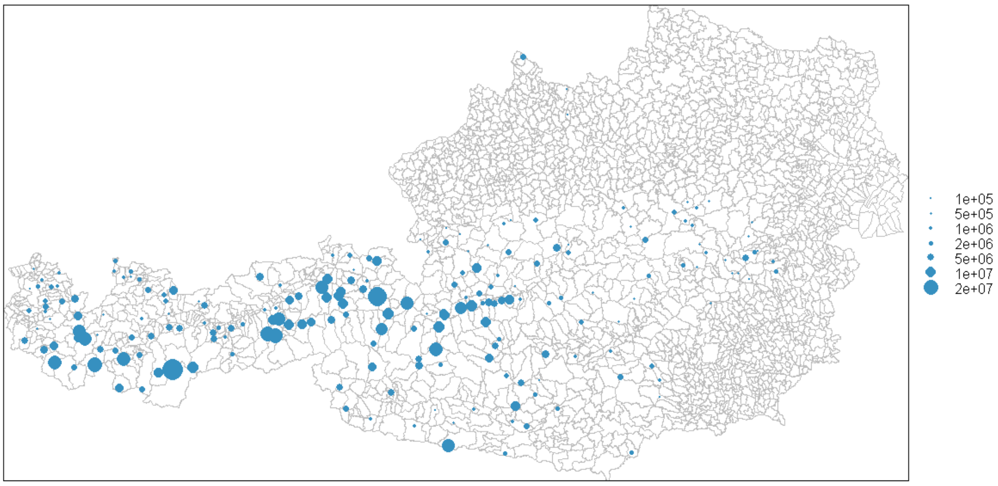

Figure 2: Transport capacities of ski areas in Austria

In addition, the mean, lowest and highest altitudes of the ski areas are considered. The mean altitude of a ski area is calculated as the average of the mean altitudes of all the transport facilities (except drag lifts) in the area, weighted by transport capacities. The highest and lowest altitudes of an area refer to the highest mountain station and respectively the lowest valley station.

Since altitudes for drag lifts are not available, some data manipulation has been carried out. Considering only transport capacity, without taking into account the number of lifts, drag lifts actually play a minor role in most of the ski areas, with an average capacity share of 20 percent. However, some areas solely rely on drag lifts. For these areas altitudes have been taken from the coordinates matching, which is described below. For areas, where drag lifts obviously exceed the altitudes given by the cable car statistics, altitudes have been manipulated separately. In addition, the altitudes have been adapted for areas, where slopes are usually not provided to get to the lowest valley stations (as these transport facilities only support skiers to get to higher altitudes).

In Figure 3 the lowest, mean and highest altitudes of the ski areas are shown as well as the altitude range from the lowest to the highest altitude. Generally both the highest altitudes and the range between the lowest and highest altitudes are much higher for the areas in the western part of the country.

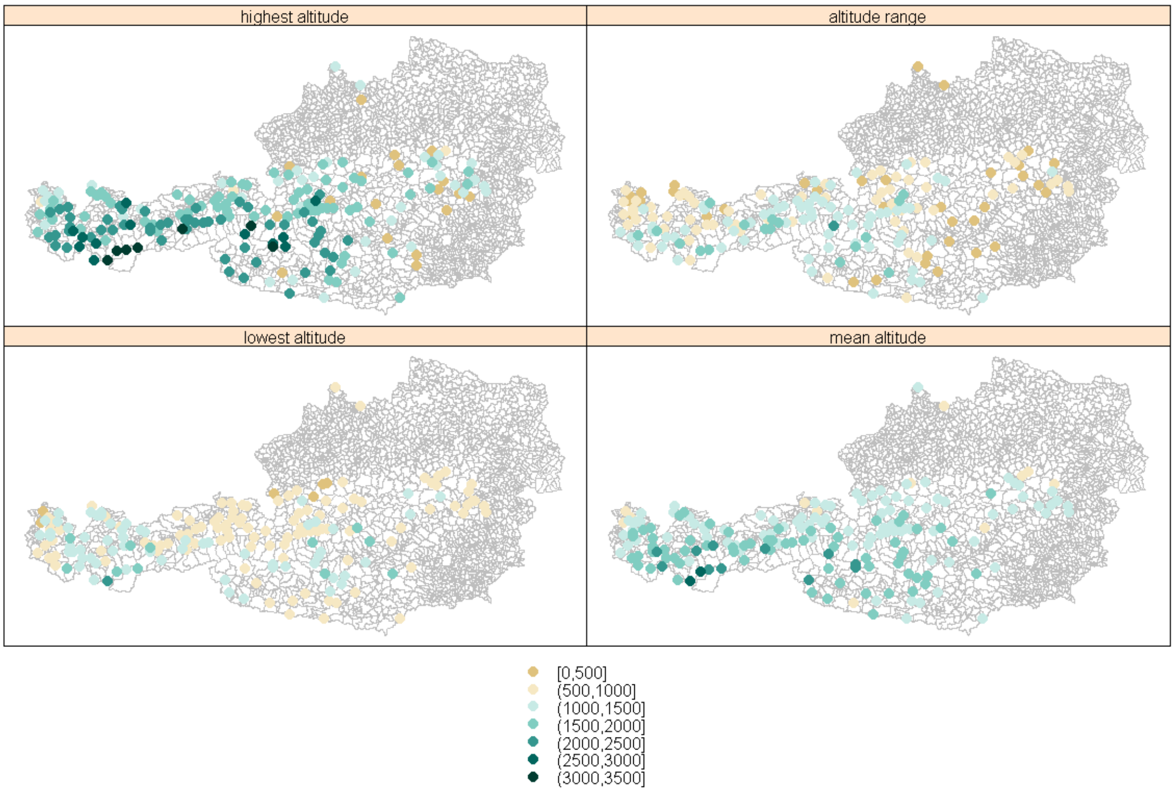

Figure 3: Lowest, mean, and highest altitude of ski areas

In addition to the lowest and mean altitudes[6] of the ski areas, the geographic coordinates have been determined for these altitudes. Beside the possibility to plot the existing data spatially, this is necessary for the meteorological model to provide snow data for each of the ski areas (see section 2.3). The exact coordinates were detected by using the altitude information provided in the dataset and the software 'AMAP3D viewer'. This software enables viewing the Austrian map with a scale of up to 1:10 000, whereby the transport facilities of ski areas are imaged (except recent extensions) and can be compared to the ski areas maps at www.bergfex.at.

For the determination of the coordinates the technical specification of the meteorological model has been taken into consideration. Since the model operates with a resolution of 1x1 km it was important to find coordinates within the ski areas, where the altitudes provided by the own dataset match as accurately as possible with the average altitude of the grid cells, which were used for the meteorological model. As the latter information was not known ex ante, several coordinates for different locations have been chosen for each ski area and altitude level. Furthermore, locations in the center of grid cells were preferred and steep declivity was avoided to minimize the difference between the given altitudes and the average altitudes of the grid. In case one ski area (by definition) includes several unconnected areas (e.g. Moelltaler-Gletscher: Flattach, where there is one glacial area, but also

[6] For ski areas with more than 500 meters difference between mean and lowest altitude the coordinates have been determined also for the 25 and 75 percent altitudes. This data might be useful for further investigations, but is currently not used in our approach.

several lower lying lifts), coordinates for each of the different areas have been determined in the corresponding altitude groups and have been considered together.

Principally, this methodology has two advantages compared to the approach used by Abegg et al. (2007). Firstly, it contains more detailed altitude information, as the mean altitude is not simply seen as the average between lowest and highest point of the ski area. Indeed, many ski areas provide more transport capacities in higher lying areas. For 90 out of the 202 ski areas the simple mean altitude (average between highest and lowest point) underestimates the weighted mean altitude (taking into account all transport facilities in an area), for 44 areas by more than 100 meters. For 52 areas there exists an overestimation, with only 4 areas deviating by more than 100 meters. For the remaining 60 areas both methods yield the same results, as only one transport facility is considered. A comparison between simple and weighted mean altitude is provided in Figure 4.

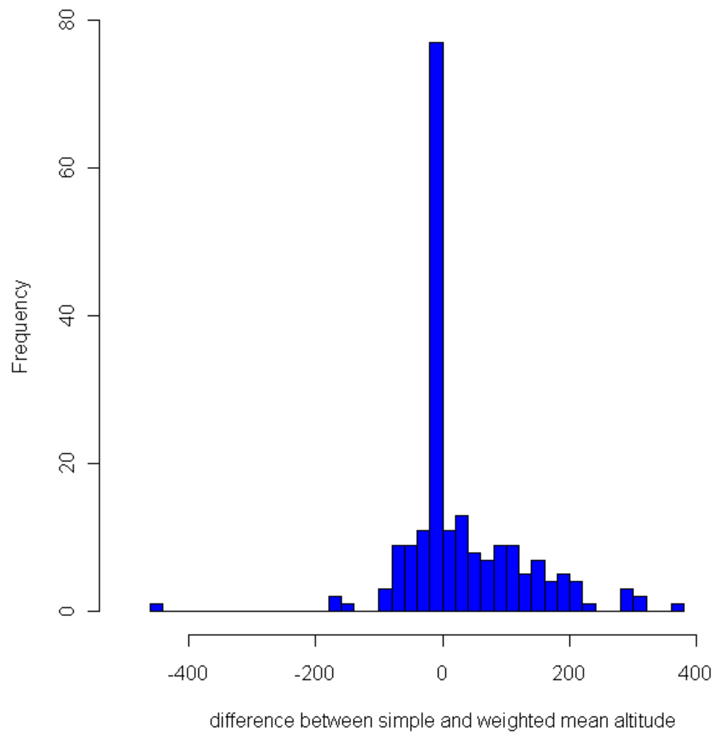

Figure 4: Difference between simple and weighted mean altitude. Positive values reveal an underestimation of the mean altitude by the simple method compared to the weighted method

Secondly, it includes the transport capacity as an indicator for the size of ski areas which allows discriminations amongst different size classes. In fact, larger ski areas generally have access to larger altitudes and it can be assumed that these areas are consequently less affected by poor natural snow conditions. This is particularly important when it comes to the estimation of climate change impacts. Abegg et al. (2007) state that the natural snow-reliability line will increase by 150 meter with every degree Celsius temperature rise, from currently 1050 meter altitude in Salzburg, Styria, Upper Austria and Lower Austria and respectively 1200 meter in Vorarlberg, Tyrol and Carinthia[7]. As a result, instead of 199 out of 228 areas (87 percent) under current conditions only 115 areas (50 percent) will be snow-reliable in case of a 2°C warming, and 47 areas (21 percent) in case of a 4°C warming.

Indeed, the sensitivity of the natural snow conditions in ski areas with respect to climate warming appears to be less alarming, when expanding the two underlying assumptions (simple mean altitude, simple summation of the number of areas) for the weighted mean altitude and particularly the transport capacity of the areas. Figure 5 reveals the difference between both approaches, showing the relation between the mean altitude of the ski areas and their total number and respectively their total transport capacities.

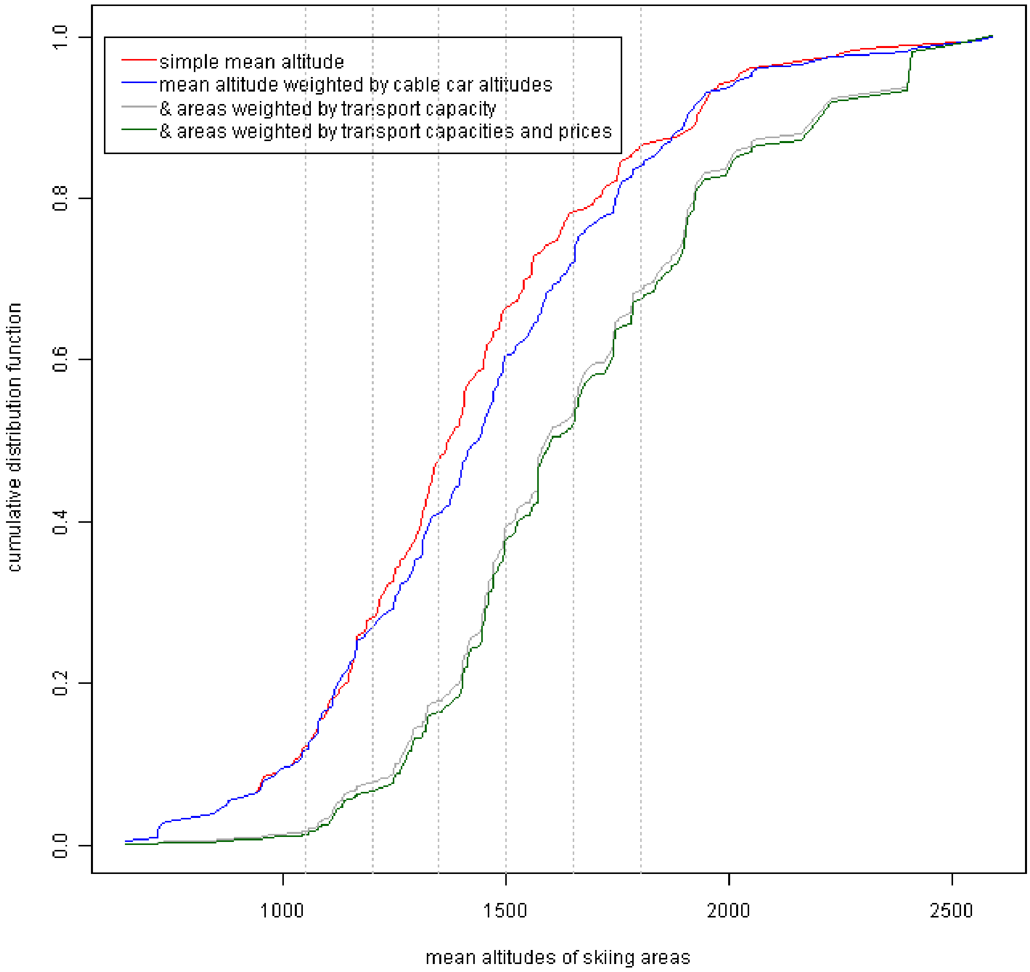

Figure 5: Cumulative distribution functions of the number of ski areas and respectively their transport capacities, considering both simple and weighted mean altitudes of the ski areas.

Figure 5 gives two insights to the altitude distribution of Austrian ski areas. As already indicated in Figure 4, the determination of mean altitudes by weighting the different altitudes of cable cars within ski areas (blue line) decreases the number of ski areas below a certain altitude threshold, compared to

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[7] However, these natural snow-reliability lines are estimated very roughly and a differentiation is definitely needed within the federal states, as a recent study by Prettenthaler, Formayer et al. (2008) indicates.

the simple meaning of the highest and lowest altitude (red line). This is particularly true for areas in medium altitudes (1200 to 1800 meters). More important, in taking not only the weighted altitudes, but also the transport capacities into account (grey line), much less of the total ski area capacities are found to be below the altitude thresholds.

Moreover, one might continue the analysis, accounting for the fact that larger areas on average show higher revenues per guest, which is suggested by arbitrarily assuming ascending prices from 25 to 40 Euro (dark green line).

All in all, Figure 5 highlights that there is substantial difference between the relative share of the number of ski areas under a certain altitude threshold and their relative transport capacities. The considered areas below 1050 meters account for 12 percent of the total number of areas (for both simple and weighted mean altitudes), but only for 2 percent of the transport capacities. The mean altitude of 28 percent of the areas is below 1200 meters (and respectively 27 percent when weighting for cable car altitudes), but these areas only make up 8 percent of the transport capacities. The areas below 1500 meters account for 66 percent of the total number of areas (weighted: 60 percent), but for only 39 percent of the transport capacity. Therefore, this analysis leads to the conclusion that it is crucial to consider not only the total amount of ski areas but also their relative size. Furthermore, it is worth to have a look at the altitude distribution of all the transport facilities within an area, not only the maximum and minimum altitude.

2.3 GENERATION OF SNOW INDICES

The availability of adequate meteorological data is seen as a critical issue when examining the relation between economic activities and weather conditions. When analyzing the snow sensitivity of skiing activities however, the availability of snow data becomes the most crucial issue. The main problem is that consistent snow measurements for longer time series, as needed for our analysis, can only be provided for a limited number of measurement stations, disregarding the regional variability of snow conditions. In addition, meteorological stations are commonly not located in altitudes, which are representative for skiing activities.

Thus, an alternative approach was chosen in taking data from a snow model instead of measurement stations. The 851 ski area coordinates were provided to the Central Institute for Meteorology and Geodynamics (ZAMG). Snow indices on a monthly scale were then calculated by ZAMG for each of the given coordinates 1x1 km grid cells. This process is described in detail in Beck et al. (2009), and the resulting data is given in chapter 3.1.2.

Concerning the adequacy of the generated meteorological data for the selected ski areas it is important that the altitudes of the ski areas correspond to the mean grid altitude of the ZAMG grid. Since in mountainous areas the altitude can vary substantially within 1x1 km grid cells, it is expected that the mean grid altitudes deviate significantly from the ski area altitudes. Indeed, the altitudes vary for up to 500 meter, with a mean deviance of 90 meter. Hence, a procedure was developed for the generation of the snow indices to select the considered coordinates in such a way, that the overall altitude deviance is minimized for each ski area, while the number of included coordinates is kept as large as possible. For each ski area and altitude level (lowest and mean altitude level) up to 5 coordinates were potentially available.

The selection procedure was based on several considerations. Firstly it was tried to include snow data from as many coordinates as possible, as this coordinates might refer to different local climatic conditions (e.g. because of slopes with different expositions). Thus, all coordinates were selected, in case the absolute value of the mean deviation did not exceed 100 meters. For example, when the first altitude was 150 meter higher and the second one 130 meter below, both have been considered, because the mean deviation is then reduced to 10 meter. Secondly, in case this 100-m-condition was not fulfilled, it was tested again after excluding one out of the coordinates (with n-1 possibilities to do so). If the condition was not fulfilled for each of the possibilities it was continued excluding two coordinates etc. Finally, at least one coordinate had to be provided for each area, even if the absolute deviation of this coordinate was greater than 100 meter.

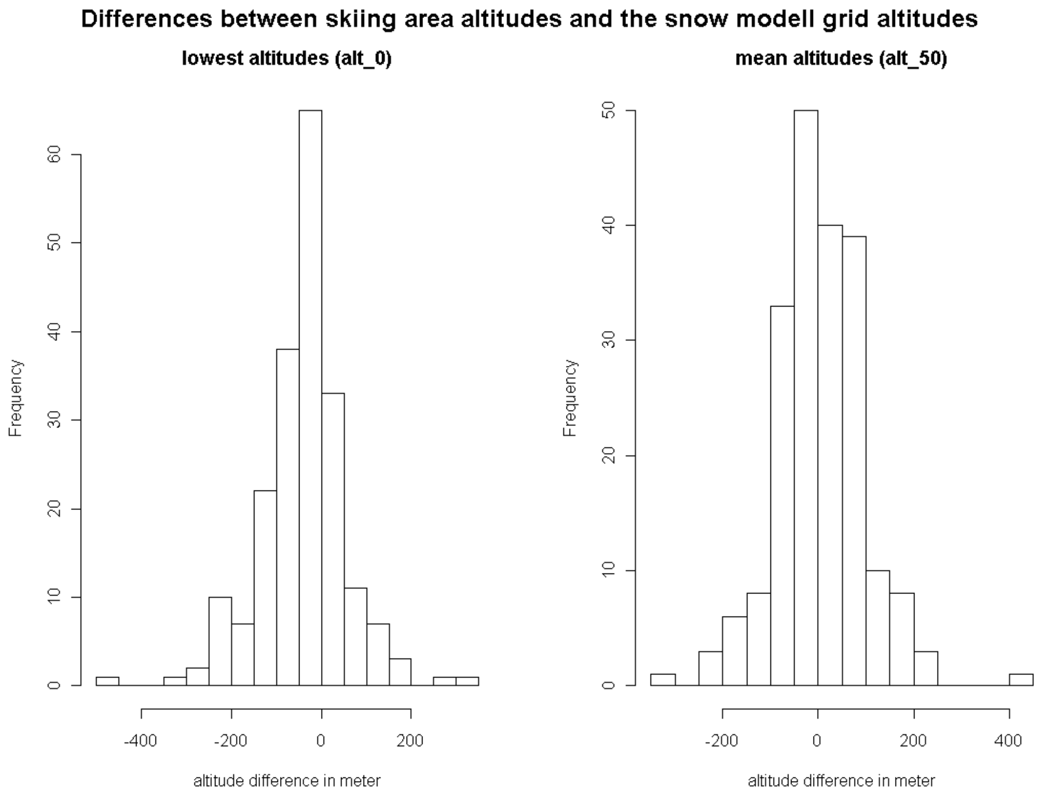

Figure 6: Differences between ski area altitudes and the snow model grid altitudes (after the selection)

The application of the selection procedure reduced the differences between ski area altitudes and the snow model grid altitudes. While still 204 out of 225 coordinates for the lowest altitude alt_0 and 270 out of 325 coordinates for alt_50 were considered, the mean deviance was reduced from 90 meters for both altitude levels to 67 meter for alt_0 and 73 meter for alt_50. In addition, outliers have been substantially reduced, with only 55 areas deviating more than 100 meters and 16 deviating more than 200 meter for alt_0, and respectively 40 areas deviating more than 100 meter and 8 deviating more than 200 meter for alt_50. The exact distributions of the altitude differences are shown in Figure 6.

