NICOLAUS COPERNICUS UNIVERSITY IN TORUŃ

Bulletin of Geography. Socio-economic Series, No. 61 (2023): 135-157
http://doi.org/10.12775/bgss-2023-0030

BULLETIN OF GEOGRAPHY. SOCIO–ECONOMIC SERIES

journal homepages:
https://apcz.umk.pl/BGSS/index
https://www.bulletinofgeography.umk.pl/

What drives them to drive? Mode choice for holiday travel in Poland and its determinants

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How to cite:
Pielesiak, I., Bartosiewicz, B. & Wójcik, S. (2023). What drives them to drive? Mode choice for holiday travel in Poland and its determinants. *Bulletin of Geography. Socio-economic Series,* 61(61): 135-157. DOI: http://doi.org/10.12775/bgss-2023-0030

Abstract. The article presents insights into holiday travel and its determinants in Poland. The purpose of the study was to analyze Polish citizens' modal split and its determinants. Raw data from a pilot survey conducted in 2015 were used as the source material. To identify the determinants of travel mode choice for holiday trips, a multilevel multinomial logit model was utilized. This approach made it possible to include the hierarchical structure of the data, in which respondents are clustered within municipalities. The results reveal that, in addition to the decision-maker's socio-economic characteristics and household attributes, trip characteristics significantly determine Polish citizens' choice of holiday travel mode. Moreover, the inclusion of municipality-level predictors substantially improved the accuracy of the model. The analysis revealed that the severity of the environmental consequences of motorized transport as perceived by respondents also significantly influences their travel mode choice for holiday trips.

Article details:
Received: 17 January 2023
Revised: 21 July 2023
Accepted: 29 September 2023

Key words:
holiday travel,
tourism geography,
multilevel multinomial logit model,
modal split & determinants,
Poland

Contents:

1. Introduction

Cyclical everyday travel behavior, such as commuting or shopping trips, or traveling in general, has gained considerable recognition in the literature so far. The purpose of and the demand for travel are repeatedly subjected to analysis. The same applies to travel patterns and directly related issues, such as mode choice, frequency, time and distance, cost or complexity. These phenomena are examined through the prism of a wide range of factors, mainly of a socio-economic nature – travelers' individual features (i.e., age, gender, education level, economic status, and psychological factors – values, attitudes), their household features, but also in relation to the surrounding environment, location in transportation network, urban structure, etc. The numerous publications on these subjects include: Schwanen (2002), Lanzini and Khan (2017), Schoenau and Müller (2017), Mirzaei et al. (2021), and De Vos et al. (2022).

There is, however, another unique kind of travel behavior, and its possible negative outcomes are observed from a divergent perspective. This is holiday travel behavior, and it is covered mostly in tourism studies (e.g., Hsieh et al., 1993; Mok & Lam, 2000; Le-Klähn et al., 2014, 2015; Thrane, 2015; Gross & Grimm, 2018; Große et al. 2019). Analysis of tourist behavior, as with other forms of mobility, is limited by the unavailability of extensive, credible, and precise source materials. While new technologies, such as passive and active GPS tracking, and big data from mobile phone, smart card, and social media traces open new avenues of research in holiday travel behavior (Ahas et al., 2008; Birenboim & Shoval, 2016; Shoval & Ahas, 2016; Zhao et al., 2018; Gutiérrez et al., 2020; Xue & Zhang, 2020; Xu et al., 2022), they come with limitations regarding data privacy, high level of aggregation, costs of commercial acquisition, or the distinguishing of tourists from non-tourists (Reif & Schmücker, 2020).

Holiday travel is a captivating research problem because of its occasional nature and the less limited choice of behavior (e.g., destination, mode) than day-to-day travel offers. Furthermore, holiday travel has adverse effects on the climate (Peeters et al., 2007; Hares et al., 2010). Recognizing the features of holiday travel and, in particular, its determinants, allows for a better understanding of consumer choices. On the one hand, such knowledge might be utilized for commercial purposes, in the tourism or transport sectors particularly. On the other, it offers decision-makers information that allows for more precise targeting and implementation of transport and environmental policies. The additional benefit is that it informs people about the negative consequences of their choices and thus may facilitate the change toward sustainable behavior.

With economic development and improved living standards, tourism is now within reach of a large part of the population who live in medium- and highly developed countries. However, the structure of holiday travels and their determinants vary according to the region of the world. Central and Eastern European (CEE) countries are certainly an interesting "laboratory" for research in this field. For decades their development path was separated and to some extent hidden from Western Europe. Despite radical changes in political and economic doctrines that finally opened them for scientific exploration, still they constitute an area in which there are unknowns that need clarifying. In terms of socio-economic development, Müller (2020) calls this part of the world the "Global East", located somewhere between the Global North and the Global South. At the same time, this region largely remains on the peripheries of the debate on spatial processes such as urban development or transport (Müller & Trubina, 2020).

Compared to Western countries, CEE still lacks complete recognition and understanding of the factors of change in transport behavior, especially for holiday travel. Therefore, an attempt was made to reveal its patterns and drivers within this specific geographic context, which appear to be a research gap worthy of closer examination. While choosing the research area we focused on the largest country of the region, Poland. No thorough diagnosis has been made for Poland in this respect so far, largely due to the scarcity of source information. Only fragmentary data are available for this region of Europe (EUROSTAT; Frei et al., 2010), and they focus more on leisure activities than on movement patterns. Furthermore, they are usually explored superficially. Apart from a few descriptive and unrepresentative studies that tackle holiday travel behavior in general, or patterns of tourists' movement only within selected areas (e.g., Zientara et al., 2021), not much is known about its determinants in Poland. What is clear, however, is that, for the last 30 years, the domestic tourist market (measured by numbers of tourists) has tripled (Czernicki et al., 2020; Tourism in 2022, 2023).

Between 2011 and 2019 alone, the share of Polish tourists increased by 30%, from 6.9 to 9 million people (Eurostat, 2022). That is an obvious consequence of Poles' growing income – between 2010 and 2020, the average salary almost doubled.

The direct market share for goods and services strictly related to travel and tourism in Polish Gross Domestic Product was 1.7%. By contrast, the combined share of those activities and cooperating industries was 4.3% (Milczarek 2017). Those numbers are clearly lower than for most Western European countries but, over the years, they have testified to the stability of the tourist sector as a source of income.

Regarding the structure of Poles' tourism, domestic trips dominate, exceeding 82% of the total number (Tourism in 2022, 2023). The development of domestic tourism is aided by the dynamic development of road infrastructure (the length of motorways and expressways has increased fivefold since 2004) and the motorization rate (a threefold increase to over 600 cars per 1,000 inhabitants in the same period according to Statistics Poland). This car dependence is certainly worth attention as, according to the European Environmental Agency, cars are older than in Western Europe and much lower electromobility dynamics are observed here.

CEE countries are close to Western European countries in a few ways, despite their turbulent past. After World War Two, they belonged to the communist bloc. However, at the end of the 20th century, they underwent a socio-economic transition. Finally, in the 21st century, they acceded to the European Union (EU). They follow Western European behavior and make similar decisions in many respects, but at times, they do reveal their different nature. Therefore, other questions arise: Does this observation also apply to travel behavior, and to holiday travel behavior, in particular? Do the gaps in living standards and economic development in a broader sense (Večerník, 2012; Otrachshenko & Popova, 2014) make a difference to those phenomena if we compare them with Western European countries? Are the dynamic economic processes – and the tourism sector, in particular – reflected in other (different) determinants that affect Poles' holiday travel? Our hypothesis is that patterns of behavior in this European region do not differ dramatically, though the role of motorized individual transport is definitely higher.

The main objective of this paper was to reveal the determinants of mode choice for Polish citizens' holiday travel, which haven't been the subject of representative studies so far. We were interested in discovering socio-demographic, economic, psychological, and spatial factors that affect decisions whether to take a car or use another means of transport while moving to and from a holiday destination. The analysis is preceded by an overview of the basic features of holiday travel regarding destinations and mode choices in this part of Europe.

