Characteristics of Middle European Holiday Highfliers

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Article

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Abstract

This article estimates a count-data model on the flight behaviour of Austrian holiday-makers based on information from a large representative quarterly survey spanning the years 2014–2016. On average, the number of holiday flights ranges between 0.6 and 1.2 per year for residents in the least populated region and the capital, respectively. Results of the estimations reveal that the number of holiday flights is highest for persons with tertiary degrees, of a young age (16–24 years) and capital city residents, while it is lowest for individuals with children and large households. Residents of the capital city fly 78 percent more often in a given quarter than those living in Carinthia, the most rural region. The Oaxaca-Blinder decomposition analysis reveals that the difference is rather related to location than to variations in individual characteristics. Socio-demographic aspects such as age, household size and travelling with children are of no relevance for the holiday flying behaviour of capital residents.

Keywords

count data model; holiday travel; tourist air travel; travel frequency

1. Introduction

Travelling by air is considered particularly harmful for the environment (Becken, Friedl, Stantic, Connolly, & Chen, 2021; Gössling & Peeters, 2007; Gössling & Upham, 2009). Despite this, long distance air travel is the fastest growing passenger mobility segment in the pre-Covid-19 world (Gössling & Humpe, 2020).

Present discussions encompass the sustainability of not only frequent flyers (Young, Higham, & Reis, 2014), but increasingly also "unnecessary" leisure and holiday travel (Alcock et al., 2017; Cohen, Higham, & Reis, 2013; Graham & Metz, 2017; Hares, Dickinson, & Wilkes, 2010; Holden & Norland, 2005; McDonald, Oates, Thyne, Timmis, & Carlile, 2015; Morten, Gatersleben, & Jessop, 2018). Since the deregulation of the aviation market and the emergence of low-cost airlines in Europe, the share of leisure travellers is increasing (O'Connell & Williams, 2005).

Air travel for purposes of business, migration, education as well as to visit friends and relatives might be difficult to avoid. Many firms, institutions and organisations are active in the international arena and long-distance relationships are not uncommon. There are also national as well as European members of parliament, who are expected to have a close relationship with their constituencies, for instance. Yet, holiday travel by air might to a certain extent be prevented because there are environmentally friendly transportation modes available for short- or medium-long distances. There is, however, no detailed information available on the role played by socio-demographic aspects in the flight behaviour of holiday-makers.

The aim of this study is to gain more insights into the determinants of air travel for holiday purposes. For this objective, the frequency of flights is estimated by use of a count data model. Socio-demographic characteristics

are employed to explain the flight behaviour of residents in both rural and urban areas. In addition, evidence of the flight destinations for holiday purposes is provided. The analysis is based on a representative survey of Austrian residents (17,400 observations) who travel at least once per quarter for holiday purposes during the period 2014–2016.

Previous studies indicate that air travel behaviour depends significantly on age, education, income, city of residence and accessibility to airports (Graham & Metz, 2017; Reichert, Holz-Rau, & Scheiner, 2016). Most studies focus on total air travel and do not distinguish travel for holiday purposes from travel for business or visiting friends and relatives. The few exceptions include research on the holiday air travel behaviour of residents in Helsinki and Reykjavik as well as students in Sweden (Czepkiewicz, Heinonen, Næss, & Stefansdóttir, 2020; Czepkiewicz, Klaas, & Heinonen, 2020; Gössling, Hanna, Higham, Cohen, & Hopkins, 2019). Research based on official representative surveys are rare (Schubert, Sohre, & Ströbel, 2020) and the use of count-data models, that allows to explain the number of holiday flights, are seldom employed so far. Exceptions to this are Czepkiewicz, Heinonen, et al. (2020) relating to the approach, Gössling, Lohmann, Grimm, and Scott (2017), Dargay and Clark (2012), Alcock et al. (2017) and Bruderer Enzler (2017) concerning the dataset as well as Schubert et al. (2020) regarding both aspects.

The structure of this study is as follows: Section 2 outlines the conceptual background; Section 3 describes the empirical approach; and Section 4 introduces the dataset and the descriptive statistics. The results are presented and discussed in Section 5, while the conclusion is presented in Section 6.

2. Conceptual Background

Investigations on flight behaviour can be found in travel and transportation as well as in tourism literature. Many studies explore the determinants of international travel, air travel or long-distance travel with a focus on socio-demographic characteristics. Common features analysed are age, gender, household type, education, occupation and income. However, air trips for holiday purposes are seldom treated separately (exceptions include Czepkiewicz, Heinonen, et al., 2020; Czepkiewicz, Klaas, & Heinonen, 2020). Graham and Metz (2017) discusses the distinction between "discretionary" leisure travel (including holiday travel) and "non-discretionary" business travel where air travels motivated by visiting friends and relatives are in principle voluntary but in practice often indispensable. Based on the latter argument, and on the fact that two out of three flights by Austrian residents are holiday-oriented, this study focuses specifically on the segment that is considered dispensable.

