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**Shifts in travel behavior influenced by risk perception,
particularly in relation to the COVID-19 pandemic**

Theses of the doctoral dissertation

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1. The justification of the topic selection and the significance of the research

Tourism is one of the most dynamically growing sectors of the last decades, and in addition to its job-creating effect, it is also one of the most important drivers of economic growth (Csapó & Gonda, 2019). The crises that have occurred since 2008, including the COVID-19 pandemic, the Russian-Ukrainian conflict, and the energy crisis, have posed significant challenges to the tourism sector (Raffay, 2020; Cruz-Ruiz et al., 2022; Nagy et al., 2021; Kellér et al., 2022).

Security is a precondition for the effective operation of tourism, which also strongly influences tourists' travel decisions (Dávid et al., 2007; Karl and Schmude, 2017; Garg, 2013; Isaac and Van den Bedem, 2020, Kiss & Michalkó, 2020). The successful functioning of this sector is not only the result of effective marketing communication but also the complex outcome of external and internal influences (Csapó & Töröcsik, 2019; Nundy et al., 2021; Cruz-Ruiz et al., 2022).

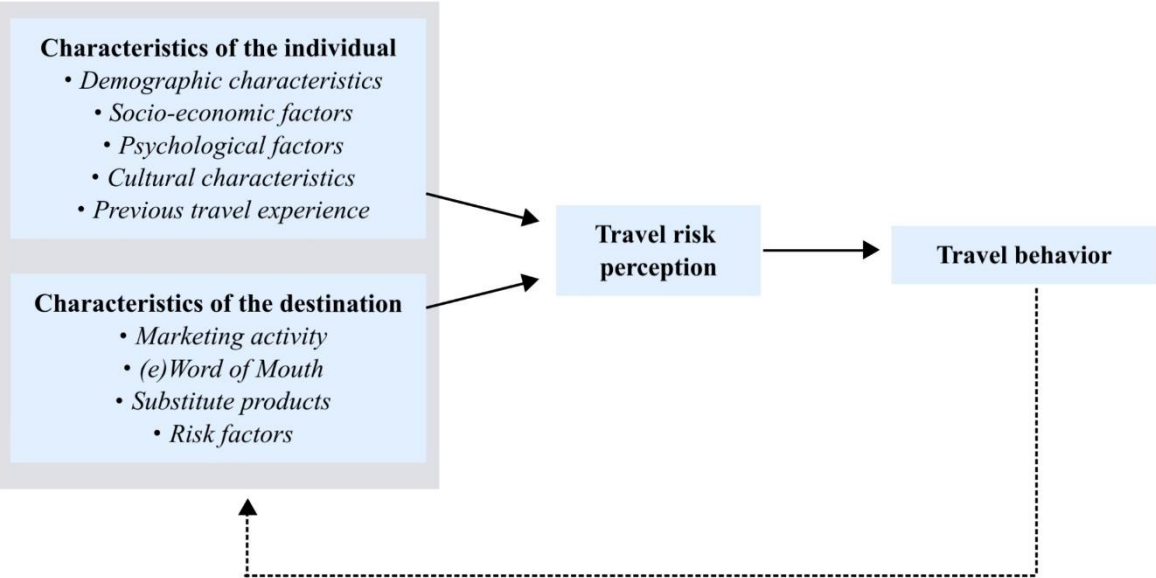
Consumers show complex behaviors in response to different risks, influenced by personal and psychological characteristics, in addition to economic, natural, political, and social circumstances (Sönmez & Graefe, 1998, Lőrincz & Sulyok, 2017). Learning from historical crises becomes crucial, allowing more effective preparation for the next crisis. My dissertation aims to provide a comprehensive overview of past crises affecting the tourism sector and using a multidisciplinary approach integrating insights from psychology, sociology, anthropology, and economics, the dissertation seeks to explore changes in consumer behavior. My objective is to develop a framework for studying changes in consumer behavior as a function of risk-taking. I started the research from the initial concept illustrated in Figure 1.

Furthermore, my dissertation aims to contribute methodological insights to the systematic literature review methodology. The challenge posed by the huge amount of online literature encouraged me to adopt a systematic approach. An essential part of the methodology is the identification and in-depth analysis of 120 relevant studies.

Key findings include the differentiation and classification of different crises according to their origin. In exploring the internal and external factors that influence travel decisions, the dissertation focuses on demographic characteristics, socio-economic factors, health, psychological characteristics, attitudes, travel motivation, and geographical knowledge.

External factors such as media influence, marketing strategies, political factors, or security measures are also taken into account. The aim is to get a comprehensive picture of how travelers navigate in times of crisis.