In this paper, we refer to the results of a pilot survey on travel behavior in Poland that was carried out in 2015 and from which we extracted data related to holidays. A multilevel multinomial logit model was utilized in the empirical quantitative analysis.

The above-mentioned assumptions and objectives determined the following structure of the paper. First, the main thrusts of research on holiday travel behavior and its determinants are presented. They are followed by a description of the research method and source material. In the next section, we refer to the results, where holiday travel behavior is characterized, and its determinants are identified and discussed. The article finishes with conclusions.

2. Literature review

In this section of the article, previous research on travel behavior – and holiday travel, in particular – has been analyzed. Our intention was to collect and organize already-published results in order to: resolve some terminological confusion we have come across, build a hypothesis, select the most accurate variables and the method for their analysis, and compare our conclusions with what other researchers have already discovered. Therefore, the following content: (1) structures the definition of holiday travel; (2) reveals the scope and perspectives already adopted within this field; (3) refers to general determinants of travel behavior, and finally (4) discusses those determinants divided into categories – socio-economic, demographic, psychological (with reference to travel characteristics), and spatial factors affecting behavior. In addition, the article was supplemented with a review table (see Appendix) ordering the research chronologically. It specifies research samples and areas, methods of assessment and dependent variables, as well as factors taken into account. Features that proved to be statistically significant have been highlighted in the table.

In the scientific literature, the behavior that is analyzed in this paper is referred to as "holiday travel" (e.g., Böhler et al., 2006; Wang et al., 2015, 2017; Li et al., 2016), "vacation travel" (LaMondia, 2010; van Nostrand et al., 2013) or "tourist's travel behavior" (Hough & Hassanien, 2010; Masiero & Zoltan, 2013; Thrane, 2015). In this context, a tourist, in contrast to "a visitor", is "any person traveling to a place other than that of his/her usual environment for less than 12 months and whose

main purpose of the trip is other than the exercise of an activity remunerated from within the place visited" (IRTS, UNWTO 2008). Böhler et al. (2006) restrict that role more, suggesting stays of at least four nights and traveling for private purposes. Wang et al. (2015, 2017) explicitly attribute being a tourist to a specific period in which one does not have to go to work or school. There is also a whole body of literature on leisure and long-distance travel that largely overlaps with the phenomenon tackled in this paper. Limtanakool et al. (2007, p. 2129) make the point that "holiday journeys are less frequent and involve longer travel distances and time spent at destinations than leisure journeys". The difference between these two categories is also acknowledged by Böhler et al. (2006). On the other hand, many researchers (e.g., Woodside et al., 2004; Hong et al., 2005; van Nostrand et al., 2013; Bieland et al., 2017; Fox et al., 2017; Gössling et al., 2017; Kirillova et al., 2018; Cole et al., 2019; Große et al., 2019; Czepkiewicz et al., 2020) do not articulate that divergence so clearly.

Similarly, the scope of long-distance travel is approached from diverse points of view. One-way distance, usually Euclidean or road distance, and trip duration are the most frequently employed descriptors. A threshold of 50 km is suggested as a minimum value (e.g., Dargay & Clark, 2012; Arbués et al., 2014, 2016), but more often it ranges from a 50-km to 100-km minimum (Van Goeverden et al., 2015; Czepkiewicz et al., 2020) or even further (100 miles by Georggi and Pendyala [2001] and Van Nostrand et al. [2013]). The extent depends a great deal on country size and the arbitrarily collected format of survey data. Furthermore, long-distance journeys might be associated with time spent traveling. In such a case, a threshold of, for instance, three hours of travel in one direction is adopted (Zanni & Ryley, 2015). Adding an overnight stay, distance, and motivation are also criteria that are used (IRTS, UN WTO 2008). An in-depth terminological consideration was given to this kind of travel by Aultman-Hall et al. (2018). Referring to the above-mentioned literature review, in our paper, we adopted the notion of holiday travel as described in section 3.2.

The holiday and leisure travel issues tackled, include, for instance, basic matters such as the desire to leave and the level of satisfaction that it gives (Terkenli, 2002; Dekker et al., 2014). Then the motivation, purpose, and frequency of such activities are examined (Wei & Conners, 2017; Wong et al., 2018). Hough and Hassanien (2010), as well as Mok and Lam (2000), expand this topic by investigating choices of holiday destination and pre-travel decisions on tourism travel organizers. The choice of travel mode and complexity of tourists' journeys are also referred to.

These matters usually concern movement between the home and the destination; however, travel behavior at the destination is also a subject of interest (Masiero & Zoltan, 2013; Le-Klähn, 2014, 2015; Gross & Grimm, 2018; Nutsugbodo, 2018; Bursa et al., 2022a,b). Analysis of mode choice may be accompanied by an examination of travel distance, time, or expenditure (Becken & Schiff, 2011; Mabit et al., 2013). Moreover, in the face of growing concerns about the negative impact of human activity on the natural environment, the specific impact of holiday travel behavior is investigated (Van Goeverden et al., 2015; Gössling et al., 2017). At the same time, data quality and its methods of acquisition (Aultman-Hall et al., 2018; Janzen et al., 2018) are regularly discussed and improved in order to provide sufficient input information for the above-mentioned inquiries.

Factors that affect travel behavior in its broadest sense may be examined from different points of view and attributed to various categories (e.g., De Witte et al., 2013; Sun et al., 2017). Usually, the roles of socio-demographic and time-related factors are recognized (e.g., Commins & Nolan, 2011; Metz, 2012; Santos et al., 2013). Moreover, psychological issues such as values, attitudes and norms, and beliefs and opinions relating to convenience, safety, or environmental consciousness are acknowledged (Buehler, 2011; Santos et al., 2013; Lanzin & Khan, 2017; Wójcik, 2019). Another popular research topic in this field is the disruptive character of natural weather phenomena and the role of climate change (Helbich et al., 2014; Böcker et al., 2016; Liu et al., 2017). And finally, the functional structure and spatial configuration of the built and natural environment are examined. That category encompasses the location of a job and service facilities relative to places of residence (densities, physical and time distances), land-use structure, public transport accessibility (access/egress distances, service frequency, and necessary transfers), length/density and configuration of roads, intersections, and bicycle lanes, and the availability of parking space, among others (Schoenau & Müller, 2017; Sun et al., 2017; Wójcik, 2020).

Some of the above-mentioned factors have also been recognized as influencing holiday, leisure, and long-distance travel behavior with reference to trip generation in general, distance, and mode choice (see Appendix). It seems that women depend on cars less than do men (Mallett, 1999; Arbués et al., 2016; Lee et al., 2016), as do elderly travelers and young

adults (Georggi & Pendyala, 2001; Limtanakool et al., 2006; Arbués et al., 2016). According to Georggi and Pendyala (2001), LaMondia et al. (2010), and Dargay and Clark (2012), increased household size decreases trip distance. Household structure also matters. The presence of children in a holiday-making group discourages long-distance travel (LaMondia et al., 2010). Similarly, having elderly members in such a group increases the probability of the journey being made by car (Li et al., 2016). This is similar to the effect of increasing the number of travel companions (Thrane, 2015).

Furthermore, married, full-time employed, and highly educated people tend to travel more (Georggi & Pendyala, 2001). Böhler et al. (2006) confirmed the significance of higher education, although their results regarding marital status differed from one another's. According to Limtanakool et al. (2006), those in high school (ages 14–18) prefer trains for their leisure trips.