Several studies show that the probability and number of air travels depend on socio-demographic factors (Bruderer Enzler, 2017; Czepkiewicz, Klaas, &

Heinonen, 2020; LaMondia, Aultman-Hall, & Greene, 2014). Proximity to the airport and residency in large metropolitan areas or in the capital region is also regarded as important factors for the likelihood of air travel (Bruderer Enzler, 2017; Graham & Metz, 2017; Holden & Norland, 2005; LaMondia et al., 2014; Schubert et al., 2020; for a review of the literature see Czepkiewicz, Heinonen, & Ottelin, 2018). Holden and Norland (2005) demonstrate that individuals living in dense, centrally located neighbourhoods in Oslo take the plane for leisure purposes more often than the average holiday traveller. Næss (2006a, 2006b) suggests that air travel has become an integral part of the urban and cosmopolitan lifestyle of inner-city residents, particularly so among young students and academics (see also Große, Fertner, & Carstensen, 2019). The high urban density constrains the quality of life by frequent traffic jams and restricted access to nature and thus creates demand for regular weekend trips or other short breaks. This phenomenon is referred to as "escape travel" or "compensation hypothesis" (Holden & Norland, 2005; Holz-Rau, Scheiner, & Sicks, 2014; Muñiz, Calatayud, & Dobaño, 2013; Næss, 2006a, 2006b; Reichert et al., 2016). Czepkiewicz et al. (2018) show that the positive relationship between urban density and long-distance travel behaviour is still significant when demographic and socio-economic variables are controlled for. Correspondingly, Heinonen, Jalas, Juntunen, Ala-Mantila, and Junnila (2013) report that air travel by urban residents in Finland (especially in the Helsinki Metropolitan region) is more frequent. The rebound effect of consumption is also used as a possible explanation behind the higher level of flying by individuals living in urban areas. In such areas you may not need to own a car for local transportation. Giving up car-ownership saves a significant amount of money, which can then be used for other purposes, such as holiday travel. Literature indicates that car-free people fly more frequently than car-owners (Ornetzeder, Hertwich, Hubacek, Korytarova, & Haas, 2008; Ottelin, Heinonen, & Junnila, 2017).

A number of studies discover that education and income are important drivers of air travel (Bruderer Enzler, 2017; Czepkiewicz, Klaas, & Heinonen, 2020; Dargay & Clark, 2012; Graham & Metz, 2017; Holden & Norland, 2005; LaMondia et al., 2014; Ornetzeder et al., 2008). Randles and Mander (2009) suggest that flying remains an activity that is used disproportionately by higher income and higher social class groups, and Graham and Metz (2017) find that the proportion of highly skilled air travellers is twice as large as that of unskilled persons. Czepkiewicz, Klaas, and Heinonen (2020) show that persons in the highest income class and those with a university degree in the larger Reykjavik area have a significantly higher number of non-work-related flights.

The freedom to travel independently of transportation mode seems to attract young adults in particular. Shaw and Thomas (2006) conclude that environmental awareness among young adults is relatively high, such as sustainable local transportation and waste recycling.

However, this does not necessarily apply to air travel. The phase of life appears to be important for the decision to travel by air (Davison & Ryley, 2013). Dargay and Clark (2012) document that United Kingdom families with children and those living in large households fly less often. Based on the Swiss environmental survey, Bruderer Enzler (2017) finds that household characteristics and family size are important, while the role of gender is less obvious. To the contrary, Dargay and Clark (2012) exhibit that women in the United Kingdom undertake less air travel.

Because of marked differences in sample designs and sizes (time period, reference period for survey questions; individual or trip level and representativeness), definitions of air travel (probability of flying, number of flights), travel distances as well as methods used (multivariate or bivariate) results in recent literature are difficult to compare. There are also few studies that distinguish between air travel for leisure, visiting friends or relatives and work among groups of residents. The few common denominators available indicate that contextual (purpose, destination, length of stay, etc.) and socio-demographic factors are of importance. However, the contextual part is less prominent here since the analysis focuses on one specific context: holidays. Based on the determinants highlighted in the literature, the first hypothesis is formulated:

> H1: The number of holiday flights depends on individual socio-demographic characteristics.

Although residents in urban and rural areas may exhibit different characteristics, literature is less clear on how this aspect affects their flying behaviour, leading to the second hypothesis:

> H2: The importance of individual socio-demographic characteristic for the number of holiday flights varies between residents in the capital city and those living in other regions.

3. Empirical Approach

The specification of the number of holiday flights per person and quarter builds on count data models similar to those employed by Czepkiewicz, Klaas, and Heinonen (2020) on urbanite leisure travel and by Falk and Hagsten (2021) on emissions caused by air travel. The flight frequency is modelled as a function of several socio-demographic factors:

$$g\left(\mu_{it}\right) = \ln(\mu_{it}) = \beta_0 + \sum_{A=1}^{5} \beta_{jA} AGECAT_{it}^A + \sum_{E=1}^{2} \beta_{jE} EDU_{it}^E +$$

$$+ \beta_{jW} WOMEN_{it} + \beta_{jK} CHILDREN_{it} +$$

$$+ \sum_{S=1}^{3} \beta_{jS} LABOURSTATUS_{it}^S + \sum_{H=1}^{5} \beta_{jH} HHSIZE_{it}^H +$$

$$+ \sum_{R=1}^{8} \beta_{jR} REGION_{it}^R + \sum_{Y=1}^{2} \beta_{jY} YEAR_{it}^Y +$$

$$+ \sum_{Q=1}^{3} \beta_{jQ} QUARTER_{it}^Q + \varepsilon_{it},$$

$$\mu_{it} = g^{-1}\left(X_{it}^{'}\beta\right)$$

with i as the individual, t as the quarter in a given year of travel, vector X representing a set of covariates and β is the corresponding group of coefficients. The link function $g(\ )$ transforms the probability of the categorical variable to a continuous scale that can be modelled by linear regression. The explanatory variables in vector X encompass $AGECAT$ denoting age-class, EDU indicating the level of education and $WOMEN$ if the traveller is female. $CHILDREN$ is a dummy variable for travelling with children, $HHSIZE$ is a set of dummy variables measuring household size and $LABOURSTATUS$ is a group of dummy variables reflecting the labour market status (employed, unemployed, student or retired). Variable $REGION$ relates to the region where the traveller resides. Macroeconomic factors such as price effects and fluctuations of the business cycle are captured by annual year dummy variables $YEAR$, indicating the year of travel and $QUARTER$ controls for calendar effects within the year. To uncover the possible differences between urban and rural agglomerations, separate estimations are conducted for the capital (Vienna) and non-capital regions, the latter consisting of eight federal states.