2.4 ALLOCATION OF COMMUNITIES TO SKI AREAS

The 202 selected ski areas include 273 of the 603 communities, which are listed in the Austrian ski resort database. The 330 excluded communities provide either very small transport facilities, which were eliminated by the size constraint, or transport facilities, which are not used for winter sport purposes. In sum the excluded transport facilities account only for five percent of the total transport capacities. Moreover, it can be assumed that these excluded transport facilities predominantly attract day trippers, while national and international overnight stays are attributable to larger areas.

Beside these 273 communities, where skiing activities take place, many more surrounding communities benefit from their close location to areas, especially to those who are internationally well known (Soelden, Arlberg, Saalbach-Hinterglemm, Kitzbuehel, Ziller valley etc.). Indeed, one can expect that the tourist stays in these communities are heavily related to those in the corresponding flag ship areas and their meteorological conditions.

Thus, it was tried to identify those communities with indirect skiing activities. In a first step this was done by limiting the Austrian communities to possible candidates, namely by listing communities that were either geographical neighbors of skiing communities, or were among the 110 non-skiing communities that accounted for the largest number in tourist nights. In a second step this selection was limited manually by excluding communities which evidently attracted tourist stays due to other reasons (spa tourism, city tourism etc.) than winter sport. The remaining communities were individually assessed on the basis of both, the vicinity (by road connections) and attractiveness of the nearby areas. A community was selected, when skiing activities in the nearby areas are thought to be the primary determinant of tourism demand in the corresponding community. The 72 selected communities and the related areas are presented in the appendix.

All in all, the 345 included communities (273 with direct and 72 with indirect skiing activities) account for 73 percent of the tourist nights in Austria, whereby this share has remained relatively constant within the last 30 years (1973: 74 percent, 1990: 76 percent). Within the federal provinces however, a remarkable difference is observable between the core ski provinces Salzburg, Tyrol and Vorarlberg and the other provinces. While in the first mentioned the tourist nights in the ski areas are the main driver for the overall development (Tyrol: 92 percent), growth rates have decoupled especially in Styria, Lower Austria and Upper Austria. In these provinces an upward trend is observable in overall tourist nights, although the ski areas have grown only slowly (Styria), stagnated (Upper Austria) or decreased steadily (Lower Austria). The trends and shares for all provinces are shown in Figure 7.

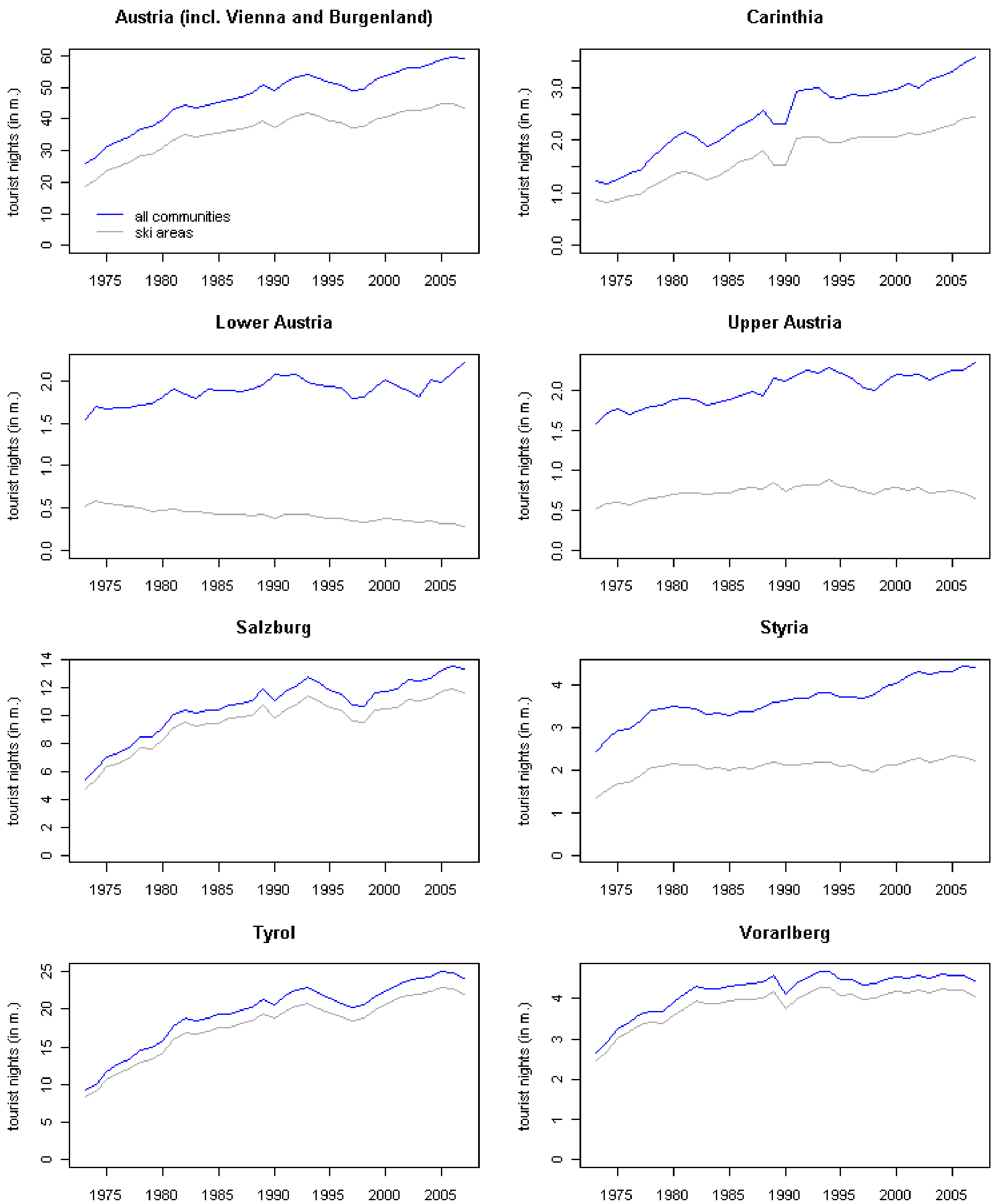

Figure 7: Development of tourist nights in the winter season both for the federal provinces (blue) and their ski areas (grey). Data source: Statistics Austria

On a more local scale it can be seen that although each federal state has communities with growing and declining tourist nights, the developments within neighboring communities are often linked tightly. Figure 8 illustrates the relative changes in tourist nights for the ski communities within the period 1977 to 2007 and 1997 and 2007.

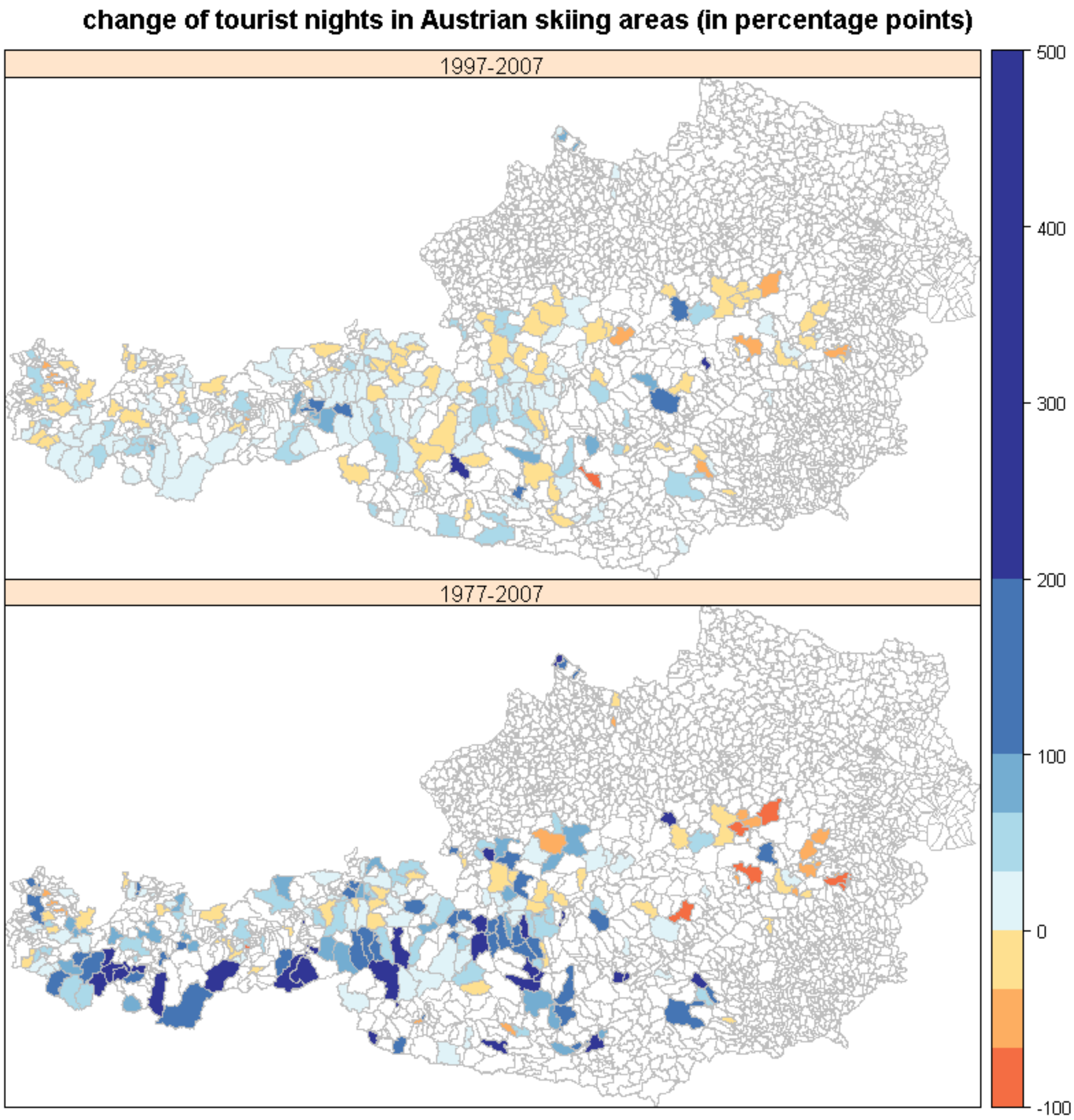

Figure 8: Development of tourist nights in Austrian skiing communities. Data source: Statistics Austria

Spatial differences in the development of tourist nights in Austrian skiing communities are quite clearly visible. Although the overall number of tourist nights has risen by 20 percent from 1997 to 2007, 96 communities (36%) have experienced a declining trend. These communities are noticeably located on the northern side of the Alps in Eastern Austria. Only 20 percent of the skiing communities in the provinces of Lower Austria and 40 percent in the province of Upper Austria faced a growth in tourist nights. While most of the communities in Tyrol and Salzburg had considerable growth rates, especially in Tyrol communities on the south side of the main chain of the Alps seem to have much stronger growth rates than those on the northern side. For Carinthia, Vorarlberg and Styria the patterns are somewhat more unclear at the first glance. Table 1 summarizes the developments in the seven Austrian provinces with skiing activities.

Table 1: Development of tourist nights in the ski areas 1997 to 2007

Province	No. of skiing communities	Communities with growth	Summary statistics (in percentage points) Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Carinthia	23	61%	-73.5	-7.0	11.9	29.8	36.9	378.4
Lower Austria	14	21%	-65.3	-31.8	-21.4	-7.2	-7.9	181.6
Upper Austria	15	40%	-38.1	-14.8	-4.5	5.2	7.4	96.6
Salzburg	52	79%	-23.1	2.2	19.4	19.4	32.3	101.0
Styria	34	62%	-47.5	-10.3	18.6	27.3	32.4	415.3
Tyrol	101	74%	-55.4	-0.4	12.9	18.3	33.9	108.2
Vorarlberg	27	52%	-46.2	-20.3	11.0	5.3	24.7	65.2

2.5 GENERATION OF GDP AND PRICE LEVELS

So far, tourist nights – representing the dependent variable – as well as snow conditions – representing the major meteorological explanatory variable – are available for each ski area. In addition, the impacts of economic developments such as price and income changes on the number of tourists will be considered.

In tourism demand functions on the international scale, origin country income is generally included as a key explanatory variable. In case the main focus lies on holiday demand or visits to friends the appropriate form is personal disposable income or private consumption, whereas if attention focuses on business visits, a more general income variable (such as GDP) should be taken. Moreover, tourism prices are regularly used as an explanatory variable, whereby prices include both the cost of traveling to the destination and the cost of living. Usually the consumer price index (CPI) in a destination country is taken as a proxy for the cost of tourism in this country. The CPI should also be adjusted by the exchange rate between the origin and destination currencies. The problem of using the CPI is that the cost of living of the local residents does not always equal the cost of living of foreign visitors to that destination (Song, Witt and Li, 2009, p. 4).

In our analysis all data is taken from the OECD homepage (OECD, 2009). The GDP is used for measuring the income level, since the tourist night data is available for the 16 largest origin countries, and GDP is available for more countries than alternative income measures. The available GDP data is calculated using the expenditure approach and is given on an annual scale in US dollar and current prices for all of the 16 largest origin countries, except Russia, Poland, Hungary and the Czech Republic. For these post communist countries no data is available before 1989 and respectively for Russia before 1992. However, while arrivals from these countries have risen in recent years, the overall impact of these countries in the examined period 1973 to 2006 is limited anyway.

As we do not separate between different origin countries in our analysis, we calculate the income level by using weights for the origin mix in each ski area. The weights are computed as constant weights for the period 2000-2007 (as for many countries detailed information is not available before). Constant weights are used in most previous studies, because they offer stable and homogenous time series and avoid any additional variance. Yet, one disadvantage of constant weights is the implicit assumption of constant market shares and tourist preferences (Luzzi and Flückiger, 2003, p. 294).

Formally, for each ski area the calculated income index GDP_t for the winter season of the year t depends on the GDP in the respective origin countries i ($GDP_{i,t}$), which is weighted by the number of average tourist nights w_i:

$$GDP_t = \sum_{i=1}^{n} w_i GDP_{i,t} \,,$$

whereby $w_i = \dfrac{\sum_{t=1}^{j} N_{i,t}}{\sum_{i=1}^{n}\sum_{t=1}^{j} N_{i,t}}$

Tourism prices are calculated taking both the CPIs and the exchange rates (EX) for Austria and the origin countries, whereby the CPIs are measured in US dollar and related to the basis year 2000 (=100). Again the tourism prices are calculated for each ski area using the constant weight of tourist nights, which can be denoted as:

$$p_t = \sum_{i=1}^{n} w_i \frac{CPI_{AUT,t} / EX_{AUT/US,t}}{CPI_{i,t} / EX_{i/US,t}}$$

2.6 ELIMINATION OF AREAS WITHOUT COMPLETE TOURIST NIGHT SERIES

In a last step, a consistent dataset was created as model input. For the sake of simplicity, ski areas with some missing observations in the dependent variable were removed from the analysis. This was done to avoid problems with missing values, especially when calculating with lags and differences. Alternatively the missing observations could be filled by taking moving averages of the previous periods or similar methods, when the number of missing observations is small. Indeed, only 14 out of 202 areas had missing observations (four with more than one observation missing) and the concerned areas are of relatively small size anyway (except one). The temporarily excluded areas are: Innerkrems, Hochrindl, Sankt Corona am Wechsel, Puchenstuben, Puchberg am Schneeberg, Veitsch, Riesneralm, Alpl, Marienbergbahnen Biberwier, Kühtai, Böderle – Schwarzenberg and Alberschwende.

3 Data and Methodology

In this chapter we briefly discuss how the dataset described in chapter 2 is used to determine the snow dependencies of tourist nights in Austrian ski areas in the period 1973 to 2006. The results will be given in chapter 4.

3.1 DATA

First of all, the time horizon and aggregation of the data is considered. For the results presented in this paper we decided to go for a longer time series (1973-2006) on a seasonal scale. Tourist nights are the limiting factor for working on a monthly scale, since for Austria they are not available on the community level before the year 2000 (and with some limitations 1995). Therefore the longer term impact of snow conditions and economic variables on tourism demand can not be determined with this data. Moreover, while the number of observations would be approximately the same when using monthly data (up to 42 months, when also November and April are included) instead of seasonal data (34 observations), the characteristics of monthly data would require many more explaining variables to be included, which lowers the model quality for such a short dataset. In particular, variables to correct for variations in holiday periods and additional lag parameters would be needed.

The data is taken with the highest possible spatial resolution, namely on the level of the individual ski areas and the corresponding communities. Indeed, if the data is considered on a more aggregate level, this would be advantageous from the perspective that in general the uncertainties related to the quality of the data (measurements errors etc.) and unknown area-specific effects would be smoothed out. This would be especially beneficial for smaller areas, like they are predominant in Eastern Austria. Aggregations could be done on the basis of political regions (e.g. districts, federal states), regions defined by tourism authorities (e.g. destinations, as classified by the Austrian Hotel Association) or natural conditions (e.g. valleys, mountain ranges, climatological classifications).

However, aggregations would inevitably lead to a loss of information, whichever criteria would be used for allocating the ski areas to regional units. Several factors, like the different development of tourism infrastructure in nearby ski areas, sometimes high differences in the altitude levels of ski areas as well as the high regional variability in snowfall patterns, indicate the limitations caused by aggregation. Criteria, which seem to be homogeneous from an economic point of view, might leave regions with heterogeneous climatological data. A classification by natural conditions might create regions with heterogeneous altitude and therefore frequently heterogeneous snow conditions et cetera. In other words, the reasons for differences in the snow sensitivities of ski areas might be plentiful. Therefore we believe that for understanding the regional dependency of tourism demand on snow conditions, we rather examine the effects on the basis of the individual ski areas, while accepting that for some areas the highly localized data might be of limited usefulness.

3.1.1 Tourism Demand Data

Tourist nights seem to be a good indicator for the demand for winter tourism in our case for several reasons. Firstly, while the majority of studies in the tourism demand literature consider tourist arrivals, tourist nights are preferable when examining the weather sensitivity for the reason that they indicate also the length of the trips. Indeed, in many cases weather conditions lead to early departures or spontaneous extension of a holiday, while the terms of cancellation in most cases encourage people to set out on a journey, even when the weather forecast is unfavorable.

Secondly, the tourist nights are considered to be more appropriate compared to ski lift ticket sales, when weather dependencies are examined over a wider area with a high number of cases. Theoretically, the number of daily visitors to the ski areas is more responsive to changes in weather conditions. It includes day trippers, which are particular flexible and are able to react to bad weather conditions. Moreover tourist nights might be less responsive, as especially in medium to high price destinations tourists have opportunities to substitute skiing in periods with poor weather conditions. However, unlike tourist night data, consistent data of ski lift ticket sales is generally not available for long time horizons and only for a limited number of ski areas. Therefore relevant studies examining the weather sensitivity of ski areas (Hamilton, Brown and Keim, 2007; Shih, Nicholls and Holecek, 2009, and Prettenthaler and Amrusch, 2009) are focused on case study data.