At the border between social and economic issues, there is professional status. Van Can (2013) noted that people who are employed in the state sector tend to travel by air and by train rather than by coach. Limtanakool et al. (2006) added that worker-families prefer trains. Jobseekers, trainees, and students who are already on the spot choose public transport more often (Gross & Grimm, 2018). Income is one of the most important factors that determine the distance covered, trip generation in general, and mode choice (Limtanakool et al., 2006; Dargay & Clark, 2012; Arbués et al., 2014). The least economically privileged groups usually choose the bus (Georggi & Pendyala, 2001; Van Can, 2013), but Limtanakool et al. (2006) noted their preference for trains, while Gross and Grimm (2018) noted a preference for public transport in general. High disposable income increases the role of the car, even compared to the train (Arbués et al., 2016; Li et al., 2016), and the wealthiest travelers more frequently choose the plane (Van Can, 2013; Thrane, 2015). Furthermore, those who own a second home are more inclined to undertake domestic travel (Czepkiewicz et al., 2020). This factor also enhances their preference for the car over public transport (Thrane, 2015; Arbués et al., 2016). Finally, owning a car and the increasing number of cars owned means there is a preference for cars when they are at the user's disposal (Gross & Grimm, 2018).

According to the literature on holiday and leisure travel, we also know that people sensitive to travel cost would rather use a surface mode of transport, and if it is important to get to a destination easily, journeys are shorter and more probably made by car (LaMondia et al., 2010). Böhler et al. (2006) and Arbués et al. (2014, 2016) noted that the longer a trip is, the higher the probability of choosing train over bus, as well as plane and train over car. Thrane (2015), however, observed that increasing the number of countries visited within the same trip made travelers more likely to use a car than a plane.

Unsurprisingly, travel time also affects tourists' choices. But it is more the out-of-vehicle rather than the in-vehicle travel time that matters (Van Can, 2013). The longer the trip between home and destination, the greater the propensity to use the train (Limtanakool et al., 2006). The elasticity of demand for car travel with respect to travel time and costs is unclear according to the observations of Rich and Mabit (2012), Li et al. (2016), and Arbués et al. (2016).

Other psychological factors matter as well. According to the theory of planned behavior, intentions affect mode choice, although other important predictors are traveler habits and past behavior (Lanzini & Khan, 2017). Thus, it is interesting that analyzing habits in relation to holiday travel behavior allowed Bieland et al. (2016) to find that repeated use of public transport makes it more likely that it will be used during short holidays. A similar observation was made earlier by Nordfjærn et al. (2015) regarding leisure travel. They additionally discovered that leisure travel was also affected by safety and security factors (accidents, offenses such as violence or theft) more than work trips were. The psychological explanation of holidaymakers' behavior has developed considerably, not only based on the above-mentioned theory of planned behavior, but also value-belief-norm theory, social comparison theory, attribution theory, and others (see Juvan & Dolnicar, 2014).

As for space-related factors (Appendix, "Place of residence" column), the type of settlement unit in which the travelers live is usually significant. Limtanakool et al. (2006) and Arbués et al. (2016) emphasize the roles of high population density and more mixed land use, which encourage people to choose public modes, as does living in a big city in general (Gross & Grimm, 2018). On the other hand, more rural destinations increase car use (Thrane, 2015). Such observations were also made by Czepkiewicz et al. (2018a). Regarding destination, high population density, mixed land use, and specialization in services also enhance the use of the train (Limtanakool et al., 2006). Those who stay longer at their tourist destination would rather get there by plane or public transport than go by car (Thrane, 2015). However, that observation is not in line with Becken and Schiff (2011), who emphasized the role of cars in such cases.

To conclude, there was a considerable range of factors analyzed as potential determinants for travel behavior. Still, not enough research has tackled holiday travel directly and explicitly, as most research refers more to broader categories of leisure or long-distance travel. In addition, some observations are contradictory, often due to national characteristics (e.g., the organization of the public transport system). And finally, all the important analyses of the determinants of holiday travel behavior refer to the situation in the West, South Asia, or Australasia. Central and Eastern Europe, and Poland in particular, are a less recognized research area in this respect.

3. Research design

3.1. Study area

With 38 million inhabitants, Poland is one of the ten largest countries by population in Europe. According to the World Bank and OECD, before 2020, its economy was also one of the fastest-growing in the EU, although just a few decades ago it was still going through a painful transition from a centrally planned economy to a market economy. As a result, there was considerable improvement in the sectoral and ownership structure, entrepreneurship, infrastructure, education, and the natural environment, among other things. Additionally, the character of tourism changed from social and mainly domestic to internationally open. However, income inequality also became more evident. Poles work longer but for smaller wages (Croes et al., 2021), which might affect their holiday behavior.

With an index value of around 634 cars per 1000 inhabitants (in 2019, according to Statistics Poland), the country has become one of the most motorized in the EU (the EU average in 2018 was 531). For several years, a great improvement has been noted in the road accessibility of Polish regions and cities (Kowalski & Wiśniewski, 2019). However, there are growing inequalities in public transport accessibility, which are due to enhanced motorization, the ownership and organizational changes of the former national bus and rail carriers, the emergence of commercial operators in urban agglomerations (Taylor & Ciechański, 2017), and the provision of bus services for school children, which is limited to rural areas. A distinctive feature is that, in regards to air travel, international traffic prevails. According to the Polish Civil Aviation Authority, in 2019, the ratio of passengers carried within the country to those going abroad was 1:10.

3.2. Data and methods

Our research is based on a representative survey of travel behavior in Poland that was conducted by Statistics Poland (2015). That is the first such rich and reliable source of data on Pole's travel behavior. Surprisingly, despite the time that has passed since the raw data was made public, it still has not been completely and thoroughly analyzed (Bartosiewicz & Pielesiak, 2019). That appears in a sense as a waste of immense potential for informing the society, as well as for providing more accurate bases for political decision-making. Since 2015, no other representative of even a similarly substantive value database on travel behavior has been developed. The survey sample included 13,500 Polish households (0.1% of the total number of Polish households). In total, there were 25,500 interviewees aged 16 and over (0.1% of the total population 16 and over) (*Note 1*). The CAII (Computer Assisted Internet Interviewing) and CAPI (Computer Assisted Personal Interview) survey was conducted as a one-off project. This allowed us to gather information on journeys made by the respondents from Monday to Friday and on weekends (for one chosen week), including occasional trips over 100 km that had happened within the preceding 12 months (before the survey).

The database comprises all types of travel activity, including journeys made every day and those made occasionally. The questionnaire included seven purposes for occasional trips: business trips, spending free time/short holiday (up to four days), shopping, accompanying somebody, personal needs (e.g., medical assistance), holiday trips (four and more days), and others. Return trips were a separate category. In each category, the respondent was asked to provide the place of residence and the destination (municipality), the time and distance of travel, the number of people traveling, and the main means of transport.

We included all data from the category "holiday trips", which consisted of trips lasting four days or more. Taking note of the origin and destination, we excluded travel within the interviewee's municipality of residence. That allowed us to remove data that referred to holidays spent with family in the same city, for

example. The second category, which we partly combined with the first one, was "spending free time/short holiday", such as on concerts, hobbies, or cultural events. It referred to shorter trips of up to four days. We limited this category to trips with a distance exceeding 100 km, which allowed us to exclude trips related to spending free time cyclically, at least to some extent. This assumption is in line with observations made by Frändberg and Vilhelmson (2003), who analyzed trips in Sweden in terms of the relationship between travel distance and purpose. We are aware of the limitations of this approach, however, and understand that our database may have included some non-holiday trips. On the other hand, we did not want to lose some of the data on short holiday trips, which are popular in Poland. Thus, it was possible to take a holistic approach to the topic.

In Table 1, the characteristics of the final sample are presented. Ultimately, 8,274 trips were selected for analysis, among which there were 3,682 occasional trips over 100 km. There were 6,958 individual travelers in the sample, which gives nearly 1.2 trips per person. The respondents lived in 988 different municipalities.