Since the dependent variable is a highly skewed count with values ranging from zero to four and a few above, the Poisson or Negative Binomial models are suitable. The Poisson model is a special case of the Negative Binomial regression model where the dispersion parameter alpha is constrained to zero (Cameron & Trivedi, 2010). A Likelihood ratio test can be used to test the Negative Binomial regression model against the Poisson model. Besides the count data model, the Pearson-Chi-Square and G tests are used to identify if the different holiday flight destinations are independent of residence (Cochran, 1954; McDonald, 2009).

4. Data and Descriptive Statistics

Data for this analysis originate from the official Austrian Travel Survey (Statistics Austria, 2017). This is a quarterly representative survey on holiday and business travels with at least one overnight stay, undertaken by persons living in Austria aged 15 years or older. The survey is stratified by federal state, age of the individual and gender. Each quarter, around 3,500 randomly selected persons are interviewed by telephone. Participation in the survey is voluntary and the non-response rate is on average 29 percent.

The dataset encompasses information on actual domestic as well as international (outbound) flights by destination country or region (42 international destinations) and travel purpose, length of stay, accommodation

type, departure month, transportation mode and expenditures. In this analysis a distinction between the capital and non-capital regions are made by use of population density measures (Thrall, 1988). Vienna has a population density of 4,600 inhabitants per square metre, which is a factor 55 higher than in the non-capital regions (Statistics Austria, 2017). The non-capital regions show a spread between 59 and 153 inhabitants per square metre (Carinthia and Vorarlberg).

The travel data are accompanied by a wide range of socio-demographic factors such as educational attainment, labour market status and travel company size. Although data are available from 2012 onwards, methodological changes of the travel survey, restrict the estimation sample to the period 2014–2016. In this study, the sample is confined to holiday trips, which amounts to two-thirds of total travels, of which 18 percent are undertaken by air transportation (Table 1). Descriptive

Table 1. Proportion of persons flying to their holiday destinations 2014–2016 (percentage).

	Other transportation	Flying	1 Flight	2 Flights	≥ 3 Flights
All residents					
2014 Q1	85.9	14.1	12.9	1.2	0.1
2014 Q2	80.2	19.8	18.2	1.5	0.1
2014 Q3	75.6	24.3	22.1	2.1	0.1
2014 Q4	84.4	15.6	14.6	1.0	0.1
2015 Q1	81.8	18.1	17.0	1.1	0.0
2015 Q2	80.3	19.7	18.0	1.5	0.2
2015 Q3	78.7	21.3	19.4	1.7	0.2
2015 Q4	87.6	12.3	11.3	0.9	0.1
2016 Q1	86.8	13.2	12.4	0.6	0.2
2016 Q2	80.7	19.3	18.0	1.2	0.0
2016 Q3	79.6	20.3	18.0	2.2	0.2
2016 Q4	86.2	13.8	12.3	1.4	0.1
2014–2016 mean	82.3	17.7	16.2	1.4	0.1
Capital residents					
2014 Q1	77.8	22.2	19.3	2.8	0.0
2014 Q2	72.8	27.2	24.9	2.3	0.0
2014 Q3	62.6	37.4	33.9	3.5	0.0
2014 Q4	78.2	21.8	20.3	1.5	0.0
2015 Q1	72.5	27.1	24.9	2.2	0.0
2015 Q2	75.2	24.8	21.7	2.3	0.8
2015 Q3	71.4	28.6	24.0	4.4	0.3
2015 Q4	77.0	22.6	20.4	1.9	0.4
2016 Q1	79.9	20.1	17.9	1.8	0.4
2016 Q2	73.6	26.4	23.2	3.3	0.0
2016 Q3	66.9	32.8	28.0	4.2	0.5
2016 Q4	80.2	19.8	15.4	4.0	0.4
2014–2016 mean	74.0	25.9	22.8	2.9	0.2
Residents in other regions					
2014 Q1	87.2	12.8	11.8	0.9	0.1
2014 Q2	81.8	18.2	16.7	1.3	0.1
2014 Q3	77.2	22.7	20.7	1.9	0.1
2014 Q4	86.1	13.9	13.0	0.8	0.1
2015 Q1	84.4	15.6	14.7	0.8	0.0
2015 Q2	81.6	18.4	17.1	1.3	0.0
2015 Q3	80.4	19.6	18.4	1.1	0.2
2015 Q4	90.7	9.3	8.7	0.7	0.0
2016 Q1	88.6	11.4	10.9	0.3	0.2
2016 Q2	82.2	17.7	16.9	0.8	0.0
2016 Q3	82.6	17.4	15.6	1.7	0.1
2016 Q4	87.7	12.3	11.5	0.8	0.0
2014–2016 mean	84.2	15.8	14.7	1.0	0.1

Source: Austrian Travel Survey (Statistics Austria, 2017).

statistics also reveal that only 16 percent of Austrian residents outside the capital region travel by air for holiday purposes in a given quarter, compared with more than one fourth of those living in the capital region. This latter group also flies more than once per quarter.

The representative sample holds data on 3,471 holiday flights over the period 2014–2016, of which less than one percent is domestic. The average number of holiday flights per person and year is 0.8, with the capital residents flying somewhat more frequently, 1.2 times (Figure 1; see also Table A1 in the Supplementary File). For Germany, Aamaas, Borken-Kleefeld, and Peters (2013) report that total trips by plane occurs with a spread of 0.6–6.6 per person and year on average, spanning from low to high-income groups.