The logarithm of the tourist nights is taken. This is common in the related literature, because transforming to logarithms will produce time series with approximately constant variance over time. Otherwise it is often the case that the higher the level of a series rise, the more variation is observed around that level (Cryer and Chan 2008, p. 98). In addition, it enables us to interpret coefficients from the regression models directly as elasticities (log-log specification) and semi-elasticities (log-lin specification).

Tourist nights are not only taken as dependent variable, but also included in the model with a time lag. The inclusion of lagged dependant variables is seen as a key strategy in tourism research model building. From a theoretical perspective the inclusion of an autoregressive term is done to consider tourist expectations and habit persistence (Witt, 1980). Behavior patterns are expected to be stable, as people, who have been on holiday to a particular destination and liked it, tend to return to that destination. Uncertainty is reduced and knowledge about the destination spreads by mouth to mouth recommendation, which may well play a more important role in destination selection than commercial advertising does (Song, Witt and Li, 2009, p. 6).

3.1.2 Meteorological Data

Several meteorological parameters are provided for each of the ski areas, both for the mean altitude (alt50) of the areas and their lowest altitudes (alt0). Three different definitions are available for snow indices, namely the number of days with more than 30 cm of snow cover (snow_greater30), the number of days with more than 1 cm of snow cover (snow_greater1) and the sums of the average monthly snow height (snow_sums). In addition, for all of the definitions artificial snow indices are available, meaning that the conditions for snow making are considered in the meteorological model. Moreover, the mean temperature is also available. All indices are described and climatologically analyzed in detail in Themeßl, Gobiet and Toeglhofer (2009).

Rather than testing for each ski area, which of the altogether 14 meteorological indices fits the data best, we choose a two-step approach to prevent excessive data-mining. In a first step we choose one of the definitions by theoretical reasons, meaning that we consider which of the given indices should reflect changes in tourism demand best. Then, all calculations are done with the chosen index, and the other indices are used for model evaluation purposes only. The following considerations suggest that for the given tourism data set the index *snow_greater1_alt50* is preferable:

- The snow conditions in the mean altitude are seen more relevant as those in the lowest altitudes for most of the skiing areas. Indeed, as it is shown in section 2.2 the majority of areas provide capacities rather in the upper range of their altitudes. If snow conditions in the valleys are poor, guests can be carried to higher altitudes in many areas. 154 of the 185 included ski areas have five or more, 89 even ten or more transport facilities. These figures indicate the relative high potential for shifting activities to higher altitudes in periods with unfavorable snow conditions. Consequently, snow indices for alt50 (which has been calculated by weighting the altitudes of all the cable cars within a ski area) are preferred to those for alt0.
- Artificial snow indices provide a useful tool to overcome the shortcomings of using solely natural snow cover to indicate the sensitivity of winter tourism towards snow conditions and are therefore promoted in the recent climate change literature (e.g. Scott et al. 2003, Steiger and Mayer 2007, Scott et al. 2008). Yet they are not particularly helpful for the analysis presented in this paper, as we examine the impacts of past weather conditions for a longer period (1973-2006) and snow making has not become a widespread used technology before the 1990s in Austria. However, it is suggested to include artificial snow indices in other examinations, where the weather sensitivities of recent years are examined.
- Climatologists usually prefer snow day indices to mean snow cover, because the latter may be strongly influenced by outstanding snow conditions. In example, if a lot of snow falls in the late season, while conditions are poor before, mean snow cover might misleadingly indicate a normal ski season. This is avoided by using snow day indices, also known as skiable days. A threshold of 30 cm is commonly assumed for simulations of the ski season length (see e.g. Scott et al. 2003 or Koenig and Abegg, 1997). By visually inspecting our dataset both for the 30 cm and the 1 cm threshold we find though, that the 30 cm threshold includes some seemingly unnatural variability. Especially for some lower lying areas it only indicates zero or one skiable days for many periods, with large outliers in some years. According to the operator of the snow model (Dr. Schöner, ZAMG) higher threshold definitions may be more vulnerable to biased model outputs. Therefore it is seen advantageous to use the 1 cm threshold. Even if it is likely to clearly overestimate the ski season length (as skiing might not be possible, when snow cover is less than 30 cm in some cases) it should be a useful index to indicate the year-to-year variability in snow conditions for winter sport purposes.

Figure 9 illustrates the climatologically mean values for *snow_greater1_alt50* and its standard deviation, while Figure 10 shows the respective significant decadal trends. Similar plots are shown for all other indices in Themeßl, Gobiet and Toeglhofer (2009).

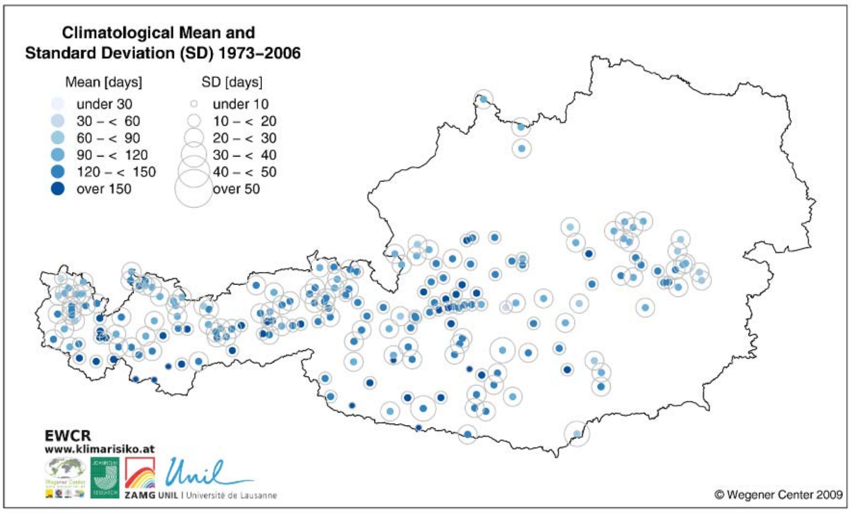

Figure 9: Climatological mean and standard deviation for snow days (>1cm) for the mean altitude of ski areas in the winter seasons 1973-2006 (source: Themeßl, Gobiet and Toeglhofer, 2009).

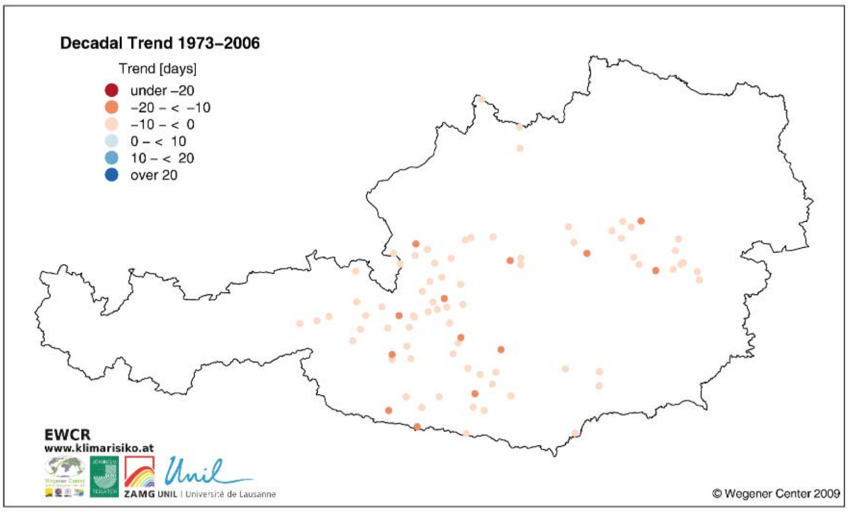

Figure 10: Significant decadal trends for snow days (>1cm) for the mean altitude of ski areas in the winter seasons 1973-2006 (source: Themeßl, Gobiet and Toeglhofer, 2009).

It can be seen from Figure 9, that the climatological mean and standard deviation for snow days (>1cm) in the mean altitude of ski areas vary substantially, whereby higher lying areas generally have higher values and less variability in the data. The examination of trends in the time series solely depicts significant, declining trends (Figure 10). Remarkably, significant negative trends are only found for areas east of the Kitzbueheler Alps. Even lower lying areas trends in Western Austria exhibit no significant decline, although the decline is usually larger for lower lying areas (- 9 days/decade below 1500 meter) than higher lying areas (-7 days/decade).

Another interesting question is to what extent the chosen *snow_greater1_alt50* index is related to other weather index definitions. In Figure 11 a summary of the correlation coefficients for each ski area is given.

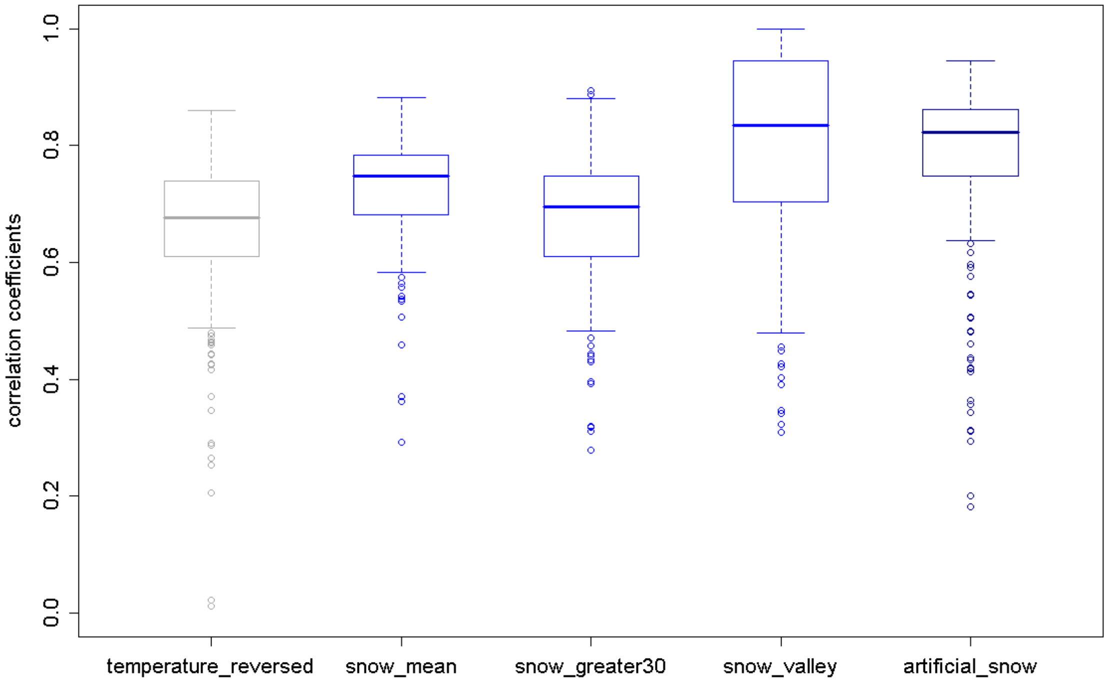

Figure 11: Summary of correlation coefficients between the snow days (>1cm) in the mean altitude of the ski areas and other meteorological parameters

The mean temperature is negatively correlated with the snow days (for comparison reasons it is plotted reversed in Figure 11), which is explained by the fact that higher temperatures both increase the likelihood of rainfall instead of snowfall and come along with higher snow melting rates. The correlation coefficients are quite high for most of the lower lying ski areas, but become lower for areas with a mean altitude over 1500 meter. Generally, the temperature is a quite satisfying proxy, when examining the weather sensitivity of tourism demand on a more aggregate scale and snow data is not available (like in Bigano et al., 2005), but is questionable on the local scale.

Interestingly, the strength of the relationship varies widely among the different snow definitions. The *snow mean* indices correlate better than the *snow_greater30* indices with the *snow_greater1* indices. Especially in lower lying areas (below 1200 meter) the correlations of the *snow_greater30 indices* is weak, which is again explainable by the low year-to-year variability and the therefore somewhat arbitrary values for these indices. The snow conditions between the lowest altitudes and the mean altitudes of the ski areas – the average difference is 506 altitude meter – are much higher related than the values on the same altitude with different definitions (mean, greater30, greater1). The correlation between the artificial snow index and the natural snow cover is above 0.8 for the majority of lower lying areas, but decreases substantially with increasing altitude.

Moreover, it needs to be decided, whether the chosen snow index should be included in the model in a linear of logarithmic form. If the index is taken linear, this would result in a log-linear specification. This means that the corresponding model coefficient indicates the percentage change in tourist nights with one additional snow day. If the index is transformed into the logarithmic scale a log-log interpretation of the coefficient is needed, which means that the percentage change in tourist nights in case of a one percent points change in snow days is given.

The log-log specifications appeals to use for some reasons. Firstly, it is rather the relative than the absolute change in snow days that cause a relative change in tourist nights. If the linear scale is used, a shift from 50 to 40 snow days would be treated in the same extent as a shift from 150 to 140 snow days. If the logarithmic scale is used, a minus 20 percent shift from 50 to 40 would be valued the same as a shift from 150 to 120 snow days. Thus in a log-log specification absolute variations are considered to be more influential for lower levels. Secondly, a log-log specification enables us to more easily compare coefficient with the economic parameters.

However, if a logarithmic scale is used, it is important to be cautious about the nature of the meteorological data. A transformation is not possible, if zero or negative values are included, which is the case with the *snow_greater30* indices and the temperature. Even though temperature could be easily switched from Celsius to Kelvin in order to avoid problems with zeros and negative values, a relative interpretation seems to make little sense anyway. Hence we do not transform temperature to the log scale.

Overall, we expect the number of tourist nights to be positively affected by snow conditions, except for some higher lying areas, which should profit from general poor snow conditions. Lower lying areas, which are easy to access, are supposed to be more snow dependent. If there is enough snow cover in lower lying areas, tourists will tend to go there, as they are usually closer to where they live. This is especially true for those ski areas in Tyrol, Salzburg and Vorarlberg, which are easy to reach from Germany (Bavaria, Baden-Württemberg) and those ski areas in Lower and Upper Austria, which are closer to Vienna compared with competing destinations in Salzburg and Tyrol. In contrast it is expected that higher lying areas benefit more from winters and preceding winters with bad snow conditions, as they are considered to be more snow reliable.

3.1.3 Tourism supply data

In addition to the snow conditions, several other factors are considered, which are likely to influence tourism demand. Firstly, the supply of accommodation is considered, as additional capacities are likely to foster also the number of visitors to an area. Therefore the number of beds in a ski area, given by Statistics Austria (2008b), is incorporated in the model specification and coefficients are predicted to be positive.

Secondly, the supply of transport capacities in the ski areas is also expected to positively influence the number of skiers and respectively tourist nights. However the given data is limited to a certain extent and hence might not be useful for all areas. The origin data from the Austrian ski resort database provide the dates, when cableway capacities were extended, but any information, whether old cableways or drag lifts were replaced (by usually higher capacities) or new cableways were built. Moreover the transport capacity can not be used for areas, which either rely solely on drag lifts or where the cableway capacities have not changed over time, as the variable is constant in these cases.

Thirdly, the inclusion of lagged dependent variables can not only be interpreted to incorporate tourist expectations and habit persistence (as argued in section 3.1.1), but may also be related to constraints on supply. If demand increase rapidly, there might be shortages of accommodations, transportation capacity and trained staff. Similarly, the tourist industry is unlikely to dwindle rapidly, once it has become highly developed. For that reason the partial adjustment mechanism given by the lagged dependent variables is postulated to allow for rigidities in supply (Song, Witt and Li, 2009, p. 7).

3.1.4 Socio-economic data

Furthermore, the tourism forecasting and demand literature suggests that a bundle of economic variables influences the level of tourist nights. We include income and price variables, which are both calculated as shown in section 2.5.

The income elasticity is generally expected to be positive, and if tourism to a specific destination is regarded to be a luxury good, the long-run income elasticity is greater than 1, which was shown by a series of recent studies. The price elasticity is expected to be normally negative, although the magnitudes in recent studies vary considerably (Li, Song and Witt, 2005, S.90)

There is one important difference however between the approach used in this paper and the international literature. While most of the studies are interested in country-to-country elasticities, we rather operate on a regional scale in order to fully understand the meteorological variables. Therefore we do expect the income variables to be generally positive, but due to the high variability given in the regional tourism demand the values are expected to vary significantly. Indeed, there will be areas with negative income coefficients, meaning that higher income lead to less demand in the respective area, as people may wish to shift to other areas, when more income is available.

More critically, the construction of the price variables by using national consumer price indices is expected to have a low explanatory power on the regional scale, as both the prices for tourist goods might deviate from the considered consumer prices and price developments might vary substantially amongst ski areas. One possible way to work with regional data, but estimate aggregate income and price elasticities is the application of panel data methods. For a further discussion how panel data can be used for the estimation of income and price elasticities it is referred to Eigner, Toeglhofer and Prettenthaler (2009).

Some more socio-economic factors are believed to have an important influence on the tourism demand, but are difficult to incorporate in national and especially more regionalized examinations. Hence, we do not include substitute prices, tastes and marketing expenditures in our examination. Substitute prices would be difficult to define for our dataset, because it need not only be defined which national and international regions would be potential substitutes for each of the ski areas, but also to find appropriate measures for prices and the travel cost to alternative destinations. Consumer tastes are even harder to quantify, as they can change as a result of innovation, advertising, changing values and rising living standards. Similarly, appropriate and long-term data about marketing expenditures is difficult to obtain, since sales-promotion activities may take various forms and much activities is not specific to a particular destination.

3.2 STATISTICAL METHODS

For estimating the weather sensitivity of tourist nights we use a general-to-specific modeling approach. Our approach is based on the work done by Song, Wong and Chon (2003), with several notable exemptions. We include meteorological data, operate on a local scale (ski areas) and restrict models using a model selection criterion instead of eliminating variables solely by their t-statistics. More considerations on the choice of the modeling approach, the model specification, the model selection and statistical testing are given in Toeglhofer and Prettenthaler (2009).

We start with a general autoregressive distributed lag model (ADLM), which contains all the variables selected in section 3.1. A lag length of one is chosen for each of the explanatory variables, while three lags are used for the dependant variable. A log-log specification is taken, so that each of the coefficients can be easily interpreted as elasticity. An exemption is the variable representing the transport capacities of the cableways, as it regularly includes zero values (in case that the first cable ways are built after the start of the time series). For this variable a semi-log specification is taken and it must be interpreted accordingly. Formally, the general model for each of the ski areas can be written as:

$$\begin{aligned}\log nights_t &= ß_0 + ß_1 \log nights_{t-1} + ß_2 \log nights_{t-2} + ß_3 \log nights_{t-3} + ß_4 \log snow_t \\ &+ ß_5 \log snow_{t-1} + ß_6 \log beds_t + ß_7 \log beds_{t-1} + ß_8 SBtcap_t + ß_9 SBtcap_{t-1} \\ &+ ß_{10} \log y_t + ß_{11} \log y_{t-1} + ß_{12} \log pp_t + ß_{13} \log pp_{t-1} + \varepsilon_t\end{aligned}$$

nights	*tourist nights in the communities of the ski area*
snow	*snow conditions, defined by the chosen meteorological index (base model: snow_gr1_alt50)*
beds	*beds available in the communities of the ski area*
SBtcap	*transport capacities of cableways in the ski area(in million person meters per hour)*
y	*GDP index*
pp	*Price index*
t	*winter seasons (November-April) between 1973 and 2006*

The Bayesian information criterion (BIC) is chosen for model selection in order to achieve a simple specification for each ski area. The selected models are then tested for autocorrelation, misspecification, heteroscedasticity and normality. A model is seen to be statistical acceptable, when none of the applied tests indicate a violation of the underlying assumptions (based on a critical p-value of 0.05). The statistical tests are denoted as:

bg_auto	*Breusch-Godfrey Test for autocorrelation*
reset_mis	*Ramsey RESET Test for misspecification*
jb_normal	*Jarque-Bera-Test for normality*
bp_hetero	*Breusch-Pagan Test for heteroscedasticity*

When summarizing the results of the models we show the number of inclusions by the model selection criteria for all models as well as only for those, which have been found to be statistical acceptable by all of the statistical tests. In the latter case models are said to be “well-specified”. Furthermore we distinguish between “only well-specified” and “well-specified and significant” coefficients, as in some rare cases p-values of the BIC-selected coefficients are above 0.05. When mentioning “coefficient sums” we refer to the sum of the coefficients of explanatory variables (e.g. for *beds* and its lag *beds1*) and to the sum of the lagged coefficients for *nights*. Coefficient sums are reasonable to use in the common case that the dependency between a variable and its lag is high, because estimates interact strongly and solely interpreting one of them might either over- or underestimate the total effects.