Figure 1: The initial concept of the research



Note. Self-edit.

2. The methodology of systematic literature review

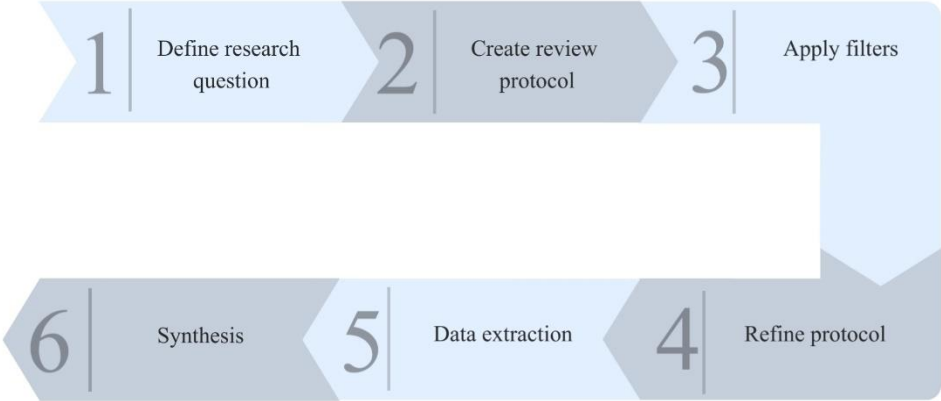
A systematic literature review embodies a comprehensive investigation conducted through scientific methodology. It involves gathering responses to a specific research query, subjecting them to strict criteria assessment, and analyzing all available research findings (Booth et al., 2011; Bettany-Saltikov, 2012).

The accessibility and speed of online scientific databases have increased the volume of available content to a degree that paradoxically complicates, rather than simplifies, the process of assimilating scientific findings.

For instance, the search term "tourism AND crisis" produced over 2 million results on the Google Scholar search engine¹. Conversely, a Systematic Literature Review (SLR), guided by a predetermined methodology, yields notably precise and transparent outcomes. The process is explained through the steps illustrated in Figure 2.

¹ Based on the query as of January 9, 2023.

Figure 2: Phases of the systematic literature review approach



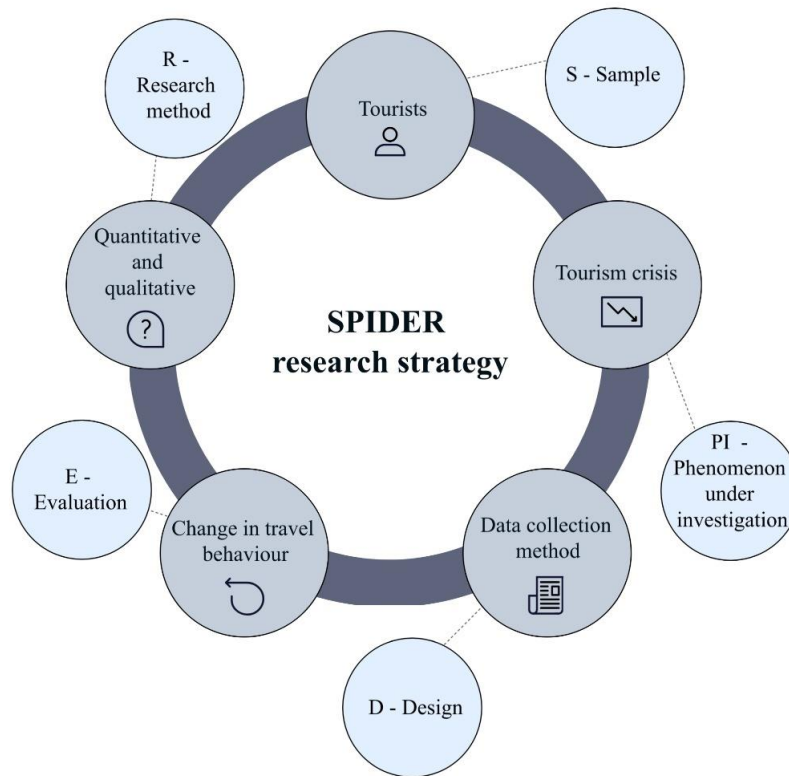
Note. Self-edit based on Bettany-Saltikov (2012).

