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AIR-RAIL TRANSPORT LINK DEVELOPMENT OPPORTUNITIES IN HUNGARY WITH A SPECIAL FOCUS ON RURAL AREAS

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ABSTRACT

This research studies the connection between air and rail transport and its development opportunities in Hungary, considering how it could contribute to the improvement of transport in regions that are further from major airports. During the research, we found that although organizing connections between air and rail services presented several challenges, it was still worth exploiting the potential it held. Successful international examples proved that the model was viable and found its place in the market. In Hungary, transportation options could be expanded without billions of dollars in investment by integrating existing networks and still bringing air travel closer to rural residents. It was also concluded that there was a clear demand from travelers for an organized service that enabled the combination of rail and air travel (hereinafter referred to as 'combined ticket'). The significant presence of air passengers in rail transport (as an alternative to road transport) could help improve the cost-effectiveness of rail transport and contribute to the rise in service quality. Last but not least, the environmental impact should not be overlooked: those who choose the train instead of road transport leave a significantly smaller ecological footprint during their journey, simply by just taking a train which runs anyway, instead of using an individual vehicle.

Keywords: intermodal transport, sustainability, regional airport, flight and train integration, passenger survey
JEL code: R41, O18

INTRODUCTION

The research has aimed to determine how closely rail transport can be connected to air travel, and whether it can be an effective and suitable tool for making international flights accessible in regions further from major airports. Our analysis covers the currently available services, international examples, and thoroughly examines the development opportunities within Hungary. The research focuses exclusively on civilian commercial transport and does not extend to private or military operations and infrastructure.

Air travel is not equally accessible to everyone. Although the emergence of low-cost (commonly referred to as 'budget') airlines has made prices more affordable, less

than 20% of the global population has flown at least once in their lifetime (*Gössling & Humpe*, 2020). Additionally, air travel is generally not a daily mode of transportation; compared to other forms of public transport, it is physically less accessible. The nearest airport is typically farther from people's residence than the most easily reachable bus stop or train station.

The present situation of air and rail transport in Hungary

Hungary's geographical location is advantageous from the perspective of international air transport as well: being in the central part of Europe, it is not too far from either the East or the West, offering numerous routes. Domestic air traffic continues to grow steadily. In 2024, a new record was set, with a total of 1,143,937 aircraft passing through Hungary's airspace, requiring air navigation services. This represents an average of more than 95,000 aircraft per month. This value shows a 5.99% increase compared to 2023, which was also a record year, and a 21.08% rise compared to pre-COVID traffic levels in 2019. During the peak period of 2024, in July and August, more than 120,000 aircraft were handled by Hungary's air traffic services provider, HungaroControl Zrt. (*HUNGAROCONTROL,* 2025). Traffic is expected to continue growing in 2025. Even in the first days of the year, the number of flights increased by an average of 15% compared to the same period in 2024 (*EUROCONTROL*, 2025). The majority of Hungary's commercial air traffic takes place at Budapest Ferenc Liszt International Airport. In 2024, the airport welcomed 17.6 million passengers, which was 19.5% higher than the previous year's traffic, and even surpassed the pre-COVID 2019 figures by 8.7% (*Budapest Airport,* 2025). The growth rate is remarkable even within the European Union, where passenger traffic increased by an average of 7.3% in 2024 (*Davitt*, 2025).

The structure of traffic was significantly altered by the bankruptcy of Hungary's national airline, MALÉV, in 2012. The 66-year-old national carrier had handled a large proportion of transfer traffic in Budapest, providing excellent connections between East and West. It used Budapest Ferenc Liszt International Airport as a hub, meaning that many passengers whose final destination was not Hungary also passed through the airport. This made operating routes, particularly in the Balkans and the Middle East, economically viable. Budapest functioned as a 'hub & spoke' air distribution center. The airline went bankrupt in 2012, which shocked the industry, including Budapest Airport. Of the 8.9 million passengers from the previous year, 3.2 million were flown by Malév, with 1.3 million transfer passengers (*MTI*, 2012). The situation regarding passenger traffic has since completely transformed. In the absence of a national airline, transfer traffic has significantly decreased, at least in terms of transfers organized by airlines.