Both the proportion of Austrians flying to their holiday destinations and the number of flights are larger for highly skilled individuals (tertiary degrees), residents of the capital city (Vienna) and young people, while travellers with children and those living in large households exhibit the opposite pattern (Table 2). Individuals with a tertiary degree undertake 0.24 holiday flights per quarter on average as compared to those without degrees (0.16 flights). Young persons (aged 15–24) fly the most while middle aged (35–44) persons the least. Individuals who mainly travel with children fly less. Residents of the capital Vienna show an average of 0.30 holiday flights per quarter, while inhabitants of Carinthia, the least populated region, exhibit the lowest number of flights (0.13). It should be noted that this region is the Austrian lake district, with both the Alps and the Mediterranean Sea within driving proximity. The highest number of holiday flights can be observed in the second and third quarters.

Additional descriptive statistics reveal that the vast majority of holiday flights (78 percent) goes to European destinations, followed by Asia, the American continent and Africa (Table 3). Given the dominance of intra-European flights and data limitations, the empirical analysis does not distinguish between European and non-European destinations. The most common destinations are Spain, Greece, Italy and Turkey, but there are differences across residence of the travellers. Viennese residents show a stronger preference for overseas trips (to North and South America) and for holiday flights to expensive destinations in Europe (France, Sweden and Switzerland) than residents of the non-capital region.

5. Empirical Results and Discussion

The Poisson estimations show that the number of quarterly holiday trips by air relates to individual socio-demographic factors, implying that H1 cannot be rejected (Table 4). Socio-demographic factors are relevant not only for the total sample but also for the sub-sample of residents living in the less populated non-capital regions. As a contrast, holiday flying behaviour of residents in the capital city area is less dependent on these aspects except the level of education, coinciding with H2. Capital city residents are also not particularly dependent on the season since only the third quarter renders significant estimates.

Younger persons, those with a tertiary degree and residents of the capital city (Vienna) show significantly higher number of air travels. The number of holiday flights are also significant and more pronounced for women than for men. Persons travelling with children and those living in larger households take the plane less often. The labour market status is not or only weakly related to the number of holiday flights. Season is also important with the largest number of flights in the summer quarter followed by spring. The Incidence Rate Ratio (IRR) coefficient reveals that residents of Vienna travel 79 percent more often by air than individuals in the region with the lowest population density (Carinthia). This difference is large given the average number of holiday flights of 0.2 per quarter (equal to 0.8 per year).
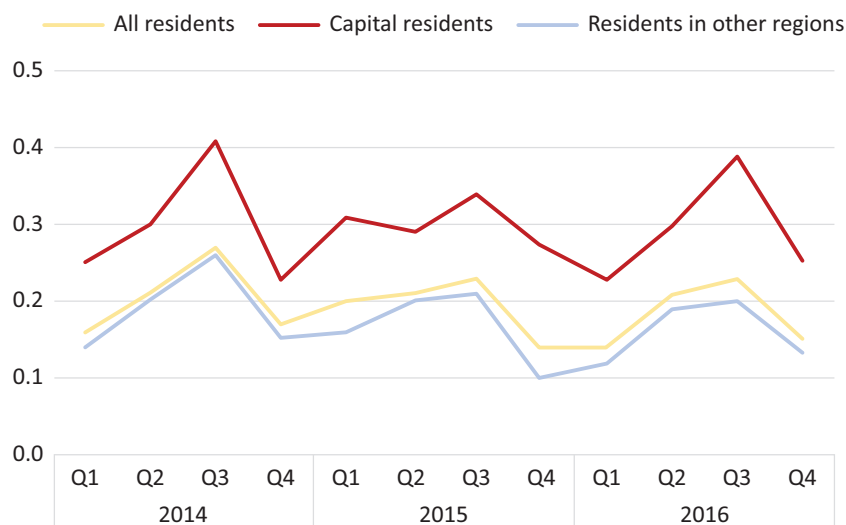
Figure 1. Evolution over time, average number of holiday flights per person and quarter. Source: Statistics Austria (2017) and own calculations.

Table 2. Individual holiday flying behaviour by characteristics (per quarter).

	Proportion	Number of flights
	Percent	Mean
Age 15–24	20.5	0.23
Age 25–34	18.2	0.20
Age 35–44	14.5	0.16
Age 45–54	19.0	0.20
Age 55–64	18.1	0.20
Age 65+	18.5	0.20
Education low level	14.9	0.16
Education medium level	17.6	0.19
Education tertiary level	21.6	0.24
Men	16.8	0.19
Women	19.3	0.21
Travellers (all) no children	19.0	0.21
Travellers (all) with children	14.0	0.15
Employed	18.0	0.20
Unemployed	18.3	0.23
Student	20.7	0.23
Pensioner/out of labour force	17.9	0.20
Household size = 1	20.7	0.23
Household size = 2	20.2	0.23
Household size = 3	18.8	0.21
Household size = 4	16.0	0.17
Household size = 5	14.7	0.16
Household size = 6	11.6	0.12
Burgenland	17.0	0.18
Lower Austria	18.0	0.20
Vienna	26.1	0.30
Carinthia	12.1	0.13
Styria	14.7	0.16
Upper Austria	15.5	0.17
Salzburg	17.3	0.18
Tyrol	16.5	0.18
Vorarlberg	20.2	0.22
Travel year 2014	18.9	0.21
Travel year 2015	18.4	0.20
Travel year 2016	17.2	0.19
Quarter 1	15.1	0.16
Quarter 2	19.6	0.21
Quarter 3	21.9	0.24
Quarter 4	14.0	0.15

Source: Statistics Austria (2017) and own calculations.