4 Results

We find that the chosen modeling approach does pretty well in determining the climatic impacts on tourism demand in Austrian ski areas over the past decades. Several interesting aspects are found by interpreting the results. A first overview of the coefficients and its prefixes is given in Table 2:

Table 2: Summary of coefficients included in the models (n= 185)

	nights1	nights2	nights3	beds	beds1	snow	snow1	y	y1	pp	pp1	SBtcap	SBtcap1
positive coefficient													
inclusions	126	20	19	52	23	47	16	27	33	24	27	17	25
only well-specified models	76	14	15	28	14	32	8	14	19	13	12	11	17
well-specified and significant	73	9	15	23	11	31	7	14	17	11	10	10	16
negative coefficient													
inclusions	1	9	13	6	13	4	14	19	14	13	21	11	16
only well-specified models	0	5	10	4	8	3	13	15	10	5	13	6	8
well-specified and significant	0	3	7	3	5	3	13	14	9	4	13	3	8
exclusions	58	156	153	127	149	134	155	139	138	148	137	157	144

Overall, the included coefficients show the expected signs in the majority of cases, except with the price variable. The lagged dependent variables *(nights1,nights2,nights3)* are included by the selection criteria in 152 of the 185 model equations, whereby the one year lag is included most often (126 times) and use to be positive in all cases, except one. Same year snow conditions *snow* are selected for 51 and previous year snow conditions *snow1* for 30 of the areas. As expected the *snow* variables are predominantly positive signed (47 out of 51 included cases). Among the supply side variables *beds* and *beds1* represent demand changes in 83 models, with positive signed coefficient sums in 80 percent of the cases. *SBtcap* and *SBtcap1* are included less often (65 models) and are positive in 60 percent and unexpectedly negative in 40 percent of the cases, which suggests that this variable is not particularly helpful. Among the economic variables either the income *y* or its lag *y1* are included 78 times, with a positive coefficient sum given 54 times. More problematic, the price variable *pp* and its lag *pp1* are somewhat difficult to judge with 44 unexpected positive inclusions and 31 expected negative inclusions.

For 107 out of 185 models the tests for autocorrelation, misspecification, heteroscedasticity and normality do not show any violations of the underlying statistical assumptions of OLS. Results for the other 78 models need to be interpreted more carefully and should not be used for policy evaluation. For most of these statistical non-acceptable models either the normality or the heteroscedasticity assumption is violated, or the RESET test indicates model misspecifications. Table 3 summarizes the outcome of the diagnostic tests:

Table 3: Number of models with some form of misspecification detected (incl. double counts)

Diagnositic tests	p-value<0.05
Breusch-Godfrey Test for autocorrelation	11
Jarque-Bera-Test for normality	38
Breusch-Pagan Test for heteroscedasticity	33
Ramsey RESET Test for misspecification	38

More detailed information about the models and the corresponding statistical tests are given in the appendix for each of the ski areas.

4.1 SNOW

4.1.1 Snow coefficients

Same year snow conditions clearly have a positive impact on tourism demand in Austrian areas. The general ADL model estimates (model estimates before selecting the specific models) reveal positive snow coefficients for 139 out of 185 areas, while 47 out of 51 snow coefficients are positive for the selected specific models with altogether 47 coefficients being significant under the 95 % confidence level (see also Table 2).

Noteworthly, these estimates are exact the opposite from what we would expect from static simple regression models, which are often used for explorative analysis of weather dependencies (e.g. in Fleischhacker and Formayer, 2007). In fact, static simple regression models would wrongly leave us with 143 negative and 42 positive coefficients, resulting from suspected spurious correlations between the mostly positive trending tourist nights (see Figure 8) and the predominantly declining number of snow days (see Figure 10). Again, this reveals the importance of using dynamic model specifications, as discussed more closely in Toeglhofer and Prettenthaler (2009).

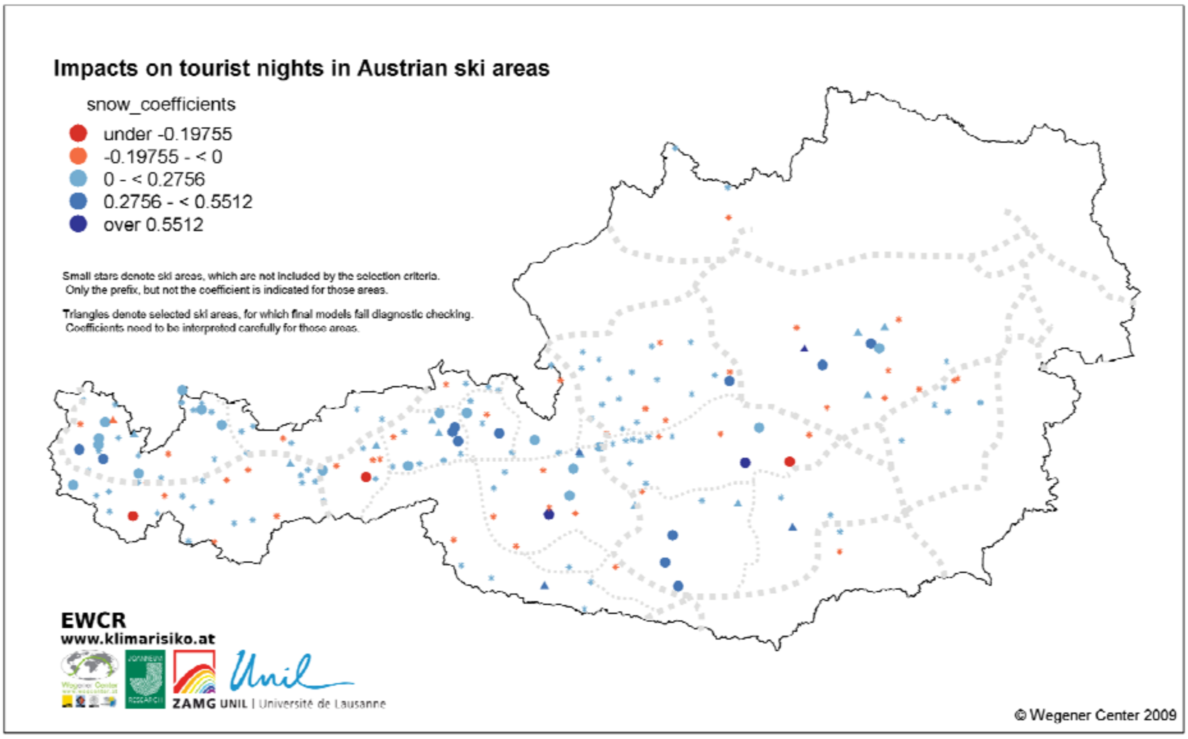

Figure 12: Snow coefficients for Austrian ski areas

Figure 12 illustrates the spatial distribution of the estimated snow coefficients. It is important to keep in mind that these coefficients are estimates for the period 1973 to 2006. Thus, for explaining their levels we have to use historic conditions (road connections, snow conditions, snow making etc.) rather than focusing solely on the present day situation. Remarkably, some clear patterns are observable:

- In Western Austria (Tyrol, Vorarlberg), areas on the north side of the main chain of the Alps seem to be more sensitive to snow conditions than the areas on the south side. Particularly areas in three regions are detected, namely in Central Vorarlberg, in the Tannheimer valley, and in the nowadays largest connected area "Wilder Kaiser/Kitzbueheler Alpen". Notably, these areas have some common characteristics. Road connection to the important German and North European market are favorable compared to other areas in Tyrol and Vorarlberg, which is advantageous in winters with good snow conditions. In contrast, altitude levels are generally lower compared to the more southern areas.

- Snow coefficients tend to be excluded by the model in the more southern areas in Tyrol, as the relationship might not be that straightforward for these mostly higher lying areas. Indeed, two areas with particularly good snow conditions (Galtür and Tux/Hintertux) are found to depend negatively on snow conditions.

- In Salzburg some large areas (Saalbach, Gasteinertal and Hochkoenig) show significant, positive snow coefficients, while further east in the wider Dachstein region (Skiwelt Amade and some areas in Styria and Upper Austria) snow coefficients are predominantly positive, but not chosen by the model any more. Altogether this suggests that snow conditions have an influence in the latter region, but are less important compared to other regions.

- In Southern Austria (Eastern Tyrol, Carinthia, Western Styria) the picture is similar, with mostly positive snow impacts. Significant positive coefficients are mostly found in the Gurktaler Alps, while coefficients tend to be negative in the “Hohe Tauern” range.
- In Lower Austria several areas are depicted to be snow dependent, with more unclear patterns for the other Lower Austrian and nearby Styrian regions. Indeed, areas in these regions are much smaller compared to Western Austrian areas, and therefore the uncertainty level is generally higher (higher variability in the data, a larger share of day trippers etc).

4.1.2 Snow dependencies

The interpretation of the snow coefficient levels in Figure 12 is not instantly possible because of the different variability in the original snow data. The estimates give the percentage change in tourist nights for a one percent change increase in snow days. However, the snow days (in logarithmic scale) vary substantially more in lower than in higher lying areas, and it is necessary to consider not only the coefficients, but also the variability in the data. Therefore, the snow dependency of tourist nights in a ski area is given as the percentage change in tourist nights, when snow days vary by the standard deviation. This can be calculated as:

*Snow dependency = Snow coefficient * Standard deviation (snow)*

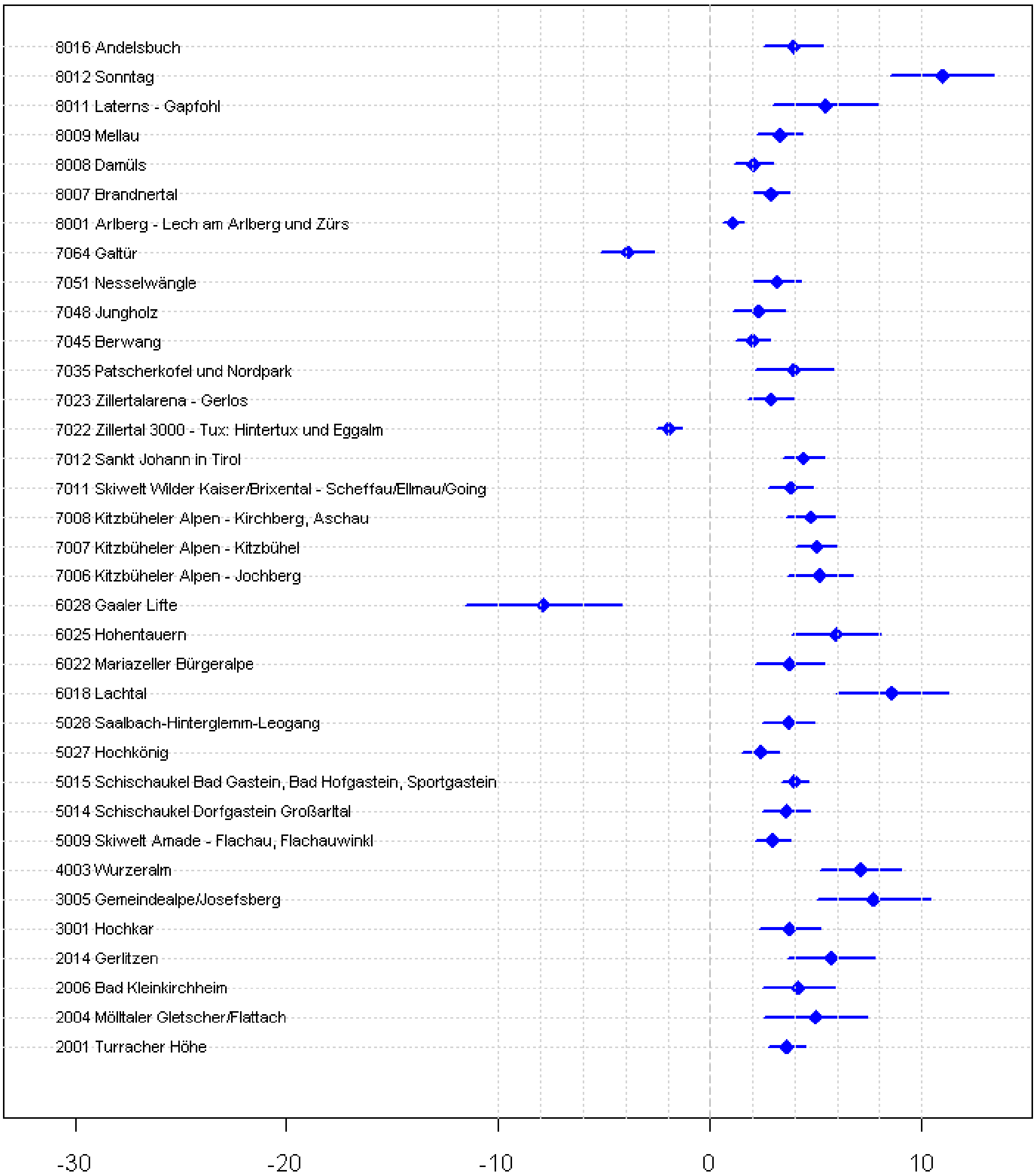

Figure 13: Snow dependency (in % change in tourist nights) in ski areas with significant snow coefficients

Figure 13 illustrates the snow dependency of the ski areas, which have significant snow coefficients and have passed all diagnostic tests. It can be seen that a change in snow days by the standard deviation results in an up to 10 percent change in tourist nights, with a median of 4 percent. A clear relationship can be depicted between the heights of the coefficients and the altitude and size of the areas. The most dependent regions are all characterized by both low lying lowest and mean altitudes (except Lachtal), and below average transport capacities.

Several area specific observations are worthy to mention. Firstly, the similarity of the estimated coefficients for the areas in the region "Wilder Kaiser/Kitzbueheler Alpen" (area codes 7006-7012) is astonishingly high, indicating a closely related evolution in both tourist nights and snow conditions over time within the region. This similarity also reveals that the given snow coefficients are not generated 'randomly' by the model but rather the modeling approach seem to be suitable for determining snow sensitivities.

Secondly, the significant negative coefficients for Galtür and Tux (Zillertal 3000) are easily interpretable. Galtür (1600 to 2300m), unfortunately well-known for an avalanche tragedy in 1999, is rather benefiting from relatively poor snow conditions. Tux is the highest lying of the areas (1300 to 3300m) in the famous Ziller valley, and is relatively to the others more difficult to reach. In the case of good road and traffic conditions the journey takes another 45 minutes from the highway. The interpretation of the third negative coefficient for the Gaaler Lifte (860 to 1230m) is somewhat unclear. The diagnostic checking does not indicate any misspecifications, but the high standard error as well as the exclusion of the *nights1* coefficient (only *nights2* is included) cause doubts about the validity of the selected model.

Thirdly, it be might expected that the glacial area "Mölltaler Gletscher/Flattach" is also negatively affected by snow conditions, as people tend to go to easier accessible areas in snowy winters. However, the indicated positive coefficient might be explained by the fact that ski activities in this area focused for a long period on the lower lying Flattach and first lifts on the glacier were not built before 1987, with major extensions not undertaken before the mid 1990s.

4.1.3 Comparing meteorological parameters

In Figure 14 the model results with the chosen snow day index (greater1_alt50_log) are compared to model runs with alternative definitions of the meteorological parameters. It can be seen that for 104 of the 185 ski areas some form of weather dependency can be found. The numbers of inclusions clearly indicate that log-log specifications detect more weather dependencies than log-linear specifications, and the snow conditions in the mean altitude of the ski areas (alt_50) are more important than the conditions in the lowest altitudes (alt_0). The chosen 1 cm threshold and the mean snow height perform best, when considering only significant (p-value < 0.05) estimates from well-specified models. All in all, the chosen snow definition has been proven to be a suitable indicator.

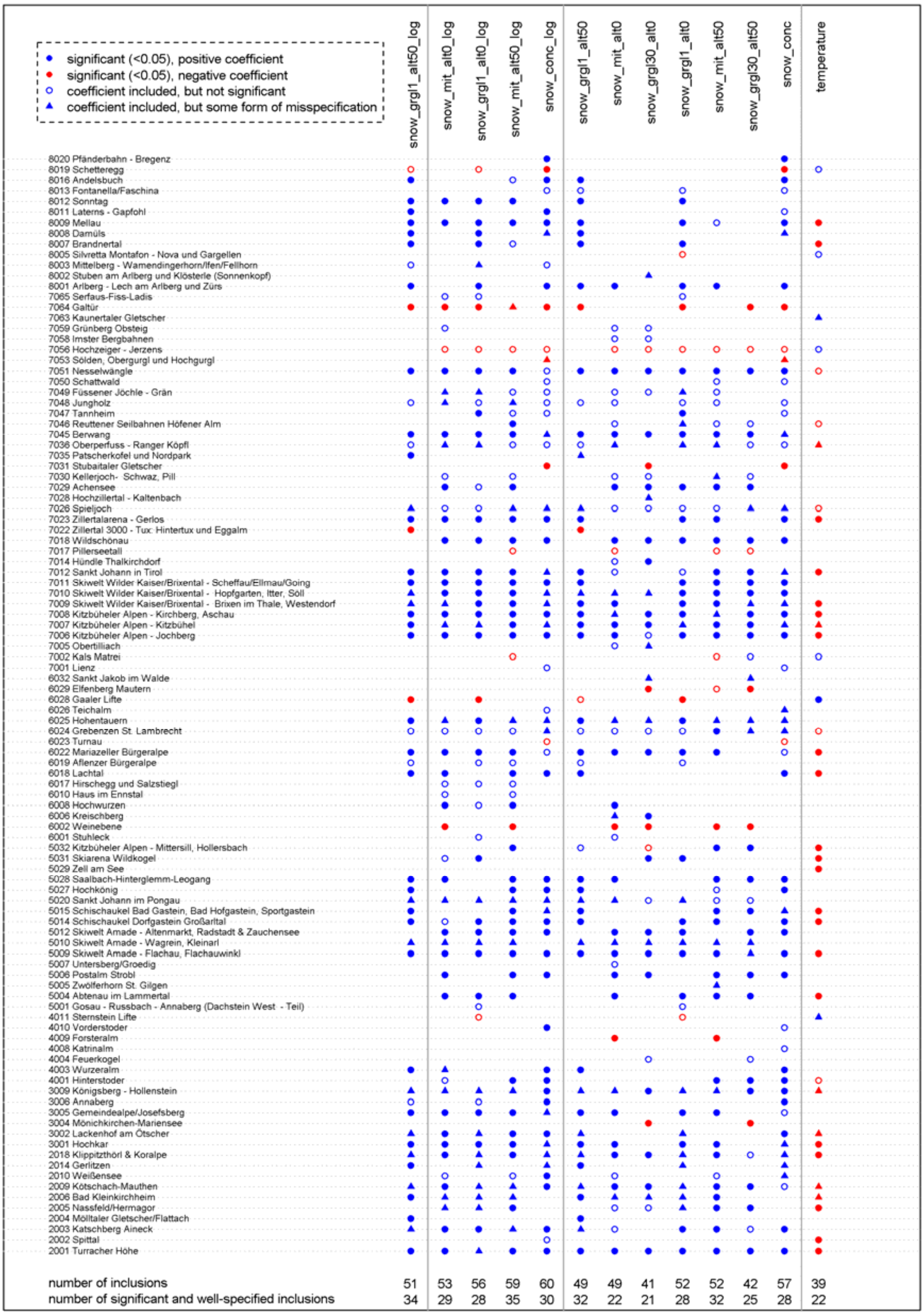

Figure 14: Included coefficients for different meteorological indices

Another interesting research issue is, whether the general snow conditions impact the number of tourist nights more than the local snow conditions. The underlying rationale is that people do not visit lower-lying and generally smaller areas, when they hear that general snow conditions are bad, and do not take the effort to get to higher-lying areas when general snow conditions are good anyway. A snow day index (*snow_conc*), which represents the weighted (by the number of tourist nights in an area) average snow conditions, is constructed to examine this effect.