As the range of statistical tools used in modeling holiday travel behavior is wide (Baltas,

Table 1. Sample characteristics

		N	%
Gender	Female	3627	43.84
	Male	4647	56.16
Education level	Lower	2259	27.30
	Middle	2980	36.02
	Higher	3035	36.68
Job market status	Self-employed	1158	14.00
	Hired staff	4220	51.00
	Student/pupil	525	6.35
	Pensioner/other	2371	28.65
Municipality type	City ≥100k inhabitants	3393	41.01
	City <100k inhabitants	2727	32.96
	Rural	2154	26.03
Adverse effect of transport: carbon emissions*	Yes	2770	33.48
	No	5504	66.52
Adverse effect of transport: congestion*	Yes	5307	64.14
	No	2967	35.86
At least one car in a household (HH)	Yes	6796	82.14
	No	1478	17.86
Average income in municipality of residence (thousands of Polish zlotys [PLN] per year)×	<25k PLN/year	1294	15.64
	≥25 and <40k PLN/year	5672	68.55
	≥40k PLN/year	1308	15.81
	Min	Max	Mean (SD)
Age	16	91	45.64 (16.01)
Number of people in HH	1	14	2.96 (1.42)
Number of people under 16 y.o. in HH	0	10	0.54 (0.86)
Railway density in municipality of residence (km per km^2)	0	11.87	0.69 (1.16)
Number of people traveling together	1	7	1.88 (0.78)

* Respondents were asked to indicate the effects of motorized transport that they consider to be the most adverse. Here, the effect was used as indicated or not indicated. × 1 PLN ≈ 0.24 € (in 2015).
Source: own elaboration.

2007), the vast majority of studies utilize the well-established random utility framework (Ben-Akiva & Lerman, 1985) to identify the determinants of travel behavior. If the dependent variable has a discrete polychotomous distribution, it is common to use the multinomial logit model (e.g., LaMondia et al., 2010; Thrane, 2015). In the dataset used in the study, trips were nested within respondents, who were nested within households, which were nested within municipalities. This complex data structure required more advanced methodological treatment than classic multinomial logit modeling. A proper approach is to consider multilevel models, which can address unobserved heterogeneity across the observations at particular levels (e.g., Hox et al., 2018: 1–7; Wong, 2017). This framework also makes it possible to relax the IIA (Independence of Irrelevant Alternatives) assumption, which often binds the classic (one-level) MNL model and restricts its applicability in some choice situations (Hausmann & McFadden, 1984; Grilli & Rampichini, 2007).

Therefore, the multilevel multinomial logit model (multilevel MNL) was utilized in the empirical part of the study (*Note 2*). This method is currently regarded as a state-of-the-art approach to modeling cross-sectional data in transportation as it can capture random intra-agent taste heterogeneity (Hess et al., 2004; Washington et al., 2011: 275–281; Ortúzar & Willumsen, 2011: 250–252). Various level structures of the model were considered, taking into account the hierarchical nature of the data. Unfortunately, attempts to estimate models that account for the full hierarchical structure were not successful. Three- and four-level model estimations suffered from convergence problems caused by an insufficient number of observations to form the groups at the household and individual levels (they were often just one trip made by an individual or one household in the sampling period) (e.g., Clarke & Wheaton, 2007; Łaszkiewicz, 2013). This resulted in the final choice of the two-level MNL model with a random intercept at the municipality level as the most appropriate tool (e.g., Arbués et al., 2016; Mercado & Páez, 2009; Hung et al., 2013).

A two-level MNL model with a random intercept at the municipality level was considered. It can be written as follows (Goldstein, 2011: 119–121; Arbués et al., 2016):

$$\log\left(\frac{\pi_{ij}^{(s)}}{\pi_{ij}^{(t)}}\right) = \alpha^{(s)} + \boldsymbol{\beta}^{(s)\prime}\boldsymbol{X}_{ij} + \varepsilon_{ij}^{(s)} + \xi_j^{(s)}, s = 1, \ldots, t-1$$

where s is the response category (mode of transport chosen), t is the number of categories of the dependent variable, and π_{ij} stands for the expected value of the response for respondent i living in municipality j. X consists of respondent level predictors with β as the regressor's parameters, α stands for a fixed category-specific intercept, and ξ_j denotes a random category-specific intercept describing the differences in choices due to the clustering of respondents within the municipalities. Finally, ε_{ij} is an error term assumed to be Gumbel distributed and independent across respondents, categories, and municipalities (Skrondal & Rabe-Hesketh, 2003).

The two-level MNL model allowed the level of correlation between respondents living in the same municipality to be assessed with an intra-class correlation coefficient (ICC), defined as the ratio of between-municipality variance and total variance (Snijders & Bosker 2012: 38–66):

$$\mathrm{ICC}^{(s)} = \frac{\sigma^2(\xi_j^{(s)})}{\sigma^2\left(\xi_j^{(s)}\right) + \pi^2/3}$$

This coefficient is calculated for each response category (excluding the base category). The statistical significance of the ICC also supports the view that spatial heterogeneity should be accounted for. When choosing the research method, the potential correlation between choice categories was taken into consideration. As the above-mentioned IIA assumption was not violated in the estimated models (the Small–Hsiao test of IIA at the 5% level of significance), it was not justified to change the methodological approach to a category-clustered oriented one (i.e., Nested Logit). On the other hand, according to Hess et al. (2004), a multilevel approach that accounts for random taste heterogeneity can capture the effects of inter-alternative correlation presence in the error term. This means that, even if a significant correlation between alternatives were present in the data, the multilevel MNL model would capture it but it would be interpreted as part of a random taste variation.

The final specification of the model was developed based on a series of Likelihood Ratio tests and the assessment of theoretical plausibility. The selection of variables for the final model was performed in accordance with the general-to-specific modeling paradigm (Campos et al.,

2005), which assures that none of the statistically significant predictors will be omitted.

4. Results and discussion

This section presents basic information about Polish travelers' modal split, followed by a description of the results of the multinomial analysis. Finally, the results are contrasted with what the scientific literature reveals regarding subsequent determining factors.

4.1. Holiday travel behavior: basic remarks

According to the survey, the majority of Poles spend their holiday without leaving the country. Of the 8,274 trips made, only 15% were foreign. As far as domestic trips are concerned, one third went to the seaside, while mountain resorts were the second most popular destination. Another distinctive feature was the large share of trips to the biggest cities (Warsaw, Cracow, Wroclaw, and Gdansk). Those cities both attract typical tourists and might also reflect the tendency of Poles to spend their holiday with their families.

As for trips abroad, two categories may be distinguished. The first is related to visiting family, which is a result of the massive migration of labor that began in Poland after it joined the EU in 2004 (Burrell, 2011). Accodingly, the joint share of Germany and the United Kingdom reaches 20%. The other group consists of typically tourist destinations, which is apparent as far as winter (ski) and summer trips are concerned. Poles target the Czech Republic, Austria, and Slovakia for the former and Croatia and Italy for the latter, although Italy is also a popular destination in the winter season.

The high motorization index for the whole nation is visibly reflected in the modal split of holiday travel. Most Polish travelers use their own cars, which are responsible for almost three quarters of all domestic trips (Table 2).

One in ten citizens goes on holiday by bus and one in twelve by train. Air travel was only declared by those going to destinations abroad (about 40% of international trips). Simply taking shares into consideration suggests that choosing the car, which was the expected mode, becomes more likely as the number of household members increases. Furthermore, such behavior is typical of half of the interviewees who live on their own. In the case of two-person households, the share is 72%, and for large families (5+) with children younger than 16 years old, it was 81%. People living in rural areas use cars more often than those in urban areas, but the difference is not dramatic (83% vs. 75%). That pattern is determined by three factors: a higher motorization index and limited access to public transport for domestic journeys in rural areas (Bartosiewicz & Pielesiak, 2019), as well as low accessibility of airports for international journeys (Czepkiewicz et al., 2018).