In order to identify the major factors responsible for the differences in holiday flying behaviour between residents in the capital and those in the non-capital regions, the Oaxaca-Blinder decomposition translated to the case of count data models is used (Stata command "nldecompose"; Bauer & Sinning, 2008; Sinning, Hahn, & Bauer, 2008). This technique decomposes the variation in the holiday air travel behaviour into a coefficient (or residual) effect and a characteristic effect. The decomposition is important if the characteristics of the residents diverge

Table 3. Choice of holiday flight destination by residence, pooled 2014–2016 (percent).

	Total	Vienna	Other regions
Belgium	0.4	0.7	0.3
Denmark	0.6	0.5	0.6
Germany	7.6	7.7	7.6
Finland	0.1	0.0	0.2
France	4.1	5.1	3.8
Greece	11.0	11.0	11.0
United Kingdom	5.6	5.8	5.5
Ireland	1.3	1.3	1.4
Italy	8.0	9.3	7.5
Luxembourg	0.1	0.2	0.0
Netherlands	2.0	2.5	1.9
Portugal	3.1	3.0	3.2
Sweden	1.2	1.6	1.1
Spain	17.7	14.4	19.0
Iceland	0.6	0.0	0.8
Norway	0.8	0.7	0.9
Switzerland	0.6	0.9	0.5
Baltic states	0.3	0.3	0.3
Croatia	0.7	0.4	0.8
Malta	0.6	0.5	0.6
Poland	0.5	0.8	0.4
Romania	0.5	0.6	0.4
Slovakia	0.0	0.0	0.0
Slovenia	0.0	0.0	0.0
Turkey	7.8	6.9	8.2
Czech Republic	0.0	0.0	0.0
Hungary	0.0	0.0	0.0
Cyprus	1.1	1.8	0.9
Bosnia Herzegovina	0.0	0.0	0.0
Serbia	0.1	0.1	0.0
Bulgaria	0.9	0.6	1.0
Russia	0.8	0.9	0.8
Other Europe	0.5	0.8	0.3
Egypt	3.4	2.7	3.6
Tunisia	0.4	0.4	0.4
Rest of Africa	2.9	3.1	2.8
United States	3.5	4.3	3.2
Canada	0.5	0.3	0.6
Middle and South America	3.1	3.9	2.8
China	0.3	0.2	0.4
Other Asia	6.6	5.9	6.9
Australia, New Zealand etc.	0.5	0.5	0.5
Total	100	100	100
Regions:			
Europe	78.8	78.6	78.8
America	7.1	8.4	6.6
Africa	6.6	6.3	6.7
Asia and Pacific	7.5	6.7	7.8
Number of holiday flights	3,465	960	2,505

Source: Statistics Austria (2017) and own calculations.

Table 4. Determinants of holiday flights 2014–2016, Poisson estimations.

	Total sample		Vienna		Other regions	
	IRR	z-stat	IRR	z-stat	IRR	z-stat
Age 15–24 (ref cat.: 45–54)	1.308 ***	3.48	1.028	0.18	1.388 ***	3.73
Age 25–34	0.925	−1.28	0.970	−0.27	0.910	−1.30
Age 35–44	0.804 ***	−3.49	0.894	−0.95	0.768 ***	−3.59
Age 55–64	0.920	−1.37	0.994	−0.06	0.907	−1.33
Age 65+	0.924	−1.00	0.876	−0.89	0.947	−0.59
Education medium (ref.: low)	1.234 ***	3.77	1.344 **	2.13	1.210 ***	3.12
Education tertiary level	1.512 ***	6.60	1.526 ***	2.97	1.525 ***	5.91
Women	1.147 ***	3.94	1.101	1.47	1.167 ***	3.76
Travellers with children	0.808 ***	−3.48	0.915	−0.79	0.779 ***	−3.39
Unemployed (ref.: employed)	1.213 *	1.73	1.030	0.16	1.297 *	1.88
Student	1.235 *	1.66	1.120	0.52	1.321 *	1.80
Pensioners/out of labour force	1.128	0.98	1.081	0.36	1.154	0.95
Household size = 2 (ref. = 1)	1.107 *	1.81	1.161 *	1.71	1.079	1.02
Household size = 3	0.963	−0.58	0.967	−0.31	0.954	−0.58
Household size = 4	0.849 **	−2.38	0.832	−1.44	0.844 **	−1.99
Household size = 5	0.797 ***	−2.64	0.762	−1.54	0.789 **	−2.30
Household size = 6	0.644 ***	−3.98	0.829	−0.72	0.609 ***	−3.94
Burgenland (ref.: Lower Austria)	0.940	−0.56			0.944	−0.52
Vienna	1.445 ***	7.27				
Carinthia	0.664 ***	−4.30			0.666 ***	−4.26
Styria	0.820 ***	−2.99			0.822 ***	−2.95
Upper Austria	0.869 **	−2.46			0.869 **	−2.45
Salzburg	0.930	−0.96			0.931	−0.93
Tyrol	0.931	−0.96			0.928	−1.01
Vorarlberg	1.132	1.51			1.133	1.51
Quarter 2 (ref.: quarter 1)	1.304 ***	5.09	1.101	1.00	1.396 ***	5.40
Quarter 3	1.545 ***	9.00	1.431 ***	3.99	1.596 ***	8.15
Quarter 4	0.912	−1.58	0.940	−0.59	0.900	−1.49
Year 2015 (ref.: year 2014)	0.924 *	−1.91	1.001	0.01	0.899 **	−2.20
Year 2016	0.890 ***	−2.76	0.994	−0.07	0.858 ***	−3.08
Constant	0.118 ***	−14.87	0.182 ***	−6.77	0.113 ***	−12.47
Number of observations	17,381		3,216		14,165	
Log pseudo likelihood	−9032		−2182		−6836	
Pseudo R^2	0.030		0.014		0.025	
LR-test alpha = 0, p-value	0.292		0.500		0.200	