The 1-5 steps illustrated in Figure 2 took place from October 14, 2022, to January 28, 2023, followed by the synthesis part, which continued until August 28, 2023. A systematic literature review is a comprehensive and time-consuming process, typically taking an average of 9-12 months to complete. This is the reason why the current literature review includes literature up to 2022, but I believe that the detected 120 pieces of literature included in the research provide a punctual and relevant overall understanding and reliable results. Furthermore, due to the precise documentation, this research can be easily complemented with new studies published since then within a subsequent study.

After formulating the research question, I established the research methodology (SPIDER²), using it to define the subjects under investigation, the events being studied, and the direction toward the desired outcome — in this case, changes in travel behavior resulting from crises. The visual representation of the research strategy is presented in Figure 3.

² Research strategy, where each letter stands for the initials of the following terms: sample (S), phenomenon under investigation (PI), design (D), evaluation (E), research method (R)

Figure 3: Visualization of the search approach following the SPIDER framework



Note. Self-edit based on the SPIDER search strategy tool (Cooke et al., 2012).

Afterward, I identified the primary keywords³, which I employed to search the electronic databases: Web of Science, Scopus, EconLit with Full Text, and Academic Search Complete.

Following this, I arranged the obtained results in order of citation following the SLR method protocol. Then, after reviewing the titles, keywords, and abstracts, I compiled the final list of keywords⁴ using the three most relevant studies, i.e., those investigating changes in tourist behavior resulting from crises (Table 1.).

³ Primary keywords: tourism AND crisis.

⁴ They are included in Appendix 1.

Table 1: The three most frequently referenced literature sources concerning the subject

	Author (year)	Type of risk	Sampling location / sample composition	Research method	Google Scholar citation (27.01.2023)
1.	Sönmez & Graefe (1998)	Terrorism	USA / U.S. residents who have previously traveled or plan to travel internationally	Quantitative - Self-completion questionnaire by post	1470
2.	Rittichainuwat & Chakraborty (2009)	Terrorism & SARS outbreak	Thailand / International tourists arriving in the country	Quantitative & qualitative - questionnaire survey & interview	650
3.	Lepp & Gibson (2008)	Comprehensive literature, consideration of multiple risks	USA / Young adult residents of the United States	Quantitative - Questionnaire survey	606

Note. Self-edit based on my research.

Next, using the earlier identified keywords and their synonyms, I created the following search query:

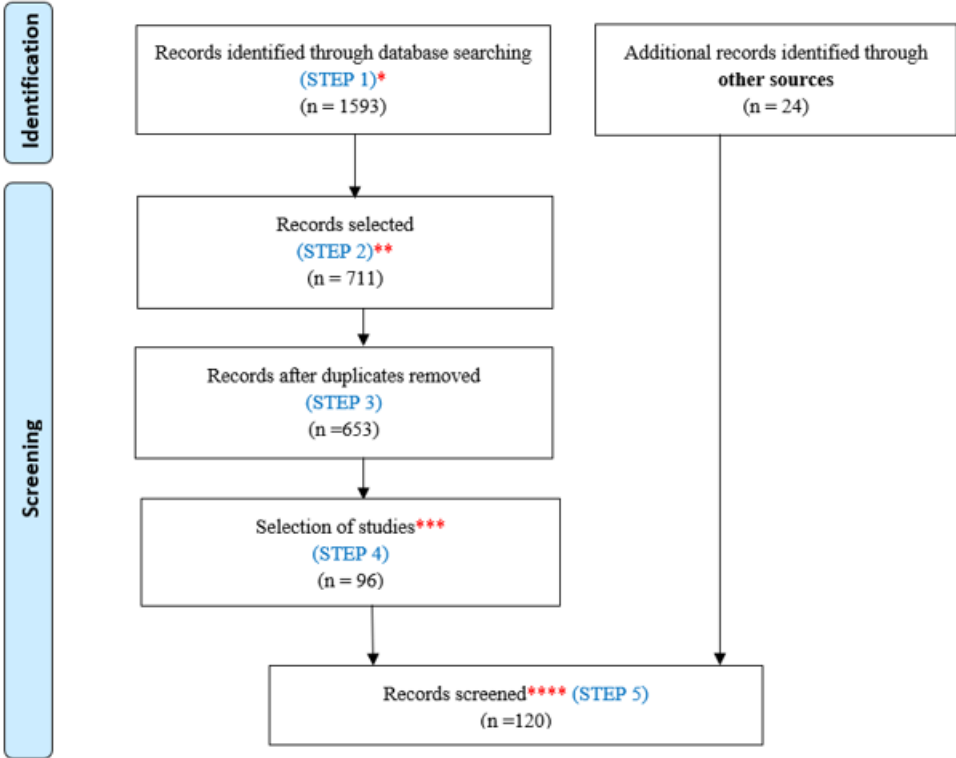
TS = ((tourist OR visitor* OR vacationist*) AND ("financial cris*" OR "economic cris*" OR recession* OR disaster* OR "natural disaster*" OR pandemic* OR epidemic OR outbreak OR war OR terror*) AND (interview* OR "focus group" OR "case stud*" OR "literature review*" OR synthesis OR observation* OR surve*) AND (react* OR act* OR behav* OR perform*))*