4.2 Determinants of holiday travel behavior: multivariate analysis

The transport mode chosen for holiday trips was taken as the dependent variable in the two-level MNL model. As the car was the most popular mode chosen by respondents, it was used as the base category. The estimated results for the choice of bus, train, and plane are presented in Table 3.

Table 2. Modal split of Poles' holiday trips*

modal split	urban			rural			Total		
	D**	I	D + I	D	I	D + I	D	I	D + I
car	78.7	38.2	72.3	87.7	53.0	83.1	81.1	41.6	73.6
motorcycle	0.5	0.6	0.5	0.2	0.0	0.2	0.4	0.5	0.6
bus	9.4	16.4	10.5	7.7	15.1	8.7	8.9	16.1	9.9
train	11.0	1.8	9.6	4.1	0.7	3.6	9.2	1.6	8.0
plane	0.1	42.7	6.9	0.0	30.9	4.2	0.1	39.9	6.2
ship	0.0	0.2	0.0	0.0	0.3	0.0	0.0	0.2	0.2
bike	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.2
other	0.2	0.1	0.2	0.2	0.0	0.1	0.2	0.1	1.3

* Holiday trips – trips of four days or more and a distance of more than 100 km
** D – domestic; I – international
Source: own elaboration.

Table 3. One-level and two-level multinomial logit models for travel mode choice for holiday trips in Poland

	One-level MNL						Two-level MNL					
	Bus		Train		Airplane		Bus		Train		Airplane	
	B	Z-score	B	Z-score	B	Z-score	B	Z-score	B	Z-score	B	Z-score
Fixed parameters												
Socio-economic characteristics												
Age	0.048***	2.772	0.023	1.222	0.053**	2.340	0.047**	2.110	0.023	1.061	0.053**	2.340
Age * Age	-0.001**	-2.312	-0.001*	-1.709	-0.001***	-2.739	-0.001*	-1.798	-0.001	-1.450	-0.001***	-2.654
Gender: Female ♦	0.436***	4.761	0.220**	2.240	0.455***	4.604	0.454***	4.627	0.260**	2.417	0.463***	4.884
Education: Middle †	-0.340***	-3.249	0.044	0.372	0.081	0.591	-0.358***	-2.863	0.005	0.044	0.071	0.481
Education: Higher †	-0.285**	-2.415	-0.006	-0.044	0.285**	2.072	-0.300**	-2.148	-0.042	-0.336	0.269*	1.709
Job market status: Self-employed ‡	-0.657***	-3.314	-0.666***	-2.889	0.389**	2.239	-0.701**	-2.405	-0.757***	-3.328	0.384*	1.922
Job market status: Hired staff ‡	-0.302**	-2.435	-0.159	-1.134	0.002	0.011	-0.338**	-2.167	-0.168	-1.076	0.012	0.085
Job market status: Student/pupil ‡	0.991***	4.373	0.997***	4.321	0.524*	1.954	0.955***	3.141	1.023***	3.275	0.515*	1.760
Household (HH) attributes												
Total number of people in HH	0.443***	10.623	0.309***	6.222	0.083	1.469	0.480***	8.485	0.342***	5.122	0.101	1.627
Number of people under 16 y.o. in HH	-0.552***	-7.321	-0.418***	-5.009	-0.336***	-3.969	-0.616***	-5.975	-0.442***	-4.082	-0.353***	-3.507
At least one car in HH	-2.022***	-19.333	-2.375***	-21.430	-0.913***	-6.934	-2.145***	-15.213	-2.446***	-15.693	-0.933***	-8.023
Trip characteristics												
Number of people traveling together	-1.408***	-17.302	-1.026***	-11.985	-0.659***	-7.757	-1.481***	-11.310	-1.083***	-8.734	-0.669***	-6.264
Municipality characteristics												
Type: City <100k inhabitants ◊	-0.228**	-2.171	-0.625***	-5.547	-0.461***	-3.950	-0.190	-1.222	-0.543***	-3.199	-0.426***	-3.122
Type: Rural ◊	-0.463***	-3.042	-0.738***	-4.072	-0.203	-1.272	-0.441**	-2.080	-0.691***	-2.939	-0.178	-0.959
Railway density	-0.064*	-1.653	0.077**	1.962	0.046	1.101	-0.067	-1.402	0.085**	2.097	0.045	1.146
Average income: 25k–40k PLN/year #	-0.181	-1.265	0.167	0.849	0.789***	3.649	-0.139	-0.741	0.165	0.727	0.793***	3.281
Average income: >40k PLN/year #	-0.389**	-2.116	0.130	0.581	1.079***	4.604	-0.522**	-2.084	0.118	0.399	1.007***	3.681
Transport's side effects												
Carbon emissions	0.134	1.509	0.107	1.105	0.226**	2.326	0.106	1.029	0.132	1.192	0.244***	2.634
Congestion	-0.243***	-2.653	-0.289***	-2.872	-0.081	-0.760	-0.276**	-2.574	-0.296***	-2.691	-0.076	-0.649
Intercept	0.183	0.394	0.368	0.735	-2.617***	-4.698	0.141	0.213	0.154	0.248	-2.719***	-4.566
Random intercepts							Est.	S.E.	Est.	S.E.	Est.	S.E.
σ^2							0.626	0.254	0.577	0.160	0.147	0.181
ICC							15.986%		14.922%		4.277%	
LR	2856.192						2611.226					
p-value (LR)	0.000						0.000					
No. of level-1 observations	8274						8274					
No. of level-2 observations							988					
Log-likelihood at convergence	-5342.166						-5299.896					
McFadden's Pseudo R2	0.211						0.198					
Nagelkerke's Pseudo R2	0.362						0.339					
AIC	10804.331						10740.674					

Note: Car is the base category for the whole model. Z-scores were calculated using robust standard errors. *p < 0.1, **p < 0.05, ***p < 0.01. ♦ Base category: Male. † Base category: Lower. ‡ Base category: Pensioner/jobless. ◊ Base category: City ≥ 100k inhabitants. # Base category: < 25k PLN/year (PLN refers to the national currency of Poland, the Polish zloty).
Source: own elaboration..

Of the respondents' socio-economic characteristics, only the influence of gender was significant for all modes of transport considered. In each case, women were less likely to choose a car than men, which is in line with observations made for American, Dutch, Spanish, and Chinese citizens by Mallett (1999), Limtanakool et al. (2006), Arbués et al. (2016), and Li et al. (2016), respectively. The nonlinear effect of age was significant for trips made by bus and airplane. The negative value of the squared term suggests that, as the respondents get older, the likelihood that they will choose a bus or plane over a car increases but with a diminishing rate (an inverted U-shaped parabolic relationship). This confirms what Georggi and Pendyala (2001) noted based on simple descriptive statistics and Chi-squared testing. They also noted that for, elderly Americans, the role of bus transport also increases with age. On the other hand, their results reveal no visible preference for rail transport, in contrast to Limtanakool et al. (2006).

According to our research, education level significantly determines the choice of the bus on holiday trips. As the level of education increases, the probability of choosing the bus over the car gets smaller. This is a new insight and, again, is different from the Dutch preference for trains among highly educated travelers (Limtanakool et al., 2006). Highly educated respondents tend to choose the plane more often than low-educated respondents, which is in line with what Czepkiewicz et al. (2019) observed regarding young Icelanders' international travels.