Notes: ***, ** and * represent significance at the 1, 5 and 10 percent levels; dy/dx denotes the marginal effects and IRR is the incidence rate ratio. A likelihood ratio test indicates that the negative binomial regression model is rejected in favour of the Poisson model. Therefore, the interpretation of the results focuses on the Poisson estimations. Source: Statistics Austria (2017) and own calculations.

between the capital city and the other regions. Vienna has, for instance, the highest share of persons with tertiary degrees among all regions. The characteristic effect measures the difference in the predicted number of holiday flights by air for the total sample when the parameter vector is held constant. On the other hand, the coefficient effect is the variation in predicted number of holiday flights by air when the characteristics of capital city residents are held constant. Results of the decomposition show that the coefficient effect account for between 88 and 90 percent of the total capital resident effect (given the 59 percent higher flight intensity when only the Vienna dummy variable is included) indicating that deviations in the characteristics between the capital and

non-capital regions are negligible. In other words, if residents in the capital city region would have the same characteristics as those in the non-capital areas, the observed difference in the flying behaviour would only be reduced from 59 to 53 percent.

Besides location, education is a major variable of influence. Persons with tertiary education fly on average 51 percent more often to their holiday destinations ((1.51–1) × 100 = 51 percent) than people without degrees. This means that the average number of holiday flights by tertiary educated individuals is 0.10 larger compared with those without, given a sample mean of 0.2 holiday flights per quarter. Young people fly 31 percent more often than middle-aged persons (45–54) while

persons aged 35–44 show the lowest number of flights (minus 20 percent).

In general, the results coincide to some extent with recent, but fragmented literature in that educated individuals (Graham & Metz, 2017) living in urban areas fly more (Bruderer Enzler, 2017; Czepkiewicz et al., 2018). Schubert et al. (2020) use both a similar approach to the present study and a representative (Swiss) dataset, although their explanatory variables expand beyond socio-demographic aspects. In line with this study, Schubert et al. (2020) find that residents in urban areas have a higher probability to travel by air, but only short and middle distances. As a contrast, education and age are variables of no importance for the Swiss travellers, while gender is the only significant socio-demographic factor for long distance flights. The differences in results could originate from variations in travel behaviour across neighbouring countries as well as from the survey or the modelling itself, where certain lifestyle questions in the Swiss study also implicitly capture educational level, income and age, for instance.

As compared to other studies, the present approach also allows a ranking of the importance of the explanatory variables, where young persons, those with higher degrees or residents of the capital city both have a higher probability to take the plane for their holiday and use this transportation mode more often than others. The two latter variables may also be indications of a certain income level. Thus, the suggestion of escape or compensation travel by inhabitants in urban areas cannot be dismissed (Czepkiewicz et al., 2018), although it should not be forgotten that capital cities attract individuals with certain characteristics. This could mean preference for a lifestyle without car ownership, for instance, but use of other transportation modes, including air (Ornetzeder et al., 2008; Ottelin et al., 2017). An alternative explanation, that closeness to an international airport leads to more flying (Bruderer Enzler, 2017; Graham & Metz, 2017), is not convincing in this case since the neighbouring provinces of Vienna show significantly lower number of holiday air travel despite the fact that the travel time is less than two hours for the majority of these residents.

Given the geographical location of Austria, in the middle of Europe, several European holiday destinations are easily reached by car, bus or train. The same is valid for a large group of countries around Austria. Thus, the results are expected to be representative beyond the Austrian borders, but not necessarily for the countries in the outskirts of Europe or the islands, where the probability of flying to a holiday destination might be higher.

The first robustness check, where the flight intensity is estimated by a Probit model, confirms that low age, high education, being a woman, large household size, travelling with children and region of residence give the largest marginal effects (Table A2 in the Supplementary File). Among the predictors, location of residence has the largest effect. Persons living in the capital city region have a 12.7 percentage points higher probability to fly per quarter than those living in Carinthia. The decomposition analysis for Probit models developed by Fairlie (2005) shows that the characteristics effect explains 90 percent of the difference in the number of holiday flights between the capital and the other regions. In other words, if capital residents share the same characteristics as those in rural areas, then the observed difference in the number of holiday flights would be reduced from 8.8 to 7.8 percentage points.

The third robustness check uses Chi-square and G-tests to establish whether the choice of destinations differs between the residents in capital and non-capital regions. Due to the features of the tests, which do not allow small number of observations in the cells, 35 out of 42 destinations need to be excluded. This reduces the number of holiday flights with eleven percent to 3,437. The results of the Pearson Chi square test show that the null hypothesis is rejected, implying that there is evidence of a statistical association between different flight destinations and place of residence at the five percent level (Table 5). The G-test (or Likelihood ratio test) comes to a similar conclusion.

Table 5. Test of interdependence for choice of holiday destination and residence in the capital city 2014–2016.

	$chi2(34)$	p-value
Pearson Chi square test	51.536	0.027
Likelihood-ratio (G) test	50.222	0.036

Notes: The number of holiday flights used in the test is 2,477 and 960, for capital and non-capital residents, respectively. Slovakia, Hungary, Czech Republic Bosnia and Herzegovina, Finland, Iceland as well as Slovenia are excluded because there is no flight in at least one of the two groups. The test is recommended for large sample sizes with 1000 or more observations. The Pearson Chi-square test and the G-test require not only a large sample size, but also that no more than 20 percent of the cells in the expected frequency table contains fewer than five observations and that no cell has less than one (Cochran, 1954).