Although this methodology seems to be rather simple, the results in Figure 14 give some support that the general snow conditions are also important to be considered. In most cases the results obtained with *snow_conc* follow the results for the specific snow conditions in the ski areas (greater1_alt50_log), which is explainable due to the predominantly high relationship between general and specific snow conditions (correlation coefficient for the median ski area: 0.81). Interestingly, some more ski areas are identified by *snow_conc*, which confirm the described rationale. Vorderstoder, Teichalm, Schattwald, Fontanella and the Pfaenderbahn are identified to be positively affected by general snow conditions rather than their own snow conditions. All of these areas can be said to be small and in lower-lying altitudes. In contrast, the Hochzeiger, Soelden (the biggest Austrian area including a glacier area) and the Stubaitaler Gletscher are identified to be negatively dependent on the general snow conditions. These areas particularly profit from their high degree of snow reliability in winters with unfavorable general snow conditions.

4.2 SNOW IN PREVIOUS YEARS

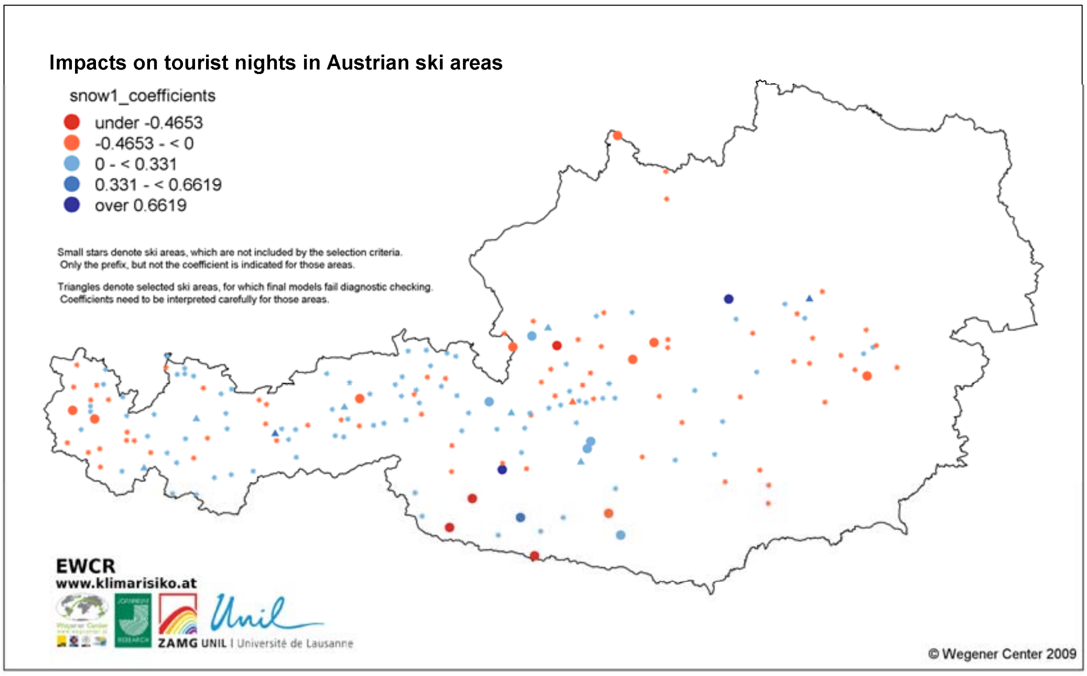

Figure 15: Impacts of snow conditions in the previous year on tourist nights in the ski area

If not the snow conditions in the same, but in the previous year are considered, some more spatial patterns can be depicted (Figure 14), but it is somewhat hard to interpret these patterns. Snow conditions in the previous year tend to affect the tourist nights positive in Tyrol, while the coefficients tend to be negative in Vorarlberg and in parts of Eastern Austria. We suspect that these patterns might be related to the share of foreign tourists for the reason, that foreigners book ski trips more in advance than domestic guests. Therefore, they do not consider the actual but rather the snow conditions in the previous year and tend to revisit ski areas with favorable snow conditions.

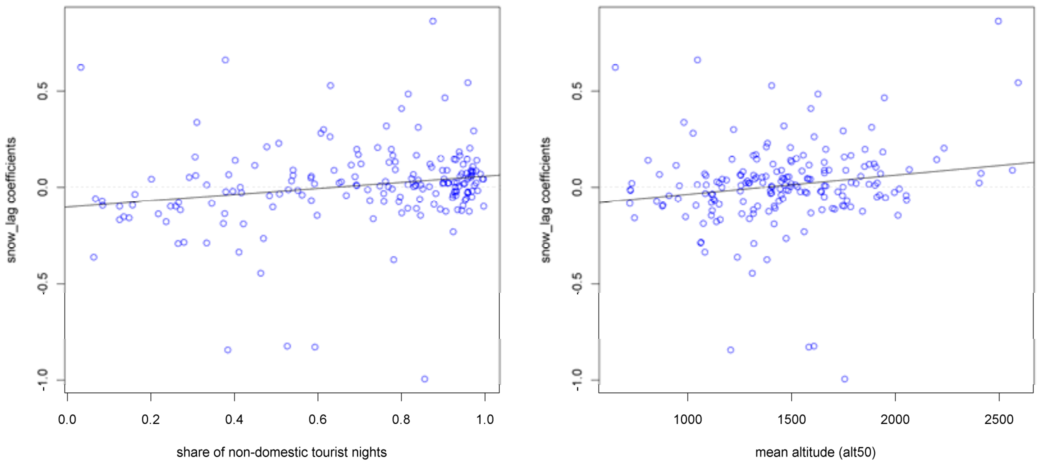

Figure 16: Snow-lag coefficients related to the share of non-domestic tourist nights and the mean altitude

The left plot in Figure 15 depicts that a (non-significant) positive relationship is found between the share of non-domestic tourist nights and the snow-lag coefficients. However, the relationship is rather weak and similar relationships can be found for other indicators as well, like with the mean altitude (as shown in the right plot). Anyway, the snow-lag coefficients are mostly not selected by the selection criteria, and therefore not too much effort is spent to further examine these effects. Overall we conclude, that the underlying model specification (and the seasonal dataset) does not reveal any substantial snow lag effects.

4.3 HABIT PERSISTENCE AND EXPECTATIONS

The introduction of a lagged dependant variable is seen as a major strategy in tourism demand modeling and the results of our modeling approach confirm that the inclusion gives valuable insights also on the local scale. In the vast majority of areas aggregate coefficients (the three different lag levels are summed up) are ranged between 0 and 1, which is expected from theoretical considerations. Stable behavior patterns are assumed, if coefficients are close to 1.

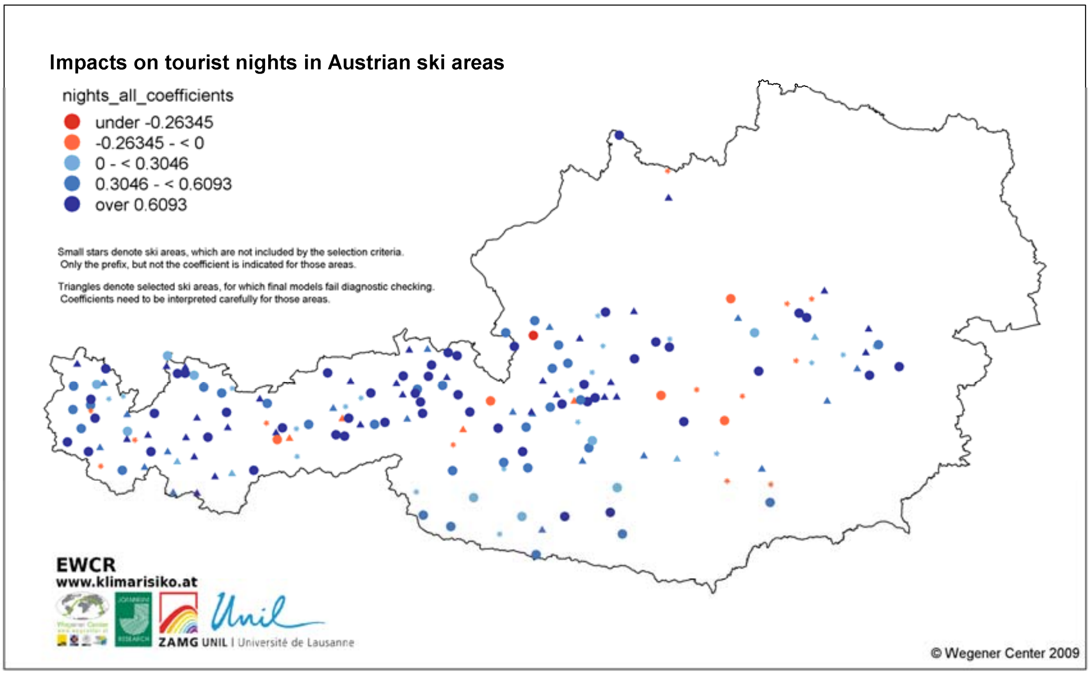

Figure 17: Coefficient sums of the lagged dependent variables

Figure 17 shows the coefficient sums of the lagged dependent variables *nights1*, *nights2* and *nights3*, whereby the estimates are clearly dominated by *nights1*, which is included much more often and its coefficients are generally higher. It can be seen that the coefficient sums tend to be higher in Western Austrian ski areas than in Eastern Austrian areas. This might be possibly explained by size effects and related structural advantages, but caution is needed, as higher modeling uncertainties might be the reason for lower coefficients.

Indeed, there is a (non-significant) positive relationship between ski areas sizes (measured by transport capacity) and the coefficient levels. Again, also on a more regional scale the observation denoted by Song, Witt and Li (2009, p. 7) seems to be appropriate that once the tourist industry in an area has become highly developed, it is more unlikely to dwindle down quickly. In other words, past levels of tourist nights affect the current levels in larger areas more than in smaller areas, which can be also seen in the much lower relative year-to-year variations in the tourist night time series of larger areas.

Large and well-known areas tend to have higher coefficients compared to other areas. Particularly high coefficients are found for some areas in the Ziller valley and the Kitzbueheler Alps. However, larger areas do not automatically come up with high coefficients and vice versa. In example, in contrast to its neighboring areas a clearly below average coefficient of 0.46 is found for Kitzbuehel itself.

In this context it is important to denote that coefficients for individual ski areas should not be taken for granted for methodological reasons. Individual tourist night series are not systematically checked for any area-specific effects or structural breaks. Take the example of Kitzbuehel, where the tourist nights peaked in the 1980s by around 700.000 after some quick growth. In the early 1990s they declined abruptly again to around 550.000 and remained stable since then. In fact, the given data does not explain this two structural breaks sufficiently, which can be easily seen in the residuals of the corresponding model. Moreover, numerous other non-captured effects (like events, changes in the quality of the provided services, changes of reputation etc.) might be influencing the number of tourist nights in a specific area. Hence, before drawing quick conclusions from our rather general modeling approach, more detailed considerations for the specific areas are definitely needed.

4.4 OTHER VARIABLES

Supply side changes are considered by including both the beds available for overnight stays in a ski area and the respective transport capacities. Overall, it is seen that rises in these supply side variables lead to a rise of tourist nights in most of the communities, where these variables were selected (80 percent positive signed coefficient sums for beds and 60 percent signed coefficient sums for transport capacities). It is evident that beds represent supply side changes better than the transport capacities, where the given data is somewhat limited. However, beds remain still a quantitative indicator, which does not express the quality of the supplied services in a community. Especially in communities with dwindling demand a slow adjustment to demand changes takes place. The level of beds often remains at a high level for a while, resulting in a low average utilization.

The interpretation of the economic variables is somewhat more difficult on the regional scale. On the national scale it is expectable that more income in the origin countries is generally related to more tourism demand, which is shown in numerous studies (see Li, Song and Witt, 2005 p. 90). On the local scale though, many more factors influence the strongly varying tourism demand. Therefore positive coefficients occur mainly in those ski areas, where the demand has grown strongly in the examined period, for whatever reason. In other words, the values of the income coefficients heavily depend on the growth rate of the tourist nights in the respective ski areas. Indeed it is questionable to assume that GDP growth in other countries directly causes that tourist activities are growing (positive relationship) in some communities, but are declining (negative relationship) in some others. In this context a closer look would be needed on the quality of services (e.g. indicated by local price levels, accommodation categories etc.) or changes in times of recessions. For a further discussion of recession impacts on tourism demand in Austria it is referred to Smeral (2008).

5 Summary and Conclusions

In this paper we introduce an approach for determining the year-to-year snow sensitivity of tourism demand in Austrian ski areas. The estimation is done based on an extensive dataset containing regionalized tourism, economic and meteorological data, which allows considerations both for a high number of cases (n=185) and a considerable number of seasons (t=34). A general-to-specific modeling approach is applied, starting from an autoregressive distributed lag model (ADLM). Final models are selected by the Bayesian information criterion (BIC) and are then tested for autocorrelation, misspecification, heteroscedasticity and normality.

We find that in the examined period 1973 to 2006 the number of tourist nights in the ski areas is highly dependent on snow conditions, incorporated into the model by the number of days with more than one centimeter of snow in the mean altitudes of the ski areas. Snow estimates are positive for 139 out of the 185 general models, which is surprisingly high and indicates the fundamental importance of snow for the Austrian tourism industry. For the selected specific models snow coefficients are positive in 47 cases (44 significant under the 95 % confidence interval) and negative in only 4 cases (3 significant). It can be seen that a change in snow days by the standard deviation results in an up to ten percent change in tourist nights, with a four percent change in the median ski area (with a significant coefficient). A clear relationship can be depicted between the heights of the coefficients and the altitude and size of the areas. The most dependent regions are mostly characterized by both low lying lowest and mean altitudes and below average transport capacities. In contrast, negative coefficients (more snow result in less tourist nights) are found for Galtür and Tux (Zillertal 3000).

Moreover, we examine the ski areas dependency on other meteorological parameters and the general snow conditions. Overall for 104 of the 185 ski areas some clear statistical dependency can be found for at least one of the tested snow and temperature indices (by that the index is chosen by the selection criteria to explain changes in tourist nights).The numbers of inclusions clearly indicate that log-log specifications detect more weather dependencies than log-linear specifications. This is intuitive, because it is rather than the absolute changes in snow days that cause a relative change in tourist nights. In other words, if the linear scale is used, a shift from 50 to 40 snow days is treated in the same extent as a shift from 150 to 140 snow days, which is unlikely to be the case for weather dependencies in reality. Likewise, more dependencies are found, when the snow conditions in the mean altitudes instead of the lowest altitudes of the ski areas were considered. This might indicate that guest's decisions are influenced more by whether skiing is possible in most parts of an area rather than by the availability of valley runs at any time. Interestingly, some more areas are revealed to be dependent on the general Austrian (weighted-average) snow conditions instead of the area-specific snow conditions. In example, Soelden (the biggest Austrian area including a glacier area), the Hochzeiger area and the Stubaitaler Gletscher are identified to be negatively dependent on the general snow conditions.

In addition to the meteorological parameters we also include several indicators representing habit persistence, tourism supply and respectively economic activities in the origin countries. The inclusion of lagged dependent variables in the models show that also on the regional scale habit persistence and tourist expectations play an important role. Therefore dynamic model specifications, as the ADL model presented in this paper, are particularly useful for reducing the problem of autocorrelation in the error terms. Considering both, the development of tourist beds and the transport capacities of cableways in the ski areas as tourism supply indicators, we find that especially the former are beneficial for explaining variability in tourism demand. Furthermore, income and price variables are constructed for each ski area by considering GDP and relative (to Austrian levels) consumer price indices in origin countries, weighted by the country shares in the area. However, we find that this approach is not particularly beneficial, as especially on the regional scale many more unknown factors influence tourism demand. Consequently it is recommended to either use more detailed regional economic data, or rather work on the aggregate national or at least provincial level.

Basic data evaluations for the ski area specific information (altitudes, transport capacities) reveal some misconceptions in recent climate impact studies for Austria (e.g. Abegg et al. 2007). Firstly, by solely taking into account the mean between the lowest and highest altitude of ski areas the (current) potential of ski areas for shifting activities to higher altitudes in periods with unfavorable snow conditions is clearly underestimated. Indeed, the majority of areas provide transport capacities rather in the upper range of their altitudes and we find it more appropriate to weight altitudes by the location of all the transport capacities. Secondly, alarmism is fostered by simply counting the number of ski areas with a mean altitude below a certain threshold and neglecting differences in size. In this paper it is found that the mean altitude of 28 percent of the areas is below 1200 meters, but these areas only make up 8 percent of the transport capacities. Analogously, areas below 1500 meters account for 66 percent of the total number of areas, but for only 39 percent of the transport capacity.

All in all, the results give several implications for future work. Firstly, we showed that for understanding the interaction between the climate and economic activities it is especially important to consider the relationship between supply factors (such as weather conditions) and tourism demand, rather than considering solely supply changes (e. g. through the 100-days rule and examinations of the snow-reliability line). Secondly, snow making is seen as a major adaptation strategy by ski lift operators in Austria (although the diffusion should not be exclusively linked to climate conditions). As indicated by Steiger and Mayer (2008), even at lower altitudes snow making might still be possible climatically under a 2°C warming scenario, but the intensification of capacity will lead to significantly higher operation costs. Thus, the sensitivity of winter tourism is rather seen to depend on the economic adaptive capacity of ski areas than on the reliability line of natural snow cover. This reveals the necessity for an integrated assessment of climatic factors determining the natural snow cover and the conditions for snow making and economic factors, such as the costs of adaptive strategies and their benefits (e.g. reductions in the snow sensitivity of tourism demand).