The search conducted in the four electronic databases yielded a total of 1593 results. Following this, I defined the criteria for inclusion and exclusion, further refining the list of literature to be processed. According to these criteria, the studies I intended to include in my research could be international journal articles from Scimago Q1-Q4 categories. Additionally, according to the accepted SLR methodology protocol, I excluded books, conference proceedings, and other types of documents. The language of the studies could only be English, with no geographical or publication time restrictions. It was also sufficient for a study to appear in one of the four examined databases; it did not need to be present in all four. Due to the interdisciplinary nature of the research question, I included studies from the following fields: economics, psychology, sociology, anthropology, and other social sciences.

With the above criteria, 711 studies were remaining on the list, which decreased to 653 after removing duplicates. After reviewing their titles and abstracts, I selected those studies that proved to be relevant to my research question.

In the primary search list, a total of 96 studies remained that I deemed worthy of processing. Following the recommendations from the methodology literature, I conducted supplementary searches. By thoroughly examining the references of the previously selected 96 studies and consulting with experts in the field, I included an additional 24 studies in the research. A visual representation of the study selection process is presented in the form of a PRISMA diagram (Figure 4).

Figure 4: PRISMA flow diagram



Note. Self-edit.

* The number indicates all records derived from WoS, Scopus, EconLit with Full Text and Academic Search Complete.

** Records selected based on inclusion and exclusion criterias.

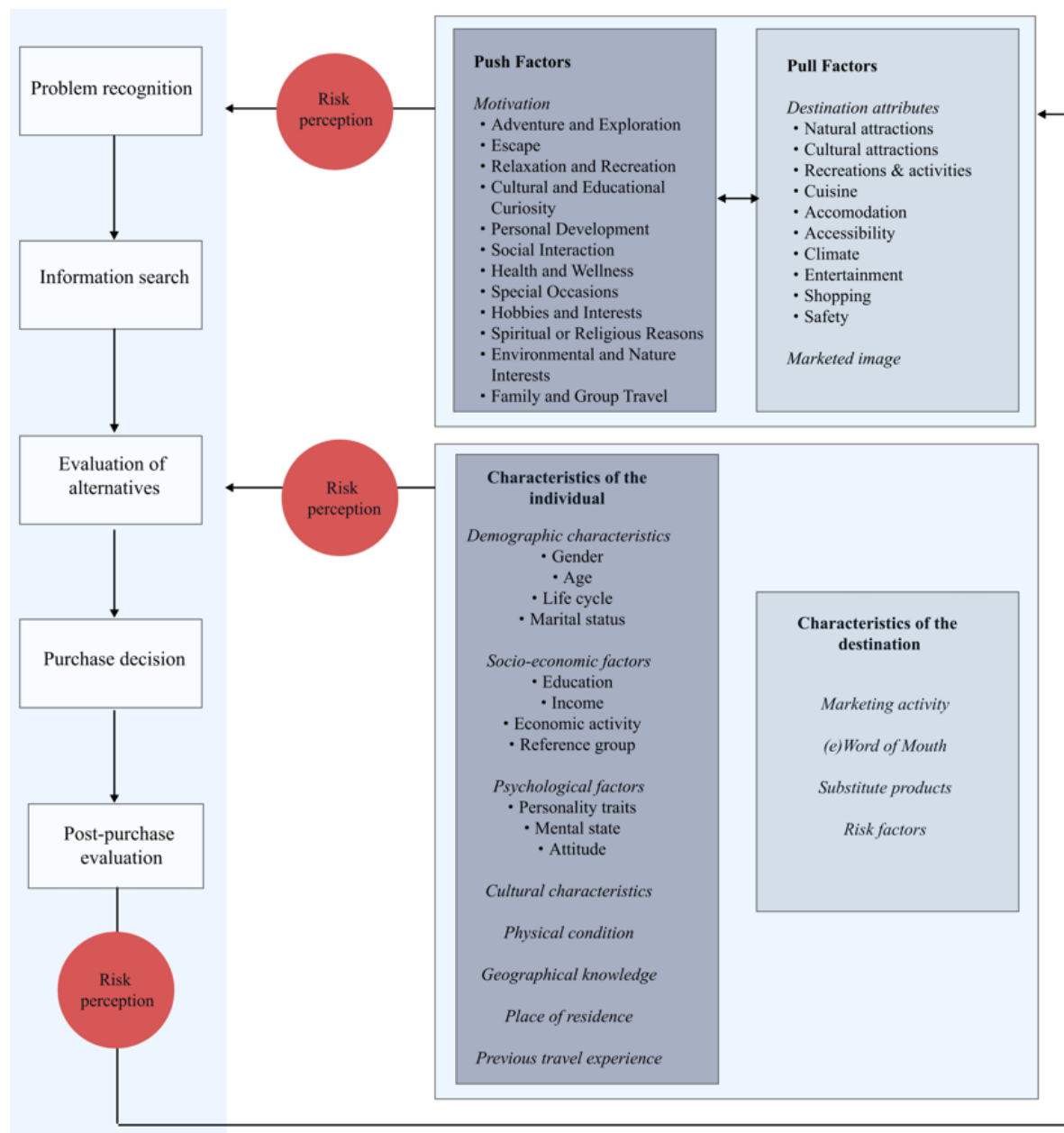
*** Primary research list.