6. Conclusion

This study estimates a count-data model on the flight behaviour of Austrian holiday-makers, based on a large quarterly representative dataset for the years 2014–2016. In general, flying to a holiday destination is a rare event and the majority of holiday-makers do not even fly once per year (0.8 holiday flights), although capital city residents use this transportation mode somewhat more often (1.2 flights per year). Those who fly twice or more for holiday purposes amounts to almost two percent per quarter on average. This means that excessive holiday flying is not a general trend, even if two out of three flights have holiday purposes. A presumptive explanation behind this could be the central location of Austria, where several sun and beach as well as winter sport destinations can be reached within a few hours by car, bus or train.

Persons with higher education, those who live in the capital city and young people, fly more regularly. This coincides with the existing, somewhat fragmented literature and could be related to the idea of escape travel. Alternatively, people who habitually travel often, may search for dwelling in larger cities. While the average results indicate the importance of several socio-demographic aspects, the flying by residents in the capital region is mainly driven by individuals with higher education.

The findings imply that only a small group of Austrian residents engage in extensive holiday flying. In light of this, presumptive policy measures to reduce flying need to be customised. Some limitations of the study should be noted. The central location of Austria in the middle of Europe means that the conclusions may not be fully representative for countries at the outskirts where flying might be a necessity to reach a holiday destination. Income level is an important variable in determining the demand for air travel. This variable is not available in the dataset at hand. Instead, income effects are expected to be captured by the variables for region, employment status and education. There are several ideas for future work. One idea is to investigate the determinants of holiday destination choice by using a Multinomial Logit model. Another is to focus on the supply side of air travelling.

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Conflict of Interests

The authors declare no conflict of interests.

Supplementary Material

Supplementary material for this article is available online in the format provided by the authors (unedited).

References

Aamaas, B., Borken-Kleefeld, J., & Peters, G. P. (2013). The climate impact of travel behavior: A German case study with illustrative mitigation options. *Environmental Science & Policy*, *33*, 273–282.

Alcock, I., White, M. P., Taylor, T., Coldwell, D. F., Gribble, M. O., Evans, K. L., . . . Fleming, L. E. (2017). 'Green' on the ground but not in the air: Pro-environmental attitudes are related to household behaviours but not discretionary air travel. *Global Environmental Change*, *42*, 136–147.

Bauer, T. K., & Sinning, M. (2008). An extension of the Blinder–Oaxaca decomposition to nonlinear models. *AStA Advances in Statistical Analysis*, *92*(2), 197–206.

Becken, S., Friedl, H., Stantic, B., Connolly, R. M., & Chen, J. (2021). Climate crisis and flying: Social media analysis traces the rise of "flightshame." *Journal of Sustainable Tourism, 29*(9), 1450–1469.

Bruderer Enzler, H. B. (2017). Air travel for private purposes. An analysis of airport access, income and environmental concern in Switzerland. *Journal of Transport Geography*, *61*, 1–8.

Cameron, A. C., & Trivedi, P. K. (2010). *Regression analysis of count data* (2nd ed.). New York, NY: Cambridge University Press.

Cochran, W. G. (1954). Some methods for strengthening the common chi-square tests. *Biometrics*, *10*, 417–451.

Cohen, S. A., Higham, J. E., & Reis, A. C. (2013). Sociological barriers to developing sustainable discretionary air travel behaviour. *Journal of Sustainable Tourism*, *21*(7), 982–998.

Czepkiewicz, M., Heinonen, J., & Ottelin, J. (2018). Why do urbanites travel more than do others? A review of associations between urban form and long-distance leisure travel. *Environmental Research Letters*, *13*(7), 073001.

Czepkiewicz, M., Heinonen, J., Næss, P., & Stefansdóttir, H. (2020). Who travels more, and why? A mixed-method study of urban dwellers' leisure travel. *Travel Behaviour and Society*, *19*, 67–81.

Czepkiewicz, M., Klaas, V., & Heinonen, J. (2020). Compensation or cosmopolitan attitudes: Explaining leisure travel of Nordic urbanites. *Travel Behaviour and Society*, *21*, 167–187.

Dargay, J. M., & Clark, S. (2012). The determinants of long distance travel in Great Britain. *Transportation Research Part A: Policy and Practice*, *46*(3), 576–587.

Davison, L., & Ryley, T. (2013). The relationship between air travel behaviour and the key life stages of having children and entering retirement. *Journal of Transport Geography*, *26*, 78–86.

Fairlie, R. (2005). An extension of the Blinder-Oaxaca decomposition technique to logit and probit models. *Journal of Economic and Social Measurement*, *30*, 305–316.

Falk, M. T., & Hagsten, E. (2021). Determinants of CO_2 emissions generated by air travel vary across reasons for the trip. *Environmental Science and Pollution Research*, *28*, 22969–22980.

Gössling, S., Hanna, P., Higham, J., Cohen, S., & Hopkins, D. (2019). Can we fly less? Evaluating the 'necessity' of air travel. *Journal of Air Transport Management*, *81*, 101722.

Gössling, S., & Humpe, A. (2020). The global scale, distribution and growth of aviation: Implications for climate change. *Global Environmental Change*, *65*, 102194.

Gössling, S., Lohmann, M., Grimm, B., & Scott, D. (2017). Leisure travel distribution patterns of Germans: Insights for climate policy. *Case Studies on Transport Policy*, *5*(4), 596–603.