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7 Appendix

7.1 APPENDIX 1: SKI AREAS AND CORRESPONDING COMMUNITIES

ID	ski area	communities	communities (indirect skiing activities)
2001	Turracher Höhe	Reichenau Predlitz-Turrach	
2002	Spittal	Baldramsdorf Spittal an der Drau Seeboden	
2003	Katschberg Aineck	Katschberg Aineck	
2004	Mölltaler Gletscher/Flattach	Flattach	Obervellach
2005	Nassfeld/Hermagor	Hermagor-Pressegger See	Gitschtal
2006	Bad Kleinkirchheim	Bad Kleinkirchheim	Radenthein Feld am See
2007	Innerkrems	Krems in Kärnten	
2008	Ankogel Mallnitz	Mallnitz	
2009	Kötschach-Mauthen	Kötschach-Mauthen	
2010	Weißensee	Weißensee	
2011	Flattnitz	Glödnitz	
2012	Hochrindl	Albeck	
2013	Simonhöhe	St. Urban	
2014	Gerlitzen	Treffen am Ossiacher See Steindorf am Ossiacher See Feldkirchen in Kärnten	
2015	Verditz	Afritz am See	
2016	Dreiländereck	Arnoldstein	
2017	Petzen	Feistritz ob Bleiburg	
2018	Klippitzthörl & Koralpe	Wolfsberg Bad St. Leonhard im Lavanttal	
2019	Hebalm	Preitenegg	
2020	Emberger Alm	Berg im Drautal	
2021	Heiligenblut	Heiligenblut	
3001	Hochkar	Göstling an der Ybbs	
3002	Lackenhof am Ötscher	Gaming	
3003	Hirschenkogel	Semmering	
3004	Mönichkirchen-Mariensee	Aspangberg-St. Peter Mönichkirchen	
3005	Gemeindealpe/Josefsberg	Mitterbach am Erlaufsee	
3006	Annaberg	Annaberg	
3007	Sankt Corona am Wechsel	St. Corona am Wechsel	
3008	Türnitz	Türnitz	
3009	Königsberg - Hollenstein	Hollenstein an der Ybbs	
3010	Puchenstuben	Puchenstuben	
3011	Reichenau an der Rax	Reichenau an der Rax	
3012	Puchberg am Schneeberg	Puchberg am Schneeberg	
3013	Maria Schutz	Schottwien	
4001	Hinterstoder	Hinterstoder	Klaus an der Pyhrnbahn
4002	Kasberg - Grünau	Grünau im Almtal	
4003	Wurzeralm	Spital am Pyhrn	Edlbach
4004	Feuerkogel	Ebensee	
4005	Gmunden	Gmunden	
4006	Hochficht	Klaffer am Hochficht Schwarzenberg am Böhmerwald Aigen im Mühlkreis	Schlägl
4007	Krippenstein/Obertraun	Obertraun	
4008	Katrinalm	Bad Ischl	
4009	Forsteralm	Gaflenz	Weyer Land

4010	Vorderstoder	Vorderstoder	Edlbach Windischgarsten
4011	Sternstein Lifte	Bad Leonfelden	
4012	Kirchschlag bei Linz	Kirchschlag bei Linz	
5001	Gosau - Russbach - Annaberg (Dachstein West - Teil)	Gosau Rußbach am Paß Gschütt Annaberg-Lungötz	
5002	Gaißau Hintersee	Krispl Hintersee	
5003	Hallein Dürrnberg	Hallein	
5004	Abtenau im Lammertal	Abtenau	
5005	Zwölferhorn St. Gilgen	Sankt Gilgen	
5006	Postalm Strobl	Strobl	
5007	Untersberg/Groedig	Grödig	
5008	Faistenau	Faistenau	
5009	Skiwelt Amade - Flachau, Flachauwinkl	Flachau	
5010	Skiwelt Amade - Wagrein, Kleinarl	Wagrain Kleinarl	
5011	Skiwelt Amade - Filzmoos	Filzmoos	
5012	Skiwelt Amade - Altenmarkt, Radstadt & Zauchensee	Altenmarkt im Pongau Radstadt	
5013	Skiwelt Amade - Eben	Eben im Pongau	Hüttau
5014	Schischaukel Dorfgastein Großarltal	Großarl Dorfgastein Lend	
5015	Schischaukel Bad Gastein, Bad Hofgastein, Sportgastein	Bad Gastein Bad Hofgastein	
5016	Obertauern	Untertauern Tweng	
5017	Fageralm Forstau	Forstau	
5018	Werfenweng	Werfenweng	
5019	Goldegg	Goldegg	
5020	Sankt Johann im Pongau	Sankt Johann im Pongau	
5022	Grosseck Speiereck	Mauterndorf	
5023	Fanningberg Mariapfarr	Mariapfarr Weißpriach	Göriach Sankt Andrä im Lungau
5024	Rauris	Rauris	
5025	Kaprun Kitzsteinhorn und Maiskogel	Kaprun	Piesendorf Niedernsill
5026	Weißsee	Uttendorf	
5027	Hochkönig	Mühlbach am Hochkönig Dienten am Hochkönig Maria Alm am Steinernen Meer Saalfelden am Steinernen Meer	Taxenbach
5028	Saalbach-Hinterglemm-Leogang	Saalbach-Hinterglemm Leogang	Maishofen Viehhofen
5029	Zell am See	Zell am See	Bruck an der Großglocknerstraße
5030	Loferer Almbahnen	Lofer Unken Sankt Martin am Tennengebirge	Sankt Martin bei Lofer
5031	Skiarena Wildkogel	Neukirchen am Großvenediger Bramberg am Wildkogel	
5032	Kitzbüheler Alpen - Mittersill, Hollersbach	Mittersill Hollersbach im Pinzgau	
5033	Zillertalarena - Wald/Krimml	Wald im Pinzgau Krimml	
6001	Stuhleck	Spital am Semmering	
6002	Weinebene	Trahütten	
6003	Veitsch	Veitsch	
6004	Niederalpl	Mürzsteg	
6005	Lammeralm	Langenwang	
6006	Kreischberg	Sankt Georgen ob Murau	
6007	Schladming	Schladming	
6008	Hochwurzen	Rohrmoos-Untertal	
6009	Reiteralm	Pichl-Preunegg	
6010	Haus im Ennstal	Haus	
6011	Skiregion Ramsau/Dachstein	Ramsau am Dachstein	
6012	Tauplitz	Tauplitz Bad Mitterndorf	
6013	Loser	Altaussee	
6014	Präbichl	Vordernberg	
6015	Riesneralm	Donnersbachwald	

6016	Planneralm	Donnersbach	
6017	Hirschegg und Salzstiegl	Hirschegg Pack	
6018	Lachtal	Schönberg-Lachtal	
6019	Aflenzer Bürgeralpe	Aflenz Kurort	
6020	Rieseralm	Obdach	
6021	Galsterbergalm	Pruggern	Michaelerberg
6022	Mariazeller Bürgeralpe	Mariazell	
6023	Turnau	Turnau	
6024	Grebenzen St. Lambrecht	Zeutschach Sankt Lambrecht	
6025	Hohentauern	Hohentauern	
6026	Teichalm	Fladnitz an der Teichalm	
6027	Hauereck	St. Kathrein am Hauenstein	
6028	Gaaler Lifte	Gaal	
6029	Elfenberg Mautern	Mautern in Steiermark	
6030	Alpl	Krieglach	
6031	Stoderzinken	Gröbming	
6032	Sankt Jakob im Walde	Sankt Jakob im Walde	
7001	Lienz	Gaimberg Lienz Nußdorf-Debant	
7002	Kals Matrei	Matrei in Osttirol Kals am Großglockner	
7003	Sankt Jakob in Defereggen	St. Jakob in Defereggen	
7004	Sillian Hochpustertal	Sillian	Kartitsch Heinfels
7005	Obertilliach	Obertilliach	
7006	Kitzbüheler Alpen - Jochberg	Jochberg	
7007	Kitzbüheler Alpen - Kitzbühel	Kitzbühel Reith bei Kitzbühel	Aurach bei Kitzbühel
7008	Kitzbüheler Alpen - Kirchberg, Aschau	Kirchberg in Tirol	
7009	Skiwelt Wilder Kaiser/Brixental - Brixen im Thale, Westendorf	Brixen im Thale Westendorf	
7010	Skiwelt Wilder Kaiser/Brixental - Hopfgarten, Itter, Söll	Hopfgarten im Brixental Itter Söll Thiersee Wörgl	Angath
7011	Skiwelt Wilder Kaiser/Brixental - Scheffau/Ellmau/Going	Ellmau Scheffau am Wilden Kaiser Going am Wilden Kaiser	
7012	Sankt Johann in Tirol	St. Johann in Tirol Oberndorf in Tirol	
7013	Fieberbrunn	Fieberbrunn	
7014	Hündle Thalkirchdorf	Kirchdorf in Tirol	
7015	Waidring Steinplatte	Waidring	
7016	Kössen	Kössen	Schwendt
7017	Pillerseetall	St. Ulrich am Pillersee	
7018	Wildschönau	Wildschönau	
7019	Alpbachtal	Alpbach Reith im Alpbachtal	
7020	Kramsach	Kramsach	
7021	Zahmer Kaiser/Walchsee	Walchsee	
7022	Zillertal 3000 - Tux: Hintertux und Eggalm	Tux	
7023	Zillertalarena - Gerlos	Gerlos	
7024	Zillertarena - Zell am Ziller	Zell am Ziller Hainzenberg Gerlosberg Rohrberg	Hippach Ramsau im Zillertal Zellberg
7025	Zillertal: Ahorn, Penken, Rastkogel, Horberg	Mayrhofen Schwendau Finkenberg	
7026	Spieljoch	Fügen	
7027	Hochfügen	Fügenberg	Bruck am Ziller Schlitters Hart im Zillertal
7028	Hochzillertal - Kaltenbach	Kaltenbach Aschau im Zillertal Stummerberg	Ried im Zillertal Stumm Uderns Strass im Zillertal
7029	Achensee	Achenkirch Eben am Achensee	
7030	Kellerjoch- Schwaz, Pill	Pill	Schwaz
7031	Stubaitaler Gletscher	Neustift im Stubaital	

7032	Seefeld - Rosshütte und Gschwandtkopf	Seefeld in Tirol Reith bei Seefeld	
7033	Axamer Lizum	Axams	Kematen in Tirol Götzens
7034	Mutterer Alm	Mutters	
7035	Patscherkofel und Nordpark	Innsbruck Patsch	Aldrans Ellbögen Lans
7036	Oberperfuss - Ranger Köpfl	Oberperfuss	
7037	Schlick 2000	Fulpmes Telfes im Stubai	Schönberg im Stubaital
7038	Glungezer	Tulfes	
7039	Bergeralm - Steinach am Brenner	Steinach am Brenner	Matrei am Brenner Mühlbachl Pfons
7040	Serlesbahnen Mieders	Mieders	
7041	Leutasch	Leutasch	
7042	Ehrwald - Zugspitzbahn, Wetterstein und Almbahn	Ehrwald	
7043	Grubigsteinbahnen Lermoos	Lermoos	
7044	Marienbergbahnen Biberwier	Biberwier	
7045	Berwang	Berwang Bichlbach	
7046	Reuttener Seilbahnen Höfener Alm	Höfen	Lechaschau Wängle
7047	Tannheim	Tannheim	
7048	Jungholz	Jungholz	
7049	Füssener Jöchle - Grän	Grän	
7050	Schattwald	Schattwald	
7051	Nesselwängle	Nesselwängle	
7052	Jöchelspitze - Bach	Bach	
7053	Sölden, Obergurgl und Hochgurgl	Sölden	Sautens Umhausen Wenns
7054	Pitztaler Gletscher	St. Leonhard im Pitztal	Arzl im Pitztal
7055	Oetz/Hochoetz	Oetz	
7056	Hochzeiger - Jerzens	Jerzens	Roppen
7057	Kühtai	Silz	
7058	Imster Bergbahnen	Imst	Karrösten
7059	Grünberg Obsteig	Obsteig	
7060	Nauders	Nauders	
7061	Ischgl (Silvretta Arena ohne Samnaun CH)	Ischgl	
7062	Kappl	Kappl	
7063	Kaunertaler Gletscher	Kaunertal	
7064	Galtür	Galtür	
7065	Serfaus-Fiss-Ladis	Serfaus Fiss Ladis	Pfunds Tösens
7066	Landeck - Zams - Fließ	Zams Fließ Landeck	
7067	See	See	
7068	Fendels-Ried- Prutz	Fendels Prutz Ried im Oberinntal	Kauns
7069	Pettneu am Arlberg	Pettneu am Arlberg	
7070	Arlberg - Sankt Anton/Sankt Christoph	St. Anton am Arlberg	Flirsch
8001	Arlberg - Lech am Arlberg und Zürs	Lech	Steeg Holzgau
8002	Stuben am Arlberg und Klösterle (Sonnenkopf)	Klösterle	Dalaas
8003	Mittelberg - Wamendingerhorn/Ifen/Fellhorn	Mittelberg	
8004	Warth- Schröcken	Warth Schröcken	Au
8005	Silvretta Montafon - Nova und Gargellen	St. Gallenkirch Gaschurn	
8006	Silvretta Montafon - Hochjoch, Silbertal	Schruns Silbertal	Bartholomäberg
8007	Brandnertal	Brand Bürserberg Bürs	Bürs
8008	Damüls	Damüls	
8009	Mellau	Mellau	
8010	Diedamskopf	Schoppernau	

8011	Laterns - Gapfohl	Laterns			
8012	Sonntag	Sonntag			
8013	Fontanella/Faschina	Fontanella			
8014	Böderle - Schwarzenberg	Schwarzenberg			
8015	Alpenarena Hochhäderich - Hittisau	Hittisau			
8016	Andelsbuch	Andelsbuch	Bizau		Schnepfau
8017	Golm im Montafon	Tschagguns	Vandans		
8018	Alberschwende	Alberschwende			
8019	Schetteregg	Egg			
8020	Pfänderbahn - Bregenz	Bregenz			
8021	Muttersberg - Bludenz	Bludenz			
8022	Dornbirn	Dornbirn			

7.2 APPENDIX 2: ESTIMATES FOR THE DEMAND MODELS

	2001	2002	2003	2004	2005	2006	2008	2009	2010	2014	2018	2019
(Intercept)	2.629 **	0.1701	1.7311 **	-3.8394	4.4218 **	1.621	4.6954 ***	-0.8836	0.5817 *	1.1206	4.4797 ***	-15.331 ***
	(1.2006)	(1.2831)	(0.6343)	(2.8341)	(1.9685)	(1.3357)	(1.6807)	(3.2585)	(0.3378)	(1.256)	(1.0549)	(4.4875)
nights1	0.4699 ***	0.7553 ***	0.432 ***		0.9865 ***	0.8721 ***	0.5953 ***		0.6995 ***	0.4088 ***		
	(0.1245)	(0.1464)	(0.0792)		(0.1579)	(0.061)	(0.1447)		(0.1213)	(0.1248)		
nights2					-0.3844 **							
					(0.148)							
nights3	-0.2503 *								-0.3113 ***			
	(0.126)								(0.1098)			
beds	0.4778 ***	0.4142 ***	0.4777 ***		0.6071 ***			0.5486 **				0.8341 ***
	(0.1528)	(0.1016)	(0.0902)		(0.1979)			(0.2158)				(0.2995)
beds1	-0.2622	-0.3288 ***						-0.617 ***		0.3254 ***		
	(0.1569)	(0.1125)						(0.208)		(0.1169)		
snow	0.3703 ***		0.0946 **	0.8268 **		0.279 **		0.3655 ***		0.2979 ***	0.5389 ***	
	(0.0874)		(0.0406)	(0.4017)		(0.1128)		(0.0699)		(0.1069)	(0.1824)	
snow1			0.1548 ***	0.9929 **	-0.9306 **	-0.2657 **				0.2876 **		
			(0.0412)	(0.3729)	(0.3549)	(0.1081)				(0.1149)		
y	0.311 ***	2.2122 **		2.3916 ***					0.6328 ***			
	(0.0789)	(0.8207)		(0.7261)					(0.1357)			
y1		-2.0353 **		-1.8915 **				0.9676 ***			0.3983 ***	1.8908 ***
		(0.7951)		(0.6963)				(0.2331)			(0.0338)	(0.3604)
pp								9.1802 ***	-7.0095 ***			
								(2.06)	(2.4389)			
pp1			3.5316 ***						4.2335 *			9.002 **
			(0.6512)						(2.2633)			(3.6366)
SBtcap	-0.0515 *									0.1052 ***		
	(0.0266)									(0.0267)		
SBtcap1	0.0869 ***		0.048 ***	0.2153 ***								
	(0.0275)		(0.0083)	(0.0194)								
bg_auto	1.654	0.318	4.078**	0.045	0.251	1.869	2.558	0.12	0.543	0.073	1.767	0.829
pvalue	0.198	0.573	0.043	0.832	0.617	0.172	0.11	0.729	0.461	0.787	0.184	0.363
reset_mis	1.117	0.584	0.079	0.145	1.187	2.055	0.125	6.087***	9.672***	1.949	5.714***	0.429
pvalue	0.347	0.565	0.924	0.866	0.322	0.148	0.883	0.007	0.001	0.163	0.008	0.655
jb_normal	0.735	1.152	0.929	1.301	0.378	0.332	0.342	1.762	18.474***	0.341	0.826	0.022
pvalue	0.692	0.562	0.628	0.522	0.828	0.847	0.843	0.414	0	0.843	0.662	0.989
bp_hetero	7.668	1.639	10.388	6.438	0.771	5.984	0	3.615	2.325	6.774	2.111	12.39***
pvalue	0.467	0.897	0.109	0.266	0.942	0.112	0.988	0.606	0.803	0.238	0.348	0.006

	2020	2021	3001	3002	3003	3004	3005	3006	3008	3009	3011	3013
(Intercept)	6.2388 ***	10.1485 ***	5.0566 ***	9.9474 ***	7.5508 ***	0.7323	-1.0163	3.5452 ***	6.2116 **	-0.7624	1.1967	5.2459 ***
	(1.4635)	(2.5624)	(1.5101)	(0.3736)	(0.7179)	(0.4852)	(0.766)	(0.9022)	(2.3138)	(1.011)	(0.8987)	(1.444)
nights1		0.5069 ***				0.7411 ***	0.9011 ***		0.7979 ***	0.3566 **	0.8849 ***	0.6907 ***
		(0.1468)				(0.1126)	(0.049)		(0.0908)	(0.1536)	(0.0846)	(0.1849)
nights2			0.1019									-0.3478 *
			(0.0924)									(0.1834)
nights3	0.1967 **											
	(0.0779)											
beds	0.455 ***				0.486 ***					0.5664 ***		
	(0.0779)				(0.0991)					(0.1718)		
beds1		-0.5942 *				0.2757 *		0.6938 ***	-0.2645 **			
		(0.299)				(0.1386)		(0.1345)	(0.1198)			
snow			0.4143 **	0.2311 ***			0.4142 ***	0.1347		0.6409 ***		
			(0.1578)	(0.0787)			(0.1436)	(0.1062)		(0.1762)		
snow1	0.3893 *							0.3439 ***				
	(0.2073)							(0.1092)				
y	-0.313 ***											
	(0.0551)											
y1			0.3124 ***						-0.254 ***			
			(0.0817)						(0.0889)			
pp			0.2335		1.116 ***							
			(0.1597)		(0.3658)							
pp1	-6.0022 ***	1.5938 ***	-0.4621 ***					-0.5468 ***		-0.5077 *		
	(1.7981)	(0.562)	(0.1647)					(0.1008)		(0.2615)		
SBtcap			-0.0881		0.0643							
			(0.0529)		(0.0411)							
SBtcap1		0.0954 **										
		(0.0362)										
bg_auto	0.578	0.137	0.447	2.704*	2.039	2.713*	1.034	0.816	0.945	0.128	0.165	0.677
pvalue	0.447	0.711	0.504	0.1	0.153	0.1	0.309	0.366	0.331	0.72	0.685	0.411
reset_mis	1.071	0.161	0.58	1.524	0.157	2.89*	0.156	1.115	2.482	5.291**	3.178*	0.152
pvalue	0.359	0.852	0.568	0.234	0.855	0.072	0.856	0.343	0.102	0.012	0.057	0.86
jb_normal	1.486	0.192	4.082	13.231***	8.633**	1.123	1.201	6.69**	8.58**	3.375	0.326	0.792
pvalue	0.476	0.908	0.13	0.001	0.013	0.57	0.548	0.035	0.014	0.185	0.85	0.673
bp_hetero	1.402	6.008	3.955	0.015	3.958	3.353	0.697	2.523	7.036*	4.977	10.068***	1.785
pvalue	0.924	0.199	0.683	0.903	0.266	0.187	0.706	0.64	0.071	0.29	0.002	0.41

	4001	4002	4003	4004	4005	4006	4007	4008	4009	4010	4011	4012
(Intercept)	5.343 ***	3.5014 ***	2.2253	16.3282 ***	1.9609 *	4.9087 ***	11.0232 ***	1.4256	-11.1485 ***	10.483 ***	13.0323 ***	1.2687 *
	(0.9053)	(0.9238)	(1.44)	(0.4884)	(1.0372)	(1.3158)	(0.0529)	(1.0528)	(2.355)	(0.2398)	(0.3912)	(0.7153)
nights1	0.7435 ***	0.7946 ***			0.3716 **	0.6393 ***		0.8791 ***				0.8475 ***
	(0.0611)	(0.0437)			(0.167)	(0.1136)		(0.0892)				(0.0838)
nights2			0.7112 ***		0.4304 **							
			(0.1296)		(0.1586)							
nights3									-0.2616 **			
									(0.1205)			
beds		-0.1977 *							0.949 ***			
		(0.1089)							(0.2667)			
beds1												
snow			0.536 ***									
			(0.1439)									
snow1	-0.2528 ***					-0.2516 **			0.814 ***			
	(0.0838)					(0.0936)			(0.1856)			
y	-1.3553 **		-0.1695 **						1.2041 ***			
	(0.5876)		(0.0656)						(0.1915)			
y1	1.2458 **			-0.6509 ***						0.102 ***	-0.3265 ***	
	(0.5628)			(0.0508)						(0.0249)	(0.0403)	
pp		-2.3779 *			7.6465 **				21.2675 ***			
		(1.2475)			(3.1023)				(3.1564)			
pp1		3.2892 **	9.5213 ***				3.5601 ***					
		(1.274)	(2.9793)				(0.9509)					
SBtcap						0.1311 ***						
						(0.0445)						
SBtcap1							-0.7705 ***					
							(0.1572)					
bg_auto	0.009	0.044	0.003	1.683	0.386	0.003	0.372	0.475	2.81*	0.44	0.059	2.377
pvalue	0.923	0.835	0.955	0.195	0.534	0.957	0.542	0.491	0.094	0.507	0.808	0.123
reset_mis	0.651	4.534**	0.183	2.397	1.441	0.175	5.368**	4.036**	1.853	0.012	1.029	1.596
pvalue	0.53	0.02	0.834	0.109	0.255	0.84	0.011	0.028	0.179	0.989	0.37	0.22
jb_normal	1.104	0.276	1.028	3.437	1.622	0.432	2.962	0.908	1.937	0.005	101.029***	84.64***
pvalue	0.576	0.871	0.598	0.179	0.444	0.806	0.227	0.635	0.38	0.998	0	0
bp_hetero	2.741	3.022	2.199	1.24	2.096	0.992	0.297	2.431	5.32	0.209	1.001	2.023
pvalue	0.602	0.554	0.699	0.265	0.553	0.803	0.862	0.119	0.378	0.647	0.317	0.155