**** Selection based on only relevant articles that related to the research question based on SPIDER elements.

3. Conceptual framework of the secondary research: segmenting the factors influencing travel decisions in the light of risk perception

The travel decision is a complex process influenced by numerous factors (Figure 5). In my doctoral dissertation, based on the systematic literature review, I conducted a comprehensive analysis of how the elements of the conceptual model influence risk perception. This conceptual framework serves not only as a model for the present research but hopefully provides a complex system or model for further related research.

Figure 5: Conceptual framework of the secondary research



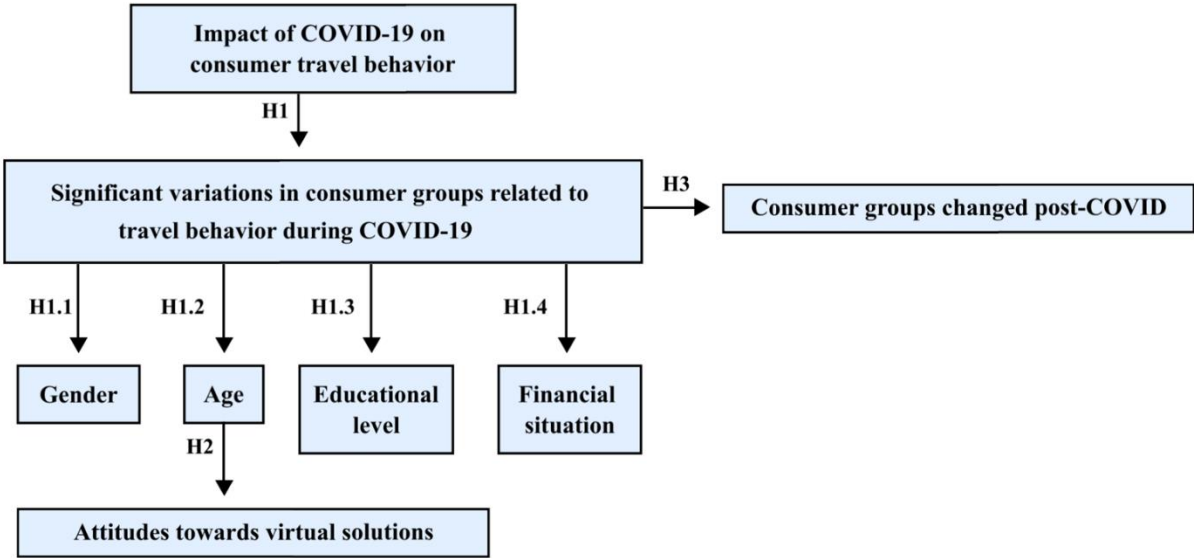
Note. Self-edit based on the results of the systematic literature review.

In the decision-making process, the stage of need recognition marks the initial point where we begin to form our list of potential destinations. However, even at this early stage, there are destinations that we consciously exclude from consideration due to safety concerns. This exclusion may be based on previous negative experiences or simply on prejudices and perceptions about the destination's safety. As we progress to the information search stage, we gather more data about the remaining alternatives on our list. It is during this phase that we once again encounter risk perception as we evaluate the safety aspects of each destination. Finally, the impact of our post-purchase experiences plays a crucial role in shaping our future travel decisions. These experiences, whether positive or negative, contribute to our perception of each destination and influence our decisions on future trips (Lőrincz & Sulyok, 2017, Kiss & Michalkó, 2020).