Our results also add to the scientific knowledge that self-employed people tend to choose cars more often than buses or trains compared to pensioners and jobless respondents (base category). However, for trips by air, this relationship is the opposite. For respondents who are not self-employed, there is a significant preference for the car over the bus. However, being a student or pupil sharply increases the probability of choosing a bus or train over a car, which can be explained by the discounts for train and bus tickets available for this group. Moreover, this group of respondents can face problems with car accessibility due to driving license eligibility and lower precedence of car use, especially if there is only one car in the household. This finding is in line with the relationship observed in the daily travel activity of Polish students (Sokołowicz et al., 2011). Students and high-school pupils also tend to choose the plane more readily than the car. This effect is less statistically significant, but it can be explained by higher international mobility among the youth (observed among young Germans by Kuhnimhof et al. 2012), their desire for short-term trips with cheap flights (Mailer et al., 2019: 231) refer to less frequent car use among the young vs. their "greater desire to discover the world by plane"), and the discrepancy between environmental behaviors at home and while traveling, especially on holiday (Barr et al., 2010).

Household attributes are essential predictors of mode choice for almost all modes considered. So far, household size has been analyzed in the holiday travel context as a determinant of trip length. Our research revealed that it also matters for mode choice. In Poland, as the size of the household increases, the probability of choosing public transport over a car gets higher (the effect is not significant for trips by air). If we consider the number of household members who are younger than 16 years old, an inverse relationship can be observed, which was also reported by Li et al. (2016) in their analysis of Chinese domestic tourism. Ownership of at least one car in the household leads to a significant decrease in the probability of choosing any other mode of travel. Such an observation regarding tourism mobility in Austria was also recently made by Juschten and Hössinger (2020). In our case, this predictor has the most substantial influence compared to any of the other covariates in the model, which supports similar findings in other studies (e.g., Limtanakool et al., 2006). It is also important to mention that the car ownership variable can itself be related to other factors (Van Acker & Witlox, 2010). Therefore, the conclusions should be treated with caution. We argue that, in our study, the effect of car ownership can be partially related to the missing information on personal/household income.

One of the trip characteristics we considered was the number of people traveling together. An increase in the size of the travel party leads to an increase in the probability of choosing the car over alternative modes of travel, which is in line with what Juschten and Hössinger (2020) observed for Austrian tourists and their lower preference for public transport. However, it contradicts Thrane's (2015) findings on Austrian tourists' preference for air and public transport. Our study does not directly measure the perceived comfort of traveling or the per-capita cost of the trip. Therefore, we suspect that the size of the travel party might also partially account for these factors.

The Polish study also controlled for the attributes of the municipality. The inhabitants of larger cities (over 100k citizens) have a higher propensity to choose public transport modes than the residents of smaller cities and rural areas. That was expected, as it was previously suggested by Limtanakool et al.

(2006) and Arbués et al. (2016). However, we add that an increase in the density of railways raises the probability of choosing train over car. We also argue that the overall income status of respondents who reside in a particular municipality can affect modal choices. Therefore, the average yearly income in the municipality was included in the model. The relationship between this variable and mode choice is positive and significant for the use of planes for holiday travel, which confirms what Georggi and Pendyala (2001), LaMondia et al. (2010), Van Can (2013), and Thrane (2015) observed regarding the use of the "household income" variable for air travel. We also observed a negative relationship between municipality income and the probability of choosing bus over car, which is particularly significant in the wealthiest regions compared to the poor ones.

As for travelers' opinions regarding the side effects of transport, the multivariate analysis revealed that respondents who perceive exhaust emissions as the most adverse side effect of transport are more likely to choose planes than cars for their holiday travel (*Note 3*). Thus, it seems that emissions are attributed more to road traffic than to air travel. However, this contradiction between the expectancy of more awareness (for which higher education might be a proxy) and choosing less environmentally friendly modes of transport was also observed for long-haul travelers by Böhler et al. (2006). Similarly, Davison et al. (2014: 21) observed a "cognitive dissonance between attitudes and behavior" in this respect. This was later confirmed by McDonald et al. (2015), Alcock et al. (2017), and Lanzini and Khan (2017), among others. Hares et al. (2010) and Juven and Dolnicar (2014) explained it through the prism of: (1) unwillingness to change behavior as holidays are prioritized more than environmental concerns; (2) denial mechanisms (referring to responsibility, external factors, e.g., financial and time constraints, or limited accessibility); (3) downward comparison (worse behavior happens), an exceptional situation (on holiday vs. at home), and covering harms with the benefits that tourism offers. Mailer et al. (2019) found that tourists are still not ready to welcome dramatic changes that limit their freedom, accepting relatively easy or temporary compromises that enhance sustainability.

On the other hand, Bruderer Enzler (2017) observed that people who care more about the environment choose the plane less frequently. However, that study concerned air travel for private purposes rather than explicitly for holiday travel. Therefore, the possibilities of comparison with this case are limited. The respondents who selected congestion as the most critical consequence of transport tend to travel more by car than by bus or train. One could expect an inverse relationship here, but this effect can be explained by the fact that frequent car users are primarily affected by congestion daily.

The values of the intraclass correlation coefficients (ICC) for each mode are reported in Table 3. This measure can be interpreted as the proportion of variability explained by spatial differentiation. For bus and train travel, the ICC equaled around 16% and 15%, respectively; for the choice of plane, it was significantly smaller (4.3%). These results mean that most of the mode choice determination stems from the traveler's individual characteristics, but the between-municipality differences are not negligible. For the choice of train, similar results were obtained by Arbués et al. (2016) for Spain. On the other hand, their estimated ICC for the choice of bus over car was significantly lower. It is hard to determine the exact factors responsible for the spatial heterogeneity of choices. They may be related to local taste variation or the differences in the infrastructure between the regions and access to a particular mode of transport.

The validity of the choice of the two-level MNL model as a tool for researching holiday travel behavior was confirmed by the significant LR test outcomes. The results of the two-level MNL model were also compared with the classic (one-level) MNL model. The outcomes of this comparison suggest that the results are robust in terms of parameter significance and signs of coefficients. The value of the Akaike Information Criterion (AIC) was significantly higher for the one-level MNL model (10804.331), which supports the choice of the two-level MNL for the multivariate analysis (see Hox et al., 2018: 38–39). The model's goodness-of-fit can be assessed with McFadden's and Nagelkerke's Pseudo R2 values (Grabowski, 2019: 215–239). According to Hox et al. (2018: 123–124), values between 0.2 and 0.4 indicate a good fit of the model, which leads to the conclusion that the outcomes of the empirical analysis are acceptable and reliable.

5. Conclusions

In terms of the efficiency or everyday functioning of the transport system, holiday travel is not directly comparable to, e.g., commuting. It comprises occasional journeys, which occur infrequently (mainly during the holiday season) and which are channeled along the main transport routes. These do not significantly affect congestion in the most

urbanized regions, where the number of road users is already high. However, in more remote, less populated, and less intensively developed areas, as well as areas with a critically fragile natural environment, such travel behavior causes serious adverse effects. At the same time, it increases local demand for goods and services, thus supporting a wide range of economic entities and stimulating investment (e.g., technical infrastructure, service facilities, or public spaces) that serves both tourists and residents. For the latter, this means interweaving benefits with nuisances (e.g., higher prices, noise, crowds, congestion). Those issues were addressed by, e.g., Archer et al. (2005), as far as tourism, in general, is concerned, or Bursa (2021), who focused on the impact of tourists' travel behavior.

5.1. Main findings and limitations

The paper provides the first complex examination of factors that affect holiday transport behavior in Poland, a CEE country in which the path of socio-economic development has deviated considerably from the one observed in Western countries. It turns out, however, that this divergent development path has not had much effect on the choice of mode for holiday travel. The 30-year transition period has been long enough to make Polish society very similar to Western societies in this respect. When going on holiday, Poles most frequently choose cars. This behavior is more typical of people who live far from the highly accessible public transport found in cities. Furthermore, trains are also chosen less frequently, which is attributed to the limited level of development of the rail infrastructure. This finding becomes even more interesting if we take into account the tendency of the inhabitants of this part of Europe to return to the same destinantions during subsequent holidays. That was observed by Coerria et al. (2015). This raises the need for a continuation of this line of research in future. If relevant long-term data become available, it will be worth examining whether the patterns of transport behavior on holidays still do not change and what possibly might determine that.