	5001	5002	5003	5004	5005	5006	5007	5008	5009	5010	5011	5012
(Intercept)	9.1765 ***	-7.7626 ***	2.9642 **	4.5937 ***	-0.0889	4.2557	-4.6301 ***	4.507 ***	3.7245 ***	0.1733	7.4096 ***	3.0731 ***
	(1.2931)	(1.736)	(1.4346)	(1.0981)	(1.9524)	(2.6765)	(1.5795)	(1.0345)	(0.8832)	(0.69)	(1.1498)	(0.4939)
nights1			0.4902 ***	0.4628 ***	0.5102 ***	0.614 ***	0.3381 ***		0.5119 ***	0.6077 ***		0.769 ***
			(0.1511)	(0.1342)	(0.1423)	(0.1011)	(0.12)		(0.0906)	(0.1142)		(0.0375)
nights2			0.3618 **					0.5526 ***				
			(0.1585)					(0.1036)				
nights3	0.4616 ***	-0.5269 ***				-0.2975 ***						
	(0.0547)	(0.1601)				(0.0935)						
beds		0.847 ***		0.2151 *		0.401 **	0.8409 ***				0.6055 ***	
		(0.2894)		(0.1069)		(0.1653)	(0.1852)				(0.1409)	
beds1	-0.3514 *	0.9383 ***			-0.1051				0.1496 **	0.4645 ***		
	(0.1923)	(0.2927)			(0.145)				(0.0682)	(0.16)		
snow									0.2504 ***	0.1953 **		
									(0.069)	(0.0879)		
snow1		0.2763 ***	-0.304 ***		0.2146	-0.4822 ***						
		(0.0842)	(0.0914)		(0.1394)	(0.1535)						
y		1.0514 ***			2.4013	-4.6503 ***						
		(0.14)			(1.832)	(1.3979)						
y1					-1.9252	4.8898 ***	0.5887 ***					
					(1.703)	(1.2819)	(0.1153)					
pp					5.9648 *	5.2545 **			1.4789 ***		2.0145 **	
					(3.0667)	(2.1596)			(0.5003)		(0.8068)	
pp1	2.1788 ***	13.2153 ***			3.1983			4.6572 **				
	(0.4828)	(2.7739)			(3.5325)			(2.1185)				
SBtcap		-0.2388 **							0.0178 ***			
		(0.1034)							(0.0039)			
SBtcap1	0.0314 ***		-0.2967 ***			0.3892 *						
	(0.0103)		(0.0982)			(0.2034)						
bg_auto	0.974	0.004	0.143	2.234	2.814*	1.964	2.496	2.321	0.034	0.031	4.328**	0.687
pvalue	0.324	0.95	0.705	0.135	0.093	0.161	0.114	0.128	0.854	0.861	0.037	0.407
reset_mis	2.142	2.288	0.292	1.524	2.635*	3.365*	1.606	1.1	1.456	1.413	14.356***	0.771
pvalue	0.139	0.126	0.749	0.235	0.093	0.055	0.219	0.347	0.252	0.261	0	0.472
jb_normal	0.58	0.003	0.633	0.421	5.599*	0.752	2.117	0.066	0.238	7.873**	9.9***	0.118
pvalue	0.748	0.999	0.729	0.81	0.061	0.687	0.347	0.968	0.888	0.02	0.007	0.943
bp_hetero	1.371	3.843	2.706	1.351	16.365**	6.966	5.244	1.742	2.88	0.833	6.854**	0.463
pvalue	0.849	0.798	0.608	0.509	0.022	0.54	0.155	0.419	0.718	0.842	0.032	0.496

	5013	5014	5015	5016	5017	5018	5019	5020	5022	5023	5024	5025
(Intercept)	3.453 ***	1.7515 **	-2.6398	7.5417 ***	0.1844	2.4749 ***	0.3276	-0.5021	3.7716 **	3.8756 **	3.8524 ***	5.4615 ***
	(0.6941)	(0.7873)	(1.5915)	(0.806)	(0.9102)	(0.8538)	(1.0422)	(1.2113)	(1.5639)	(1.556)	(0.4671)	(0.9696)
nights1	0.7022 ***	0.6076 ***	0.6484 ***			0.7861 ***	0.352 **	0.8736 ***	0.7689 ***		0.6821 ***	-0.1092
	(0.0603)	(0.0922)	(0.1203)			(0.0743)	(0.1318)	(0.0614)	(0.1359)		(0.0389)	(0.1661)
nights2			0.2291 *									
			(0.1163)									
nights3					-0.241 ***				-0.3211 ***	0.2933 ***		
					(0.0814)				(0.1114)	(0.0596)		
beds				0.39 ***	1.0626 ***		0.7033 ***			0.5198 **		0.2385
				(0.1298)	(0.2108)		(0.2141)			(0.1924)		(0.2433)
beds1			0.3319 **		0.4862 **				0.2344 **			0.5335 **
			(0.1507)		(0.1874)				(0.1028)			(0.2005)
snow		0.2705 ***	0.2373 ***					0.403 **				
		(0.083)	(0.0372)					(0.1706)				
snow1					-0.1524 *		0.1245 **		0.1847 ***	0.0989 **		
					(0.0867)		(0.0523)		(0.0553)	(0.0446)		
y				0.2409 ***			0.1194 **			-1.037 **		0.2269 ***
				(0.0397)			(0.0548)			(0.43)		(0.0693)
y1		0.2023 ***			0.3785 ***					1.0297 **		
		(0.0636)			(0.1034)					(0.4057)		
pp					1.7529 **				2.5491 ***			0.9181 ***
					(0.627)				(0.8445)			(0.2552)
pp1					1.6766 *							0.5568 *
					(0.8174)							(0.2741)
SBtcap				0.0074 *	-0.196 **							-0.0446 **
				(0.0037)	(0.0774)							(0.0162)
SBtcap1								0.0347		-0.0511 **		0.0482 ***
								(0.022)		(0.0191)		(0.0167)
bg_auto	2.224	0.043	0.055	0.584	0.019	1.07	5.311**	2.156	0	0.069	0.045	0.024
pvalue	0.136	0.836	0.815	0.445	0.89	0.301	0.021	0.142	1	0.793	0.832	0.877
reset_mis	1.117	0.422	0.902	1.213	9.574***	0.594	0.385	9.846***	1.477	1.194	0.311	8.037***
pvalue	0.341	0.66	0.419	0.313	0.001	0.559	0.684	0.001	0.249	0.322	0.735	0.002
jb_normal	23.923***	0.938	5.145*	0.415	9.358***	3.552	6.166**	22.995***	1.978	0.264	1.878	1.004
pvalue	0	0.626	0.076	0.812	0.009	0.169	0.046	0	0.372	0.876	0.391	0.605
bp_hetero	0.035	2.388	1.425	1.28	5.121	11.94***	5.834	1.586	5.171	7.904	0.348	14.041*
pvalue	0.851	0.496	0.84	0.734	0.745	0.001	0.212	0.663	0.395	0.245	0.555	0.081

	5026	5027	5028	5029	5030	5031	5032	5033	6001	6002	6004	6005
(Intercept)	10.6519 *** (0.055)	6.5096 *** (1.2794)	2.8965 * (1.5351)	1.5925 (1.005)	3.2629 *** (0.5005)	3.9047 *** (1.0631)	1.9197 *** (0.3796)	3.3489 *** (0.5917)	3.7563 ** (1.6086)	-3.6114 * (2.0886)	0.8602 (1.3555)	5.522 *** (0.8119)
nights1			0.6516 *** (0.1052)	0.7978 *** (0.0704)	0.7407 *** (0.0401)	0.5111 *** (0.1451)	0.8399 *** (0.0322)	0.3656 ** (0.1403)	0.7413 *** (0.1123)	0.5049 *** (0.1195)		
nights2								0.3602 *** (0.125)				
nights3		-0.2365 * (0.123)									0.2772 ** (0.1022)	
beds		-0.4015 * (0.2084)								0.9692 *** (0.2792)	0.4986 ** (0.1832)	
beds1		0.5527 ** (0.2097)		0.4225 ** (0.1619)								
snow		0.1777 ** (0.065)	0.3006 *** (0.0989)									
snow1		0.189 ** (0.0688)										
y				-0.3178 *** (0.0892)					-0.1056 * (0.0527)	0.2906 *** (0.1026)		0.275 *** (0.0835)
y1		0.726 *** (0.1359)	0.0627 ** (0.0286)			0.2237 *** (0.0794)					0.3401 ** (0.1509)	
pp												15.6078 ** (6.4245)
pp1	3.9496 *** (0.6034)									-0.6354 ** (0.2951)		-19.6783 *** (6.4663)
SBtcap	0.1594 *** (0.0184)											
SBtcap1		-0.0464 *** (0.0114)		0.0486 *** (0.0125)				0.038 *** (0.0104)				
bg_auto	0.267	0.236	0.181	1.442	0.862	0.415	0.04	1.397	1.206	0.749	1.313	3.014*
pvalue	0.605	0.627	0.671	0.23	0.353	0.519	0.842	0.237	0.272	0.387	0.252	0.083
reset_mis	0.049	0.048	0.035	0.385	1.775	1.228	0.652	0.49	5.578***	0.77	5.542***	2.4
pvalue	0.952	0.953	0.966	0.685	0.187	0.308	0.529	0.618	0.009	0.473	0.01	0.11
jb_normal	4.391	0.384	0.816	0.995	0.799	1.346	1.111	0.77	11.764***	1.108	2.511	2.142
pvalue	0.111	0.825	0.665	0.608	0.671	0.51	0.574	0.68	0.003	0.575	0.285	0.343
bp_hetero	0.509	7.791	6.902*	6.812	0.537	6.029**	0.952	7.56*	4.703*	3.508	3.93	2.336
pvalue	0.775	0.351	0.075	0.146	0.464	0.049	0.329	0.056	0.095	0.477	0.269	0.506

	6006	6007	6008	6009	6010	6011	6012	6013	6014	6016	6017	6018
(Intercept)	0.9127 * (0.4864)	1.3496 ** (0.6313)	2.1567 *** (0.5968)	3.9042 *** (0.4921)	4.0191 *** (0.9429)	4.6839 *** (0.9588)	5.4019 *** (1.3013)	4.1775 *** (0.6037)	5.6168 *** (1.4597)	7.3182 *** (1.6667)	-1.0433 (1.0888)	-0.5686 (1.49)
nights1	0.6076 *** (0.0835)	0.6974 *** (0.0645)	0.67 *** (0.0747)	0.5951 *** (0.0635)	0.4 ** (0.1553)	0.7303 *** (0.0716)	0.6789 *** (0.1067)		0.6443 *** (0.0998)	0.3748 ** (0.1391)		0.723 *** (0.1086)
nights2											0.3334 ** (0.142)	
nights3					0.2629 ** (0.1092)					-0.3982 *** (0.128)		
beds	0.4881 *** (0.1503)	0.2942 ** (0.1399)								0.348 *** (0.095)		
beds1			0.2442 * (0.1229)	0.1118 ** (0.0546)								
snow												0.6794 *** (0.2092)
snow1							-0.2808 *** (0.0755)					
y								0.6327 *** (0.0655)				
y1						-0.1383 *** (0.031)			-0.2725 *** (0.0809)	0.1521 *** (0.041)	0.7627 *** (0.1467)	
pp			-0.9046 *** (0.291)			1.2664 *** (0.4343)				0.4187 * (0.2133)	-1.63 *** (0.3876)	
pp1							-0.4039 ** (0.182)	-0.1566 (0.3256)				
SBtcap								-0.1376 ** (0.0514)				
SBtcap1					0.0108 ** (0.0049)	0.1603 ** (0.0606)	-0.0556 *** (0.0162)		0.3451 *** (0.0787)		-0.6238 *** (0.2012)	0.1764 ** (0.0701)
bg_auto	0.311	0.972	0.001	0.925	0.103	1.896	0.09	2.361	1.267	2.438	0.342	0.665
pvalue	0.577	0.324	0.981	0.336	0.748	0.168	0.764	0.124	0.26	0.118	0.558	0.415
reset_mis	5.404***	0.196	0.028	2.555*	3.934**	1.425	0.469	12.42***	0.296	0.557	3.009*	0.52
pvalue	0.01	0.823	0.972	0.096	0.033	0.259	0.631	0	0.746	0.58	0.067	0.601
jb_normal	50.879***	1.626	0.371	1.399	11.775***	2.694	0.19	58.315***	3.31	3.581	6.231**	0.968
pvalue	0	0.444	0.831	0.497	0.003	0.26	0.909	0	0.191	0.167	0.044	0.616
bp_hetero	8.603**	3.95	2.126	1.693	13.615***	1.557	5.386	7.86**	6.056	7.161	2.892	4.186
pvalue	0.014	0.139	0.547	0.429	0.003	0.816	0.25	0.049	0.109	0.209	0.576	0.242

	6019	6020	6021	6022	6023	6024	6025	6026	6027	6028	6029	6031
(Intercept)	10.2284 *** (0.6742)	8.0918 *** (0.0501)	1.6448 *** (0.4878)	2.6462 ** (1.0047)	1.9653 ** (0.7713)	-2.4275 (1.46)	8.0445 *** (0.7686)	5.4859 *** (1.5979)	4.3965 *** (1.3721)	9.4128 *** (1.6439)	23.4495 *** (4.3)	5.1002 *** (1.5561)
nights1			0.6171 *** (0.1397)	0.6947 *** (0.0929)		0.0943 (0.1453)		0.4471 *** (0.161)	0.4975 *** (0.1567)			0.6743 *** (0.1201)
nights2										-0.2223 (0.1307)		
nights3												
beds							0.5247 *** (0.0835)					
beds1					1.1762 *** (0.1195)	0.5544 ** (0.2052)					-0.765 ** (0.2881)	-0.2465 ** (0.1138)
snow	0.1213 (0.1337)			0.1746 ** (0.0755)		0.1437 (0.0951)	0.268 *** (0.0945)			-0.3608 ** (0.1686)		
snow1												
y			0.2472 ** (0.1121)				-0.2363 *** (0.0392)			5.1236 *** (1.3039)		
y1						0.7188 *** (0.1262)				-4.946 *** (1.2585)	-1.2767 *** (0.3036)	
pp		-7.5269 *** (1.6853)		-0.4745 ** (0.195)	-3.1865 ** (1.4078)						23.1278 *** (7.4488)	
pp1	8.1328 *** (1.106)					-1.2644 *** (0.3222)				-0.8051 *** (0.1721)	-18.4863 ** (7.3319)	
SBtcap	-0.4619 *** (0.085)									1.9058 *** (0.5247)		
SBtcap1				-0.1759 ** (0.0713)		-0.3671 ** (0.1634)						
bg_auto	8.58***	0.005	0.12	1.868	0.001	4.005**	1.054	1.901	1.019	0.106	0.075	0.001
pvalue	0.003	0.944	0.729	0.172	0.974	0.045	0.305	0.168	0.313	0.745	0.784	0.979
reset_mis	17.679***	1.424	2.711*	1.065	14.186***	5.174**	0.367	1.076	2.235	0.15	4.627**	0.984
pvalue	0	0.257	0.084	0.359	0	0.014	0.696	0.354	0.125	0.861	0.019	0.386
jb_normal	0.216	0.175	0.687	0.888	14.422***	0.637	2.24	41.161***	11.527***	0.72	0.844	32.347***
pvalue	0.897	0.916	0.709	0.642	0.001	0.727	0.326	0	0.003	0.698	0.656	0
bp_hetero	18.725***	0.208	7.885**	3.938	10.438***	15.932**	6.992*	2.37	0.467	7.182	9.308*	2.229
pvalue	0	0.648	0.019	0.415	0.005	0.014	0.072	0.124	0.494	0.304	0.054	0.328

	6032	7001	7002	7003	7004	7005	7006	7007	7008	7009	7010	7011
(Intercept)	1.7876 **	8.9937 ***	11.3225 ***	3.7707 ***	2.9161 ***	9.1777 ***	-2.9606	5.924 **	-0.1663	1.9449 *	1.4474 **	0.5547
	(0.7739)	(2.4551)	(2.3026)	(0.713)	(0.8286)	(1.8426)	(1.7556)	(2.1892)	(1.2028)	(1.0561)	(0.6899)	(0.5365)
nights1	0.8819 ***	0.4172 ***	0.3819 ***		0.4693 ***	0.5245 ***	0.7928 ***	0.4589 ***	0.9028 ***	0.8363 ***	0.8482 ***	0.8992 ***
	(0.0849)	(0.1313)	(0.1383)		(0.1241)	(0.0734)	(0.0769)	(0.1524)	(0.0768)	(0.072)	(0.0432)	(0.0317)
nights2												
nights3		-0.2656 **										
		(0.1215)										
beds		0.5694 ***	-0.6693 ***	1.0605 ***			0.3774 *			-0.5429 **		
		(0.1824)	(0.2053)	(0.0914)			(0.1908)			(0.2012)		
beds1										0.4449 **		
										(0.1786)		
snow							0.3476 ***	0.3071 ***	0.2978 ***	0.2198 ***	0.1231 **	0.1681 ***
							(0.1018)	(0.0597)	(0.0705)	(0.0656)	(0.0503)	(0.0459)
snow1	-0.1409 ***	-0.7413 **				-0.8656 **						
	(0.0494)	(0.3353)				(0.32)						
y												
y1					0.3084 ***		0.095					
					(0.1001)		(0.0649)					
pp					-3.0239 *							
					(1.4898)							
pp1	-0.3821 ***				5.8049 ***			-1.8728 ***				
	(0.1291)				(1.4902)			(0.5283)				
SBtcap								-0.0369 ***				
								(0.0116)				
SBtcap1			0.0448 ***		0.0742 **	0.6954 ***						
			(0.012)		(0.0279)	(0.1481)						
bg_auto	0.732	2.107	1.032	0.045	0.591	0.235	0.035	0.38	0.003	0.302	0.264	0.429
pvalue	0.392	0.147	0.31	0.831	0.442	0.628	0.853	0.538	0.959	0.583	0.607	0.513
reset_mis	0.084	0.045	2.449	0.077	0.039	1.596	2.756*	0.309	0.26	0.23	0.463	1.844
pvalue	0.92	0.956	0.105	0.926	0.962	0.221	0.082	0.737	0.773	0.796	0.634	0.177
jb_normal	1.121	0.883	0.336	3.976	0.245	2.949	0.505	1.014	0.791	10.243***	9.463***	0.176
pvalue	0.571	0.643	0.846	0.137	0.885	0.229	0.777	0.602	0.673	0.006	0.009	0.916
bp_hetero	5.785	3.682	5.569	0.788	5.013	0.306	4.759	3.491	0.768	1.237	0.601	0.179
pvalue	0.123	0.451	0.135	0.375	0.414	0.959	0.313	0.479	0.681	0.872	0.74	0.914