4. Objectives and hypotheses of the dissertation

Building upon the research questions listed below and the insights derived from the systematic literature review, I have developed the hypotheses (Table 2). The formulated hypotheses serve as key guiding principles, defining the study's direction and enabling a targeted exploration of the nuanced dynamics of consumer behavior amidst prevailing global challenges (Figure 6). This focused approach aims to yield valuable insights into the specific considerations and patterns within the Hungarian demographic group, contributing to a more nuanced understanding of the broader impact of the global crisis on consumer preferences.

Figure 6: The conceptual framework of my primary research



Note. Self-edit.

Research question 1 (RQ1): What distinct consumer groups have emerged in terms of travel as a result of the coronavirus pandemic?

Hypothesis 1 posits that the COVID-19 pandemic has led to substantial variations among consumer groups about travel behavior. At the outset of the coronavirus crisis, our research team, led by Professor Mária Törőcsik, assumed that the primary changes could be identified regarding certain factors. These factors include attitudes towards virtual solutions, concerns related to financial situations, the subjective impact of travel on the quality of life, local patriotism (preference for domestic travel), sustainability considerations, visiting family and friends as travel motivations, and willingness to use public transportation. This hypothesis suggests that the anticipated changes in these specific areas have likely contributed to the emergence of distinct consumer groups, each responding uniquely to the challenges and uncertainties introduced by the pandemic.

Hypothesis 1: The COVID-19 pandemic has led to significant variations in consumer groups about travel behavior.

In the case of the COVID-19 pandemic, fear was observed to be much more intense in women than in men (Isaac & Van den Bedem, 2020; Zheng et al., 2021b; Ertas & Kirlar-Can, 2022; Shahabi Sorman Abadi et al., 2021; Brida et al., 2022). Compared to planned travel, women traveled in smaller percentages following the first wave of the coronavirus pandemic (Li et al., 2021), and they were less likely to travel abroad, which can be attributed to their higher risk perception (Shin et al., 2022). On this basis, the following hypothesis was formulated.

Hypothesis 1.1: There are differences between the segments according to gender.

During the COVID-19 pandemic, evident age-related differences have emerged (Brida et al., 2022; Aro et al., 2009), likely linked to the increased susceptibility to disease among individuals aged 65 and older. Consequently, the older demographic significantly restricted their travel during the pandemic, leading to a greater tendency to travel after the pandemic (Shin et al., 2022). On the other hand, older individuals may perceive themselves as more at risk, further reducing their travel intentions (Peluso & Pichierri, 2020). Younger individuals tend to have a greater willingness to take risks and, therefore, express a stronger intent to travel during a potential global pandemic (Brida et al., 2021; Ertas & Kirlar-Can, 2022). Based on this assumption, the following hypothesis was developed:

Hypothesis 1.2: There are differences between the segments according to age.

Educational attainment has an impact on our risk-taking (Brida et al., 2022). Those with higher educational qualifications are likely to have greater trust in science, which was evident in their approach to the pandemic (Golets et al., 2020). On this basis, the following hypothesis was formulated.

Hypothesis 1.3: There are differences between the segments according to educational level.

In the case of the COVID-19 pandemic, even those with lower incomes had travel plans (Cruz-Ruiz et al., 2022), with the most significant changes in travel behavior occurring among those whose income declined due to the pandemic (Stefko et al., 2022; Chandra Pratiwi et al. 2022; Li et al., 2021). Individuals with greater travel experience tend to have a higher tolerance for risks, and it is assumed that they also have higher incomes (Golets et al., 2020). Based on this assumption, the following hypothesis was developed:

Hypothesis 1.4: There are differences between the segments according to financial situation.

Research Question 2 (RQ2): How have demographic characteristics influenced virtual tourism participation during the COVID-19 pandemic?

In response to the specific challenges posed by COVID-19, my hypothesis is grounded in the experience of the rapid growth of online solutions, suggesting potential impacts on the tourism sector, particularly in terms of virtual tourism. I propose that younger generations are more likely to participate as they are familiar with digital technologies. The pandemic is accelerating the adoption of online tools (Pásztor, 2020; Pásztor & Bak, 2020), and the tourism industry appears to be adapting this practice.

Hypothesis 2: The younger generation is more likely to actively engage in virtual tourism during the COVID-19 pandemic.

Research Question 3 (RQ3): Since the outbreak of the COVID-19 pandemic, how has the composition of various consumer groups changed?