Furthermore, in accordance with the hypothesis formulated in the introductory part of this article, we can conclude that age, gender, household composition, and income usually affect travel behavior in a similar manner to that found in the results in other countries. However, we added new insights on the role of the size of the household and travel party, the traveler's level of education, and the municipality in which he or she lives.

As for the methodological contribution of this study, we confirmed that the multivariate analysis that was carried out using a multilevel multinomial logit model can capture not only the impact of individuals' factors on mode choice, but also the spatial differences of their choices related to the area where they live. Nonetheless, the use of this tool remains rare in holiday travel behavior studies. The outcomes of the empirical analysis show that, among Polish citizens, this heterogeneity of choices is relatively low but not negligible, and it differs across the modes of transport. This phenomenon can be explained by the infrastructural disparities between Polish regions. To some extent, that reflects the impact of the over-hundred-year political partition that lasted until the beginning of the 20th century.

Our paper is, to the best of our knowledge, the first such comprehensive attempt to investigate the determinants of holiday travel behavior in Poland. However, we are aware that there are limitations to our research. Firstly, the sample is not in line with the characteristics of the Polish population. For example, the rural population is underrepresented in the survey. Secondly, research design regarding the source data suffered from some methodological flaws, i.e., a lack of information regarding the exact date of traveling or missing attributes of choice alternatives. Finally, 2020 brought completely unexpected difficulties for travelers due to the restrictions and uncertainty caused by the COVID-19 pandemic. These facts may have influenced the present structure characteristic and determinants of holiday trips in Poland. However, in our opinion, in general, our results and conclusions are in line with the main processes taking place nowadays. Additionally, this research offers a solid base for comparing how travel patterns were affected during the pandemic.

5.2. Policy implications

The results presented in this paper are important for the commercial sectors (carriers, accommodation, retail, and supporting industries). Knowledge of travelers' clear inclinations for domestic holiday travel and socio-economic features is an indispensable basis for precise customer targeting and the outlining of development strategies for the future. However, our findings are even more significant for policy, especially regarding transportation policy, tourism development, and spatial planning. They allow for a more adjusted implementation of instruments that enhance holidaymakers' desired behavior. There

is already a good starting point. The observed preference for domestic travel means that national and local development should be supported in multiple economic sectors. Furthermore, it requires shorter distances to be covered, which contributes to less gas emissions than longer-distance journeys. As those features are in line with the principles of sustainable development, the authorities should encourage them on a regular basis.

Travel behavior in Poland has become comparable to that observed in Western European countries although, economically, it lags behind. Thus, it may and should benefit more from those countries' rich and more mature policy experience that slowly evolved under market economy conditions. Like other CEE countries, Poland had to abruptly adapt to new political and economic circumstances. The fast pace did not allow for unhurried testing or thoughtful learning and implementation of solutions and instruments. Political decisions were made quickly and boldly, and the long-term results were not always in line with the policymakers' intentions. The time has come to develop and execute an updated comprehensive policy that effectively combines economic, transportation, and environmental principles and that learns from tried-and-tested experiences in the West.

One of the key issues to be addressed by such a policy is the relationship between Polish holidaymakers' awareness and their actual choices. We revealed a dissonance that challenges pro-environmental policy and the shift towards more sustainable tourism. According to recent public surveys (e.g., Ministerstwo Klimatu i Środowiska 2020; CBOS 2020), environmental awareness is developing, and it may be seen to be catching up with Western Europe. However, as already stated, Poland lingers behind the West in economic terms. That is clearly noticeable as far as household disposable income is concerned, for example (see OECD statistics). In a country with insufficiently developed public transport, the car remains a status symbol. But it also remains a basic means of holiday travel for short and medium distances (including trips abroad), especially for those who travel in groups.

In such circumstances, appealing to travelers' environmental awareness is obviously ineffective, and more fundamental needs and resources should be addressed. There are incentives that affect travel costs and time, as well as security and comfort for passengers. Basic measures include increasing subsidies for cheaper family tickets and substantially enhancing and promoting seasonal rail lines to popular tourist destinations. Moreover, there are special trains to festivals and major sports events. Also, schedules are tweaked to make switching means of transport easier and more convenient, and the overall travel time more competitive with private means of transport.

Special attention should be paid to railway connections due to their high transport capacity, speed, and comfort for passengers. Although the railway network covers the entire country, there are significant regional disproportions, which should be tackled urgently. If that were accompanied by replacing conventional sources for generating electricity with renewable ones, railway transport would become the most sustainable alternative.

The changes recommended above, which are intended to reduce travel costs and offer fast, safe, and comfortable traveling, are the attractors aimed especially at the huge group of families with children. Those travelers, according to our findings, would not give up their cars otherwise. If successful, apart from the direct effects, such as reducing greenhouse emissions and generating additional revenues for public transport, another goal will be accomplished, and that is familiarizing young travelers with sustainable means of transport. The traveling experiences and habits of younger age groups may affect future behavior, making the desired outcomes more durable.

We are aware that Poles' great attachment to cars probably requires other transitional solutions. The more effective development of electromobility seems to be a way of decarbonizing, at least temporarily. However, a major challenge is the development of power infrastructure that meets the demand. Another challenge is the already mentioned need to increase the share of green energy supply, as renewable sources still contribute less than 20% of total production in Poland. Finally, implementing technical measures that make the manufacturing and management of equipment more sustainable also remains a challenge. Implementing all those recommendations would be a challenge in normal times, but, especially now, in the face of the extraordinary economic difficulties and political uncertainty in the world today, that seems particularly problematic.

In order to ensure greater operational efficiency of the proposed recommendations, additional in-depth research is advisable. It should reveal the impact of potential global determinants, but it could also extend our knowledge of the role of the local spatial context, e.g., urban structure and environment-related factors, as well as the psychological foundations for personal attitudes and preferences. The results of the quantitative analysis

in this paper remain a solid starting point for such an endeavor. The most reasonable solution would be to expand the survey that our paper was based on to contain questions on norms, beliefs, intentions, and denial mechanisms in subsequent editions. Additionally, based on what Nordfjærn et al. (2015) reported for Norway, surveying travelers' fears and worries might produce an interesting basis for practical use. Norwegians seem to be encouraged by a lower risk of accidents. If that observation also proves true for Poland (infamous for having one of the highest road accident rates in the EU), a far-reaching and continuous information policy, in contrast to the rudimentary and sporadic campaigns already carried out on the safety of traveling by public transport, may be expected.

Notes

1. The data were collected in accordance with the two-stage stratified sampling technique. Sample representativeness was adjusted to the sociodemographic characteristics of the general population in the given territorial unit. In cases where representativeness was not assured sampling weights were calculated in order to facilitate the generalization of the results.
2. The multilevel multinomial logit model is known in the research literature under a variety of names (see Garson 2013: 3-12; Hox et al. 2018: 8). The most popular names include the mixed multinomial logit model, the random parameters multinomial logit model, and the hierarchical multinomial logit model. We use the name multilevel multinomial model to emphasize the focus on the structure of the data used in the empirical analysis. A similar approach can be found in Arbués et al. (2016).
3. Among the adverse effects of motorized transport, the respondents also mentioned *noise, accidents, parking in prohibited areas* and *other*. These variables were not statistically significant predictors of travel mode choice, so they were not included in the final model specification.

Acknowledgements

This work was supported by National Science Centre of Poland [grant number UMO-2019/35/B/HS4/00286] and the funding programme for young researchers at the Faculty of Economics and Sociology, University of Lodz.