Gössling, S., & Peeters, P. (2007). 'It does not harm the

environment!' An analysis of industry discourses on tourism, air travel and the environment. *Journal of Sustainable Tourism*, *15*(4), 402–417.

Gössling, S., & Upham, P. (Eds.). (2009). *Climate change and aviation: Issues, challenges and solutions*. London, and Sterling, VA: Earthscan.

Graham, A., & Metz, D. (2017). Limits to air travel growth: The case of infrequent flyers. *Journal of Air Transport Management*, *62*, 109–120.

Große, J., Fertner, C., & Carstensen, T. A. (2019). Compensatory leisure travel? The role of urban structure and lifestyle in weekend and holiday trips in Greater Copenhagen. *Case Studies on Transport Policy*, *7*(1), 108–117.

Hares, A., Dickinson, J., & Wilkes, K. (2010). Climate change and the air travel decisions of UK tourists. *Journal of Transport Geography*, *18*(3), 466–473.

Heinonen, J., Jalas, M., Juntunen, J. K., Ala-Mantila, S., & Junnila, S. (2013). Situated lifestyles: I. How lifestyles change along with the level of urbanization and what the greenhouse gas implications are—A study of Finland. *Environmental Research Letters*, *8*(2), 025003.

Holden, E., & Norland, I. (2005). Three challenges for the compact city as a sustainable urban form: Household consumption of energy and transport in eight residential areas in the greater Oslo region. *Urban Studies*, *42*, 2145–2163.

Holz-Rau, C., Scheiner, J., & Sicks, K. (2014). Travel distances in daily travel and long-distance travel: What role is played by urban form? *Environment and Planning A*, *46*(2), 488–507.

LaMondia, J. J., Aultman-Hall, L., & Greene, E. (2014). Long-distance work and leisure travel frequencies: Ordered probit analysis across non–distance-based definitions. *Transportation Research Record*, *2413*(1), 1–12.

McDonald, J. H. (2009). *Handbook of biological statistics* (Vol. 2). Baltimore, MD: Sparky House Publishing.

McDonald, S., Oates, C. J., Thyne, M., Timmis, A. J., & Carlile, C. (2015). Flying in the face of environmental concern: Why green consumers continue to fly. *Journal of Marketing Management*, *31*(13/14), 1503–1528.

Morten, A., Gatersleben, B., & Jessop, D. C. (2018). Staying grounded? Applying the theory of planned behaviour to explore motivations to reduce air travel. *Transportation Research Part F: Traffic Psychology and Behaviour*, *55*, 297–305.

Muñiz, I., Calatayud, D., & Dobaño, R. (2013). The compensation hypothesis in Barcelona measured through the ecological footprint of mobility and housing. *Landscape and Urban Planning*, *113*, 113–119.

Næss, P. (2006a). *Urban structure matters: Residential location, car dependence and travel behaviour*. London: Routledge.

Næss, P. (2006b). Accessibility, activity participation and location of activities: Exploring the links between residential location and travel behaviour. *Urban Studies*, *43*(3), 627–652.

O'Connell, J. F., & Williams, G. (2005). Passengers' perceptions of low-cost airlines and full service carriers: A case study involving Ryanair, Aer Lingus, Air Asia and Malaysia Airlines. *Journal of Air Transport Management*, *11*(4), 259–272.

Ornetzeder, M., Hertwich, E. G., Hubacek, K., Korytarova, K., & Haas, W. (2008). The environmental effect of car-free housing: A case in Vienna. *Ecological Economics*, *65*(3), 516–530.

Ottelin, J., Heinonen, J., & Junnila, S. (2017). Rebound effect for reduced car ownership and driving. In S. Kristjansdottir (Ed.), *Nordic experiences of sustainable planning: Policy and practice* (pp. 263–283). London: Routledge.

Randles, S., & Mander, S. (2009). Aviation, consumption and the climate change debate: 'Are you going to tell me off for flying?' *Technology Analysis & Strategic Management*, *21*(1), 93–113.

Reichert, A., Holz-Rau, C., & Scheiner, J. (2016). GHG emissions in daily travel and long-distance travel in Germany: Social and spatial correlates. *Transportation Research Part D: Transport and Environment*, *49*, 25–43.

Schubert, I., Sohre, A., & Ströbel, M. (2020). The role of lifestyle, quality of life preferences and geographical context in personal air travel. *Journal of Sustainable Tourism*, *28*(10), 1519–1550.

Shaw, S., & Thomas, C. (2006). Discussion note: Social and cultural dimensions of air travel demand: Hypermobility in the UK? *Journal of Sustainable Tourism*, *14*(2), 209–215.

Sinning, M., Hahn, M., & Bauer, T. K. (2008). The Blinder–Oaxaca decomposition for nonlinear regression models. *The Stata Journal*, *8*(4), 480–492.

Statistics Austria. (2017). Reisegewohnheiten der österreichischen Bevölkerung Quartale Stichprobenerhebungen zum Tages- und Nächtigungsreiseverkehr im In- und ins Ausland. Standard-Dokumentation Metainformationen (Definitionen, Erläuterungen, Methoden, Qualität) [Travel behaviour of the Austrian population, quarterly sample surveys on day trips and overnight trips at home and abroad. Standard documentation Meta-information (Definitions, explanations, methods, quality)]. *Statistics Austria*. Retrieved from http://www.statistik.at/web_de/statistiken/wirtschaft/tourismus/reisegewohnheiten/index.html

Thrall, G. I. (1988). Statistical and theoretical issues in verifying the population density function. *Urban Geography*, *9*(5), 518–537.

Young, M., Higham, J. E., & Reis, A. C. (2014). 'Up in the air': A conceptual critique of flying addiction. *Annals of Tourism Research*, *49*, 51–64.

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