The traffic at regional airports is negligible compared to Budapest. Domestic commercial flights have ceased, although there was a time when they operated daily (*Domonkos,* 2024). As a result, their commercial traffic is almost entirely limited to international flights. Among these airports, Debrecen International Airport stands out, with traffic exceeding 600,000 passengers in 2019, before the COVID pandemic. However, after the pandemic, traffic declined significantly, and the 300,000 passengers in 2023 marked a 23% increase compared to the previous year (*Dehir*,

2023). Notable commercial passenger traffic is also recorded at Győr-Pér, Pécs-Pogány, and Hévíz-Balaton airports in Hungary.

The challenges faced by Hungarian rail transport are deeply rooted and date back to the post-World War II period. The system has always lagged behind modern technologies and societal expectations. The trains have always been slow and outdated, and the level of service has not met the expectations of travelers (*Momentum Mozgalom,* 2023). High-speed rail systems, which have dynamically developed in many parts of the world, have not yet appeared in Hungary. However, in recent years the government has devoted significant energy to identifying problems and has developed a strategy for improving the organization and infrastructure (*Nemzeti Fejlesztési Minisztérium,* 2014). One of the most spectacular elements of the development is the integration of the national railway company (MÁV) and the bus operating company (Volán) (*Magyarbusz.info*, 2024).

Expansion of the Air Transport Network through the Integration of Rail Transport

The air transport network is continuously expanding, a process that has been significantly accelerated by the emergence of low-cost airlines. In addition to the major airports of large cities, smaller towns and secondary airports of major cities have also appeared on the air transport map. Thanks to this development, competition has intensified between different transport sectors. Alongside the evolution of rail and air travel, road public transportation has also transformed. The dynamically developing highway systems and vehicles have made bus transport more efficient and attractive. The price competition between transport sectors has led to the emergence of bus companies operating in a similar model to low-cost airlines, offering affordable fares (*NEA Transport Research and training*, 2006).

Combined ticket concept

Travel can be combined so that one segment is completed by rail and the other by air. The safety of these connections is enhanced by the fact that in Europe, railways generally operate with higher frequency than air services. For this reason, this travel mode can be especially advantageous for those who are less experienced in organizing transfers.

In Case of Delays, Passengers Are Taken Care Of

Like the case of transfers between two air flights, when a ticket is purchased for the entire route, the operator of the flights is responsible for ensuring the passenger's successful transfer, or more specifically, for guaranteeing the possibility of a transfer. If the transfer is missed due to the airline's fault (e.g., due to a delay in the first segment), the airline is obligated to take care of the passenger and provide an alternative solution at its own expense (*EU,* 2004). This does not apply to cases where the passenger chooses two separate flights and organizes the connection themselves. In such cases, the passenger bears the associated risks. With a 'Rail & fly' combined ticket, the airline is also responsible for the passenger in similar situations (*Lufthansa*, 2025).

Environmental and Economic Benefits

At the national economic level, the environmental impact of various modes of transport and their pollution are important considerations. When comparing the development of rail and air transport, it must be considered that most railway tracks are already in place, and the rolling stock is also readily available. Therefore, investment costs here are limited to maintaining, developing, and modernizing the existing infrastructure. In contrast, domestic regional airports would require significant investment to handle regular air traffic. The development of airports is highly expensive, as is the operation of security and precision systems. For example, Budapest Airport spent over 130 billion HUF between 2019 and 2024 (*Budapest Airport,* 2024), and even greater investments are planned for the coming years. Additionally, the operational costs of flights represent a further expense.

Successful solutions in Europe

Countries with advanced transportation systems already have a long tradition of combining different modes of transport in an organized manner. In many countries, this service already includes air travel. These combined tickets are typically available for purchase on the airline's website. For example, in Spain, the national airline Iberia offers a product called 'Train & Fly' (*Iberia*, 2023). In France, the service is also available through the national airline Air France (*Air France*, 2025). The key feature here is that the passenger does not organize the connection themselves. The transfer process is very similar to transferring to another flight. When purchasing tickets, the system takes into account the necessary time for the transfer. If the passenger misses the connection due to the airline's fault (e.g., due to a flight delay), Air France takes responsibility and rebooks the passenger for the next train. This is perhaps the greatest advantage over self-organized connections, as it is difficult to assert one's rights if the passenger misses the connecting travel due to no fault of their own. Additionally, with such combined tickets, passengers can accumulate points for loyalty programs (typically frequent flyer miles) for both the air and rail travel.