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Appendix. Determinants of travel behavior taken into consideration in research on holiday, leisure and long-distance travel

Research reference and subject	Sample size and study area	Assessment method/ dependent variable	Factors included				
			Socioeconomic characteristics	Household attributes	Trip characteristics	Place of residence/ destination characteristics	Psychological factors and experience
Hsieh et al. (1993): mode choice of outbound holiday travelers	1,503 residents of major Australian cities	stepwise logistic regression model/taking package tour while traveling overseas	**age,** marital status, personal income	-	**travel party size, traveling with children, trip type (touring/city/ resort/cruise),** stay time	-/ adventure getaway, heritage, physical activity, social escape benefits, English-speaking destination	**being & seeing**
Georggi and Pendyala (2001): long-distance travel of the elderly and low income	54,120 American households	linear regression models/total and recreation or vacation trip generation	**age, ethnic group, marital status, education level**	**household size and type, household income, car ownership**	-	-	-
Böhler et al. (2006): environmentally sustainable holiday travel	1,991 residents of Augsburg, Bielefeld and Magdeburg, Germany	stepwise regression analysis/ greenhouse emissions according to travel distance and mode choice	**age,** living arrangements based on partnership, **education level, personal income**	**household size**	-	-	values (**openness to change,** conservation, self-enhancement, self-transcendence) and attitudes toward public transport and cars
Van Middelkoop et al. (2003): behavioral assessment of tourism transport options	876 visitors to Whistler, Canada	nested multinomial logit model	age, gender, education level, **household income**	-	**travel time, cost**	**-/parking fees, fuel price,** arrival and departure point	-
Limtanakool et al. (2006): determinants of mode choice for medium- and long-distance trips	2,326 trips made by Dutch citizens	binary logit model/mode choice	**age, gender, education level**	**household type, car availability, household income**	**travel time**	**urbanization level & access to train station population density, specialization in services – in the place of residence and destination**	-
La Mondia et al. (2010): holiday travel behavior and values	2,298 travelers from Germany, Greece, Spain, France, Italy, and the United Kingdom	multinomial logit model/destination and mode choice	**nationality, job market status**	**household size, household income**	**travel party size, travel cost, use of intermediaries**	**criteria for choosing destination, products bought on the spot, kinds of visited places**	**attitude toward costs and ease of getting to/from a destination, nationality preference across different countries**
Rich and Mabit (2011): model for long-distance travel demand in Europe	111,867 separate trips in EU27	nested logit model/ mode choice conditional on destination	-	-	**travel cost and time (frequencies, access-egress, headway and transfer time), travel distance, purpose (private/ business/ holiday)**	-	-
Dargay and Clark (2012): determinants of long-distance travel	147,826 British residents	structural models/ distance travelled	**age, gender,** job market status, **driver of a company car, personal income**	**household composition, housing type, length of residence at a current address**	travel time	municipality size and **type, region/**-	**activity participation**
Van Can (2013): travel mode choice for domestic tourists	402 tourists visiting Nha Trang, Vietnam	multinomial probit model/mode choice	**age, gender, job market status**	-	**distance, in- and out-of-vehicle travel time per kilometer, per-kilometer travel cost to income ratio, price against quality of the mode, travel mode comfort, safety,**	-	-

Arbués et al. (2014): long-distance domestic travel	26,897 Spanish residents	independence double hurdle model/travel distance	**age, gender, personal income**	-	**travel distance,** purpose (business, second residency/other)	**municipality size, type of area (metropolitan/non-metropolitan), geographical region**/-	-
Nordfjæm et al. (2015): psychological factors that affect work and leisure travel	1,035 Norwegians living in the six largest regions	hierarchical cluster analysis, Cronbach's alpha and average corrected inter-item total correlations, Cohen's d-values	age, gender, education level	income, **access to car**	-	access to public transport	**car habit strength**, resistance to change, **risk perception**, worries, demand for risk mitigation
Reichert and Holz-Rau (2015): mode use in long-distance travel	34,194 residents of German municipalities	two-stage Heckman regression model/distance and total number of trips	age, gender, job market status, **education level**, driving license status	household type, **household income**, car ownership	-	municipality size, regional density, accessibility of inter-urban rail services/-	-
Thrane (2015): tourists' long-distance transportation mode choices	2,139 Norwegians	multinomial logit regression model/mode choice	**age, gender**	**household income**	**travel party size, travel time no. of countries visited, length of stay, trip purpose**	**-/ urban-rural destination**	-
Wang et al. (2015): Integrated Multimodal Travel Information (IMTI) and holiday travel behavior	415 Chinese citizens	exploratory Factor Analysis and structural equation modelling/trip chain structure (travel mode and route)	*age, job market status*	*household composition, car ownership*	*trip duration and complexity, travel time and costs, travel distance, trip origin*, **IMTI service**	-	*on spot activity*
Arbués et al. (2016): modal choice in long-distance trips	19,514 Spanish residents	multilevel multinomial logit model/mode choice	**age, gender,** job market status, education level, **personal income**	-	**trip duration,** cost, **travel distance, purpose (leisure/ business)**	**municipality size, type of area (metropolitan/non-metropolitan) /-**	-
Bieland et at. (2016): traffic behaviour of short vacationers and same-day visitors	797 randomly selected visitors to Kassel, Germany	Chi-square test of independence/mode choice	-	-	*travel party size, cost, transit possibilities, convenience, flexibility, traveling with a luggage*	-	**habitual use of public transport**
Li et al. (2016): holiday travel mode choice	891 tourists in Fragrance Hill Park, Beijing, China	cluster-based logistic regression model/mode choice	**age, gender, driving license status,** job market status	household structure, **household income, car ownership**	travel party size, relation between people traveling together, **travel and stay time**		
Trinh and Le (2017):	756 tourists in Vietnam	binary logistic regression model	nationality, age, gender, budget for the trip	**family income**	stay time, travel distance, cost and time, in- and out-of vehicle time, comfort, frequency of transport service	-/-	sensitivity to safety and weather conditions
Czepkiewicz et al. (2018a): travel patterns and greenhouse emissions in local, national and long-distance travel	841 young adults residing in Helsinki Metropolitan Area, Finland	regression models: logistic and ordinary least squares (OLS) tested with Moran's I statistic/ greenhouse emissions according to national/ international travel	**gender, education level, personal income**	**household composition,** car ownership, housing type, private yard	-	**urban zone/-**	-
Czepkiewicz et al. (2020): urban dwellers' leisure travel	1,148 residents of Reykjavik, Iceland	bivariate and multivariate hierarchical regression analysis/number of trips (domestic/ international;	age, gender, weekly workload, education level, **language skills,** dispersion of social networks, **personal income**	household type, members aged 7 or under, and members aged 7-17, **income per consumption unit in a**	participation in business trips	**urban zone,** distance to the city center, neighborhood greenness/-	pro-environmental attitude, climate change awareness, **cosmopolitan attitude**

		ground trips/flights)		**household**, car ownership, access to a private yard and **a vacation home,** housing type			**in travel**, **urban vs. natural environment preference**
Juschten and Hössinger (2020): urban–rural tourism trips in Austria	877 residents of Vienna, Austria	multinomial logit model	-	**car ownership**, **public transport discounts in household**	**travel party size**, **travel distance**, travel time	-/**quality of web presence**, **shops within walking distance**, private accommodation, vehicle rental options	-
Zientara et al. (2021): sustainable mobility at the destination	301 visitors to the Tri-city conurbation, Poland	Mann-Whitney U-test and Kruskal-Wallis test	**age, gender, education**	-	-	**place of residence (city, town, rural area)**/-	-
Bursa et al. (2022b): tourists' mode choice at destination	625 tourists in Tirol, Austria	multinomial logit model	age, gender, residence country, education	**children aged under 6 and 6-17**	length of stay, holiday type and purpose	-/hotel type and rating, air temperature, sunhours, snow, **precipitation, wind**	**prior knowledge about the destination, fitness level, participation in sport and social activities**

Key: factors marked **in bold** were found to be statistically most significant in each study (thresholds are not cited due to high methodological diversity). For factors in italics, the assessment of significance was unclear or not applicable.
Source: own elaboration.