	7012	7013	7014	7015	7016	7017	7018	7019	7020	7021	7022	7023
(Intercept)	3.732 ***	7.2274 ***	2.1272 ***	11.5767 ***	1.6319 *	2.9709 ***	4.3011 ***	1.9505	2.8254 ***	1.9393 ***	2.7484 ***	1.1254
	(1.0432)	(0.7955)	(0.5677)	(2.0642)	(0.8931)	(0.7121)	(1.0477)	(1.7136)	(0.9221)	(0.6362)	(0.5619)	(1.0781)
nights1	0.7874 ***		0.824 ***	0.3102 **	0.5629 ***	0.7451 ***	0.6683 ***		0.7484 ***	0.8361 ***	0.9139 ***	0.598 ***
	(0.0656)		(0.0475)	(0.1444)	(0.0831)	(0.0615)	(0.081)		(0.0832)	(0.0536)	(0.0184)	(0.1139)
nights2												
nights3		0.4173 ***		0.4757 ***								
		(0.0646)		(0.1219)								
beds								1.3634 ***				
								(0.1873)				
beds1												0.3465 **
												(0.1594)
snow	0.2049 ***										-0.3122 ***	0.2132 **
	(0.0457)										(0.0959)	(0.084)
snow1								-0.2366 ***				
								(0.0779)				
y				-4.1643 ***	0.3849 ***							
				(1.2267)	(0.101)							
y1	-0.2173 ***			3.2539 ***								
	(0.0669)			(1.0837)								
pp					-1.9252 **							
					(0.7624)							
pp1	-3.1502 ***			3.8498 **				-4.6314 ***		-1.4699 ***		
	(1.007)			(1.4669)				(1.1208)		(0.5263)		
SBtcap	0.0514 ***							0.0742 ***				0.016 ***
	(0.0173)							(0.0087)				(0.0058)
SBtcap1				0.1383 ***	-0.047 **							
				(0.0335)	(0.019)							
bg_auto	0.689	0.927	0.295	0.638	0.043	1.035	3.38*	0.206	1.653	2.185	2.173	1.29
pvalue	0.407	0.336	0.587	0.424	0.837	0.309	0.066	0.65	0.199	0.139	0.14	0.256
reset_mis	0.081	0.177	0.901	3.357*	4.174**	0.858	1.086	0.467	2.042	5.672***	0.278	0.022
pvalue	0.922	0.839	0.417	0.053	0.027	0.435	0.351	0.632	0.148	0.009	0.759	0.978
jb_normal	0.587	0.086	0.563	4.272	3.1	2.043	1.223	0.454	22.052***	0.404	0.046	0.791
pvalue	0.746	0.958	0.755	0.118	0.212	0.36	0.543	0.797	0	0.817	0.977	0.673
bp_hetero	10.995*	1.392	3.413*	3.732	4.252	10.204***	0.02	7.304	16.606***	8.887**	0.001	2.431
pvalue	0.051	0.238	0.065	0.713	0.373	0.001	0.888	0.121	0	0.012	0.999	0.657

	7024	7025	7026	7027	7028	7029	7030	7031	7032	7033	7034	7035
(Intercept)	0.5608	1.3759 ***	3.1005 ***	-2.4796 **	-2.855 **	2.5259 ***	2.2371 **	2.3263 ***	3.6673	0.7297	2.6352 **	12.0866 ***
	(0.4998)	(0.3391)	(0.7591)	(1.1084)	(1.0892)	(0.4104)	(0.8653)	(0.7959)	(2.1657)	(1.1861)	(1.1987)	(0.5033)
nights1	0.9601 ***	0.2898 *			0.7371 ***	0.8081 ***	0.6033 ***	0.4937 ***	0.4538 ***	0.8005 ***	0.7454 ***	
	(0.0395)	(0.1529)			(0.0633)	(0.0316)	(0.089)	(0.1434)	(0.1179)	(0.0776)	(0.116)	
nights2		0.2309 *		-0.1473								
		(0.1271)		(0.1199)								
nights3		0.3849 ***						0.2308 **				
		(0.1313)						(0.1009)				
beds			0.8172 ***	0.8789 ***			0.274 ***		0.3979			
			(0.1403)	(0.1988)			(0.0905)		(0.2634)			
beds1					0.6913 ***							
					(0.1929)							
snow			0.1917 **									0.2314 **
			(0.078)									(0.1066)
snow1			0.0534							0.3348 **		
			(0.08)							(0.1372)		
y			0.0776	0.9044 ***				1.526 **				
			(0.0946)	(0.1164)				(0.58)				
y1								-1.3979 **				
								(0.5642)				
pp	-0.7402 *		3.03 ***									5.4128 **
	(0.4312)		(0.7884)									(2.0236)
pp1		-0.8535 ***			0.9418							-5.7739 ***
		(0.262)			(0.6599)							(1.9286)
SBtcap			0.4288 ***					0.0511 **		0.1067 *		
			(0.1251)					(0.0208)		(0.0563)		
SBtcap1								-0.0462 **		-0.1249 **		
								(0.02)		(0.053)		
bg_auto	0.729	0.085	0.598	0.291	0.853	0.351	1.281	0.794	1.173	0.357	0.01	0.161
pvalue	0.393	0.771	0.439	0.59	0.356	0.554	0.258	0.373	0.279	0.55	0.921	0.688
reset_mis	0.127	1.791	22.863***	9.946***	1.851	0.577	0.667	1.706	0.003	2.596*	0.972	0.102
pvalue	0.881	0.188	0	0.001	0.177	0.568	0.521	0.205	0.997	0.094	0.39	0.904
jb_normal	0.464	0.811	5.717*	0.248	3.799	0.124	20.281***	0.679	1.079	0.512	1.233	5.939*
pvalue	0.793	0.667	0.057	0.883	0.15	0.94	0	0.712	0.583	0.774	0.54	0.051
bp_hetero	7.198**	7.464	20.917***	11.005**	6.59*	0.499	19.705***	4.265	4.586	13.007**	0.685	7.288*
pvalue	0.027	0.113	0.002	0.012	0.086	0.48	0	0.641	0.101	0.011	0.408	0.063

	7036	7037	7038	7039	7040	7041	7042	7043	7045	7046	7047	7048
(Intercept)	8.3119 ***	5.9505 ***	1.6988 *	4.4375 **	1.5568 **	4.4517 ***	5.9478 ***	5.2606 ***	2.7698 **	-3.5105 *	2.761 ***	7.2807 ***
	(1.0779)	(1.186)	(0.9032)	(1.7408)	(0.7438)	(0.677)	(0.7318)	(1.4643)	(1.0709)	(1.7846)	(0.4858)	(1.827)
nights1		0.2355 *	0.3845 **			0.3754 **		0.4163 **			0.7714 ***	0.288 *
		(0.1363)	(0.1439)			(0.1634)		(0.168)			(0.0405)	(0.1687)
nights2		-0.366 ***			-0.2034 **	0.3466 **				0.2685 **		
		(0.093)			(0.0899)	(0.1395)				(0.1299)		
nights3			0.2087 **						0.4841 ***			
			(0.0949)						(0.0858)			
beds		0.5245 ***	0.382 ***	0.8991 ***	1.2776 ***				0.3765 *			
		(0.1405)	(0.1047)	(0.2283)	(0.1355)				(0.1854)			
beds1										0.9734 ***		
										(0.1869)		
snow	0.203								0.1111 **			0.089 *
	(0.1561)								(0.0445)			(0.0459)
snow1												
y	0.0749	1.1355 **				-0.0914 ***		0.1948 ***		0.4155 ***		
	(0.0646)	(0.4926)				(0.0231)		(0.0657)		(0.0978)		
y1		-0.7386			0.2545 ***		0.6633 ***					
		(0.4673)			(0.0516)		(0.0766)					
pp					2.0109 ***							
					(0.5088)							
pp1		0.7689 **		12.6994 ***			-5.1618 ***			-3.3196 **		
		(0.3505)		(2.5452)			(1.0128)			(1.3057)		
SBtcap					0.2775 ***				0.1002 ***			-0.1726 *
					(0.0538)				(0.033)			(0.1011)
SBtcap1		-0.0751 ***					-0.1133 ***		-0.1151 ***	0.2373 ***		
		(0.0193)					(0.0163)		(0.032)	(0.0795)		
bg_auto	7.848***	0.472	2.018	0.355	5.044**	0.297	1.85	0.001	0.11	0.023	0.57	0.023
pvalue	0.005	0.492	0.155	0.551	0.025	0.586	0.174	0.977	0.74	0.879	0.45	0.878
reset_mis	0.987	2.071	0.831	10.299***	0.722	4.494**	20.551***	2.347	0.019	3.254*	1.86	2.377
pvalue	0.385	0.15	0.447	0	0.496	0.021	0	0.114	0.981	0.056	0.174	0.112
jb_normal	5.24*	0.838	1.419	201.077***	0.064	0.668	18.686***	0.186	1	5.344*	1.06	1.096
pvalue	0.073	0.658	0.492	0	0.969	0.716	0	0.911	0.607	0.069	0.589	0.578
bp_hetero	10.741***	11.794	1.681	3.72	15.553***	7.665*	11.194**	4.037	7.648	2.409	0.097	7.1*
pvalue	0.005	0.108	0.641	0.156	0.008	0.053	0.011	0.133	0.177	0.79	0.755	0.069

	7049	7050	7051	7052	7053	7054	7055	7056	7058	7059	7060	7061	7062
(Intercept)	2.8149 ***	2.0297 ***	2.0681 **	4.0264 ***	7.1994 ***	1.5664 ***	3.0378 ***	3.453 ***	3.1904 ***	4.2019 ***	1.7 **	1.6631 **	1.5456 ***
	(0.4838)	(0.4526)	(0.847)	(0.5346)	(1.5195)	(0.521)	(0.9469)	(0.9583)	(1.1604)	(0.7559)	(0.6345)	(0.7829)	(0.273)
nights1	0.5421 ***	0.8092 ***	0.6422 ***		0.4955 ***	0.8779 ***	0.7412 ***	0.4528 **	0.6828 ***	0.485 ***	0.5833 ***	0.5086 ***	0.8786 ***
	(0.1203)	(0.044)	(0.1038)		(0.1505)	(0.042)	(0.0813)	(0.1712)	(0.0923)	(0.171)	(0.1465)	(0.1346)	(0.0223)
nights2				0.3095 **				0.2586 *		0.303 *			
				(0.1146)				(0.1519)		(0.1539)			
nights3	0.2205 **			0.5481 ***	-0.3275 **								
	(0.0985)			(0.1117)	(0.1328)								
beds			0.1624 *										
			(0.0919)										
beds1				-0.3409 **							0.4323 *		
				(0.13)							(0.2178)		
snow			0.1511 ***										
			(0.0546)										
snow1									0.0883			0.1948 *	
									(0.104)			(0.1)	
y					0.4701 ***							0.4118 ***	
					(0.1178)							(0.1255)	
y1										-0.1888 ***			
										(0.0474)			
pp						0.9173							
						(0.7354)							
pp1			0.9469 *				2.0262	1.9596 **	3.9517 **				
			(0.547)				(1.3447)	(0.7689)	(1.791)				
SBtcap	0.0652 **												
	(0.028)												
SBtcap1		-0.111 ***											
		(0.0396)											
bg_auto	2.081	1.21	1.011	1.454	0.646	0.4	0.033	2.811*	2.655	0.034	4.611**	0.768	0.322
pvalue	0.149	0.271	0.315	0.228	0.422	0.527	0.856	0.094	0.103	0.854	0.032	0.381	0.57
reset_mis	3.586**	0.856	2.156	0.439	1.549	15.21***	4.508**	1.241	0.251	0.629	1.616	1.269	0.094
pvalue	0.043	0.436	0.136	0.65	0.232	0	0.02	0.306	0.78	0.541	0.217	0.297	0.91
jb_normal	0.838	3.089	1.486	0.982	1.676	8.91**	0.066	0.583	9.771***	1.782	92.892***	13.28***	1.908
pvalue	0.658	0.213	0.476	0.612	0.433	0.012	0.968	0.747	0.008	0.41	0	0.001	0.385
bp_hetero	4.593	6.691**	4.936	1.447	8.235**	7.492**	15.054***	2.032	13.446***	3.778	10.988***	0.565	1.983
pvalue	0.204	0.035	0.294	0.695	0.041	0.024	0.001	0.566	0.004	0.286	0.004	0.904	0.159

	7063	7064	7065	7066	7067	7068	7069	7070	8001	8002	8003	8004
(Intercept)	0.3642	4.5702 ***	3.8014 ***	0.2532	4.903 ***	2.1481 ***	1.5079 **	-5.2612 **	8.4682 ***	0.3563	12.7014 ***	4.0636 **
	(0.8367)	(1.2204)	(0.6857)	(1.2646)	(0.3334)	(0.4694)	(0.7339)	(2.0126)	(2.1155)	(1.0263)	(0.4396)	(1.5794)
nights1	0.7773 ***	0.3764 ***	0.5219 ***	0.7495 ***		0.5968 ***	0.5666 ***		0.5976 ***	0.4644 ***		0.497 ***
	(0.0724)	(0.0896)	(0.1562)	(0.0849)		(0.1582)	(0.1737)		(0.1341)	(0.1638)		(0.1466)
nights2			-0.2643 **		0.5676 ***		0.3055 *			0.4197 ***		-0.1791
			(0.1246)		(0.0296)		(0.1588)			(0.1485)		(0.1493)
nights3						0.226 *			-0.3027 **			
						(0.1241)			(0.1125)			
beds	0.3008	0.6473 ***		0.3347 **				2.0859 ***	-0.5284 ***	0.1455 *		0.2053 *
	(0.1927)	(0.1856)		(0.1449)				(0.2246)	(0.1801)	(0.0853)		(0.1197)
beds1									0.5465 ***			
									(0.163)			
snow		-0.3951 ***							0.0904 **		0.0994 *	
		(0.1276)							(0.0424)		(0.0554)	
snow1												
y											-0.9865 *	
											(0.5467)	
y1			0.6422 ***						0.0582 **		1.039 *	0.2704 ***
			(0.1082)						(0.024)		(0.5242)	(0.0735)
pp	1.4318 ***							-1.7135 ***				
	(0.5121)							(0.5554)				
pp1			-2.3268 ***	2.9844 **	0.9903 **							
			(0.5705)	(1.4328)	(0.467)							
SBtcap										-0.0582 **		
										(0.0247)		
SBtcap1					0.0584 ***			-0.0173 ***		0.0334		
					(0.0114)			(0.0058)		(0.0232)		
bg_auto	1.518	0.53	3.509*	0.744	1.467	0.002	0.14	1.093	0.076	1.575	4.159**	5.854**
pvalue	0.218	0.466	0.061	0.388	0.226	0.965	0.709	0.296	0.782	0.21	0.041	0.016
reset_mis	3.844**	0.536	4.201**	1.504	4.541**	1.208	1.066	3.425**	0.596	4.154**	5.681***	2.294
pvalue	0.034	0.591	0.027	0.24	0.02	0.315	0.359	0.047	0.56	0.028	0.009	0.122
jb_normal	39.666***	0.2	0.083	10.848***	4.385	0.027	21.435***	0.652	0.356	1.168	28.203***	0.808
pvalue	0	0.905	0.959	0.004	0.112	0.987	0	0.722	0.837	0.558	0	0.668
bp_hetero	6.067	2.721	2.573	13.5***	2.972	12.731***	0.974	5.289	2.986	6.432	5.004	13.188***
pvalue	0.108	0.437	0.632	0.004	0.396	0.002	0.615	0.152	0.811	0.266	0.171	0.01

	8005	8006	8007	8008	8009	8010	8011	8012	8013	8015	8016	8017
(Intercept)	12.6527 ***	7.1547 ***	7.9299 ***	0.5209	4.1505 ***	2.1138	5.2564 **	2.8878 ***	13.9145 ***	2.7655 ***	10.357 ***	4.0307 ***
	(0.6414)	(1.2262)	(1.5503)	(1.0651)	(1.0182)	(1.2472)	(2.1116)	(0.9488)	(1.7907)	(0.8923)	(0.9554)	(0.8173)
nights1		0.4781 ***			0.3718 **		0.438 ***	1.2237 ***		0.7337 ***		0.4372 ***
		(0.0957)			(0.1381)		(0.1019)	(0.1586)		(0.0865)		(0.1515)
nights2			0.3446 ***	0.6035 ***				-0.5775 ***				
			(0.1229)	(0.1039)				(0.1434)				
nights3			0.3639 ***		0.3218 ***						0.2773 ***	0.2376 **
			(0.1269)		(0.0956)						(0.0711)	(0.1065)
beds						0.4208 *	0.8647 ***		0.7031 ***			
						(0.2268)	(0.2204)		(0.239)			
beds1	-0.3571 **		-0.4072 ***			0.5056 **			-0.5697 **			
	(0.1537)		(0.1224)			(0.225)			(0.2378)			
snow			0.16 ***	0.131 **	0.177 ***		0.3316 **	0.3251 ***			0.1662 ***	
			(0.0472)	(0.0583)	(0.0577)		(0.1511)	(0.0723)			(0.0576)	
snow1							-0.3853 **	-0.2385 ***				
							(0.1637)	(0.0783)				
y	-1.7345 ***	-0.0832 **	-0.2029 ***		-0.1534 ***		-3.6213 **		-2.4238 *		-3.0418 ***	
	(0.4964)	(0.0317)	(0.0374)		(0.0341)		(1.5254)		(1.415)		(0.8492)	
y1	2.1325 ***			0.3437 ***		0.2595 ***	3.1482 **		2.0212		2.7063 ***	
	(0.4453)			(0.0492)		(0.0311)	(1.423)		(1.346)		(0.8137)	
pp	1.8148 **			-3.6535 ***			6.8639 ***		6.0928 ***			
	(0.691)			(0.7077)			(2.4807)		(1.4797)			
pp1												
SBtcap		0.0395 ***	-0.0707 **									
		(0.01)	(0.0337)									
SBtcap1			0.095 ***			0.0161						
			(0.0306)			(0.0134)						
bg_auto	1.63	0.373	0.685	0.084	0.074	1.321	1.154	0.325	0.006	1.441	0	2.661
pvalue	0.202	0.542	0.408	0.772	0.785	0.25	0.283	0.568	0.937	0.23	0.988	0.103
reset_mis	1.406	0.255	1.613	0.107	0.322	3.193*	1.183	1.505	0.241	0.166	1.097	0.939
pvalue	0.263	0.777	0.223	0.899	0.728	0.058	0.324	0.241	0.788	0.848	0.35	0.404
jb_normal	0.545	11.214***	2	0.749	0.461	32.044***	1.237	2.12	1.484	2.808	0.843	5.424*
pvalue	0.761	0.004	0.368	0.688	0.794	0	0.539	0.346	0.476	0.246	0.656	0.066
bp_hetero	4.863	0.166	9.17	6.121	6.112	7.866*	5.455	0.988	8.813	0.182	6.428	5.867*
pvalue	0.302	0.983	0.241	0.19	0.191	0.097	0.605	0.912	0.117	0.67	0.169	0.053

	8019	8020	8021	8022
(Intercept)	3.5983 ***	-0.093	7.4952 ***	1.8611 **
	(1.2412)	(1.2071)	(1.4731)	(0.8148)
nights1	0.3667 ***			0.7343 ***
	(0.1166)			(0.1368)
nights2		0.7043 ***		
		(0.1298)		
nights3			0.602 ***	-0.3016 *
			(0.1285)	(0.1677)
beds	0.4975 ***	0.1516 **	-0.2251 ***	0.3417 ***
	(0.1034)	(0.0633)	(0.0751)	(0.1089)
beds1				
snow	-0.1626 *			
	(0.0913)			
snow1				
y		0.2164 **	-0.1922 ***	0.1919 ***
		(0.0898)	(0.0387)	(0.0651)
y1				
pp	-1.1323			
	(1.0494)			
pp1		5.3722 *		
		(3.0749)		
SBtcap				
SBtcap1	0.6682 **		0.3042 ***	
	(0.303)		(0.0798)	
bg_auto	0.733	5.12**	2.372	0.242
pvalue	0.392	0.024	0.124	0.623
reset_mis	3.672**	4.307**	0.67	0.952
pvalue	0.04	0.025	0.521	0.4
jb_normal	0.264	1.836	0.679	0.109
pvalue	0.876	0.399	0.712	0.947
bp_hetero	1.58	5.045	8.223*	4.787
pvalue	0.904	0.283	0.084	0.31