According to research by Bronner & Hoog (2012), who investigated the impact of the 2008 economic crisis on travel habits, there is a significant difference between planned and actual travel behavior. Based on these findings, I have hypothesized that there may be a discrepancy between planned and actual travel behavior in the context of COVID-19, leading to changes in the size and characteristics of segments identified through research conducted at the onset

of the pandemic. The uncertainties and evolving circumstances surrounding the pandemic are likely to have influenced individuals' travel plans, potentially causing a divergence between their intentions and actual actions.

Hypothesis 3: The composition of consumer groups has undergone substantial changes since the outbreak, encompassing alterations in the size of segments and their demographic characteristics.

5. The results of the hypotheses and the theses of the dissertation

The primary objective of the dissertation was to investigate the impact of the coronavirus pandemic on consumer behavior in tourism among the Hungarian population. In my research, I sought answers to three different research questions, using a total of seven hypotheses. Throughout my investigations, I applied a diverse methodology, with a significant role assigned to cluster analysis. The hypotheses related to the research questions and their outcomes are summarized in Table 2.

Table 2: Results of the research hypotheses

Research question	Hypothesis	Research methodology	Methodology used for hypothesis testing	Test results
RQ1	Hypothesis 1: The COVID-19 pandemic has led to significant variations in consumer groups about travel behavior.	Quantitative research - Online questionnaire survey conducted in 2020	<ul style="list-style-type: none"> • Exploratory factor analysis • Hierarchical cluster analysis • K-means cluster analysis 	Accepted
	Hypothesis 1.1: There are differences between the segments according to gender.	Quantitative research - Online questionnaire survey conducted in 2020	<ul style="list-style-type: none"> • Pearson's chi-squared test 	Accepted
	Hypothesis 1.2: There are differences between the segments according to age groups.	Quantitative research - Online questionnaire survey conducted in 2020		Accepted
	Hypothesis 1.3: There are differences between the	Quantitative research - Online questionnaire		Accepted

	segments according to educational level.	survey conducted in 2020		
	Hypothesis 1.4: There are differences between the segments according to financial situation.	Quantitative research - Online questionnaire survey conducted in 2020		Accepted
RQ2	Hypothesis 2: The younger generation is more likely to actively engage in virtual tourism during the COVID-19 pandemic.	Quantitative research - Online questionnaire survey conducted in 2022	• Ordinal logistic regression	Rejected
RQ3	Hypothesis 3: The composition of consumer groups has undergone substantial changes since the outbreak, encompassing alterations in the size of segments and their demographic characteristics.	Quantitative research - Online questionnaire survey conducted in 2023	• K-means cluster analysis by transporting initial cluster centers	Partly accepted

Note. Self-edit.

To test the **first hypothesis**, I first performed exploratory factor analysis, then hierarchical cluster analysis to determine the exact number of clusters, followed by k-means cluster analysis. The practical utility of this hypothesis lies in drawing attention to the fact that the COVID-19 pandemic has led to significant changes in the travel habits of consumers. Among our initial assumptions, attitudes towards virtual solutions, concerns related to financial situations, and sustainability proved to be clustering factors. This finding allows professionals in the tourism sector to adapt to new circumstances and develop strategies accordingly. Based on the revealed results, the first hypothesis, stating that *the COVID-19 pandemic has led to significant variations in consumer groups about travel behavior*, is *accepted*.

The following hypotheses, related to the first one examine whether there is a significant difference among consumer segments, that emerged due to the impact of the coronavirus pandemic, in terms of gender, age categories, financial situation, and level of education (**Hypothesis 1.1, 1.2, 1.3 and 1.4**). To test these hypotheses chi-square tests (χ^2) were conducted. The practical utility of these hypotheses lies in highlighting the existence of

differences between segments based on demographic characteristics. Understanding these variations can contribute to more targeted and successful approaches in marketing. Based on the revealed results, the hypotheses were *accepted*. It is important to note that although the consumer groups established at the beginning of the coronavirus outbreak did show significant gender differences, this was not the case after the outbreak. However, Hypothesis 1.1 was nevertheless accepted because I examined demographic differences in the consumer groups that emerged as a result of the coronavirus outbreak. It is speculated that one of the reasons for the disappearance of significant gender differences between groups is that women's perception of risk has substantially decreased. Additional investigation is required to gain a more precise comprehension of this matter. Accordingly, I formulated the following thesis:

1. thesis: Consumer travel behavior has changed significantly during the COVID-19 pandemic, showing changes in attitudes toward virtual solutions, sustainability, and financial concerns. Significant differences were observed between the resulting consumer groups in terms of gender, age, income and education.

The COVID-19 pandemic has accelerated the spread of technological solutions in the tourism sector as well. Virtual tourism may open up new opportunities for travelers, serving as a potential substitute for actual travel or enhancing on-site experiences. It is crucial to understand how the technological proficiency of different generations is reflected in the use of virtual solutions. With this knowledge, it becomes possible to develop appropriate communication and marketing strategies to promote these services effectively. To test the **second hypothesis** ordinal logistic regression was conducted. Based on the revealed result, the second hypothesis, stating that *the younger generation is more likely to actively engage in virtual tourism during the COVID-19 pandemic*, was *rejected*. The results showed that age explains a relatively small proportion of the variation between the interest in virtual /digital tourism. The results were the opposite of what I expected; as age increased, interest in virtual/digital tourism increased, albeit slightly, rather than decreased. Further research would be necessary to gain a better understanding of the results. However, as indicated by the cluster analysis, although the majority of individuals interested in virtual/digital tourism were older, this trend reversed after the pandemic in favor of younger people. One possible explanation for this could be that the older generation primarily viewed virtual/digital tourism as a substitute, but once the crisis subsided, they reverted to their preference for traditional travel. Accordingly, I formulated the following thesis:

2. thesis: The COVID-19 pandemic has reshaped the tourism sector, fostering the adoption of technological solutions such as virtual tourism. Older individuals exhibited higher participation in virtual tourism during the pandemic.

To test the **third hypothesis**, I performed a K-means cluster analysis by transporting initial cluster centers. The results revealed that only virtual travelers exhibited a change in demographic composition. The relatively high representation of the older generation in this group during the pandemic may have been more out of necessity, due to health and safety concerns, than preference, with a subsequent shift to a higher representation of the younger generation after COVID. Regarding size and preferences the *optimistic intellectuals* cluster experienced a moderate decrease in size alongside a slightly increased rejection of virtual solutions, all while maintaining financial optimism. In contrast, the *crisis-created environmentalist* cluster saw a slight increase in size, maintaining a strong rejection of virtual solutions and persistent financial concerns. *Anxious materialists* witnessed a significant decrease in size, coupled with an increased rejection of virtual solutions and financial concerns. The *ecotourists* cluster experienced a notable decrease in size alongside a sharp decline in the rejection of virtual solutions, possibly indicative of changing preferences and increased acceptance of virtual solutions. I could only partially accept the third hypothesis, stating that *the composition of consumer groups has undergone substantial changes since the outbreak, encompassing alterations in the size of segments and their demographic characteristics*, since some clusters have not changed at all in terms of demographic composition and have only experienced slight changes in size too. The practical benefit of these results lies in their implications for targeted marketing and resource allocation in the tourism industry. By understanding how different demographic groups respond to virtual/digital tourism and how their preferences and cluster sizes change over time, tourism businesses can tailor their offerings and strategies accordingly. For example, they can adjust marketing campaigns to better target specific demographic segments or allocate resources to develop virtual/digital tourism products that cater to changing preferences. Accordingly, I formulated the following thesis:

3. thesis: Consumer preferences and demographic trends are changing constantly in the tourism industry. A notable shift in virtual passengers has occurred, presumably due to health concerns surrounding the pandemic, from older to younger generations.

6. Research limitations and possible future research directions

During my research, I encountered several limitations, the presentation of which, I believe, is essential to interpreting the results and ensuring the completeness of my work. One limitation of my study is that the research conducted at the beginning of the COVID-19 pandemic used a non-validated questionnaire. Although a 3-member expert committee formulated the questions, comparing the results with the international literature is therefore challenging. Unfortunately, due to a lack of financial resources, the survey is not representative and is only suitable for presenting pilot results.

Another limitation is that the tourism sector has faced numerous crises in recent years, making it difficult to isolate the effects solely caused by the COVID-19 pandemic. However, the constraints of my dissertation in terms of length and time did not allow for an in-depth analysis of impacts, such as the Russian-Ukrainian conflict or the energy crisis. It is also important to highlight that, although I also conducted qualitative research to gain a deeper understanding of the quantitative results, the number of interview participants was limited, so the observations may not be fully representative of the entire Hungarian population. Additionally, the information gathered during the interviews could be subjective, depending on the interviewee's perspective.

One potential direction for future research could involve creating a validated questionnaire that could effectively assess and compare the impact of various risks on travel choices, utilizing findings from existing international literature. Additionally, conducting a comprehensive qualitative study with a representative sample would provide a more precise understanding of individual perspectives and considerations when making travel decisions.

Literature used in the thesis booklet

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