In Germany, the national airline also offers the option of combining rail and air transport. Lufthansa Express Rail provides connections from 28 railway hubs across the country to Frankfurt, the airline's largest distribution centre (*Wandelt & Sun*, 2022). The main advantage of the service is the same as that offered by other similar companies: a guarantee for the transfer. Lufthansa also offers additional benefits, such as access to the railway company's (DB) business lounge for frequent flyers, or automatic seat reservations for the rail segment (*Lufthansa*, 2025; *Rudolph et al.*, 2023). There are already several examples of similar solutions in Europe, such as AiRail in Austria (*ÖBB,* 2024) or AccesRail and FlexFlight in Italy, the latter of which provides connections to Germany (*ITA Airways*, 2025).

Hungary has a relatively extensive railway network of over 7,000 km (*KSH*, 2020), with an active service system that could be integrated into the air transport system, similar to other European countries. The numerous railway stations could serve as excellent connection points to the air transport network, allowing passengers to travel to many parts of the world with a single transfer at Budapest Liszt Ferenc Airport. However, a significant shortcoming is that the airport is only connected to rail

transport via the 1st terminal, which has not been used for public commercial passenger traffic for years. The plan to connect the railway system with the 2A and 2B terminals, which handle nearly all the traffic, has been under discussion for years, but so far none of the many concepts have been implemented. As a result, passengers can only reach the 2A and 2B terminals by road. Passengers arriving by train at Terminal 1 can take the BKK bus service, taxi, or arrange transfers in other ways. The bus service is used by nearly 50,000 passengers per week, which accounts for about one-fifth to one-sixth of the airport's total passenger traffic (*BKK*, 2023). The airport does not provide its own shuttle bus service from the train station to the 2 terminals. Furthermore, at regional airports in Hungary, organized connections between airports and railways are even less developed, although there have been examples of similar bus services being organized in the past.

MATERIALS AND METHODS

In addition to reviewing the literature, we also collected primary data on travel habits through quantitative research. Our goal was to obtain the broadest possible sample from the entire population, without limiting it to any particular social class, location, or other criteria. The most suitable research method for data collection proved to be the questionnaire. It included both multiple-choice and Likert scale questions. We avoided open-ended questions in order to ensure maximum objectivity. For the Likert scale questions, we deliberately provided an even number (four) of answer options, to avoid some respondents choosing the middle (neutral) value simply for convenience. Filling out the questionnaire took no more than a few minutes.

We also reminded the participants to focus exclusively on commercial flights in the questionnaire and to exclude sport or hobby flights, as well as military operations. The number of flights referred to round-trip journeys, meaning a Budapest-Faro round trip counted as a single flight, not two. The sample of the research was not representative. The online questionnaire was created on a cloud-based platform, and the survey link was shared on social media between January 12th and April 30th, 2025. On Facebook, the survey was not filtered to any specific group; anyone could answer the questions and share the link.

The raw data collected from the responses were first cleaned and then processed using MS Excel. Every single data point was converted into a numerical value; thus, a complete code table was created. In addition to evaluating the answers to the questions individually, we also attempted to identify correlations between the feedback provided by different groups of respondents. The conclusions drawn from these correlations were analyzed separately and visualized using graphs. For the Likert scale questions, mean, mode, and standard deviation calculations were done. A Chi-square test was also made, and the relationship between two questions in the cross-tabulation analysis was examined too.

In addition to the questionnaire research, we conducted structured interviews with the managers of several regional airports, the manager of an airline, and an expert from MÁV. We prepared a set of pre-defined questions in order to collect opinions primarily on the situation of the airport, its connection to the railway, and

its development potential. Since the conversation was conducted in person, it was also possible to collect data on the questions that arose during the interview.

RESULTS AND DISCUSSION

A total of 174 responses to the questionnaire were received. The overwhelming majority of respondents were middle-aged individuals with higher education degrees. Background variables were distributed among the respondents as presented on *Figures 1-3*.

Figure 1: Age of respondents

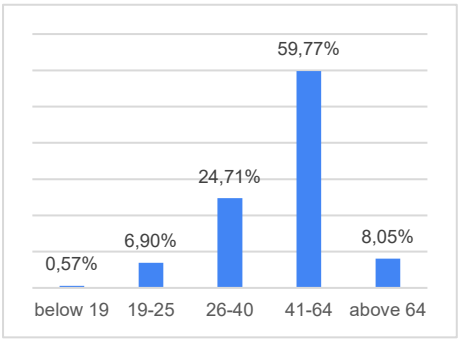


Figure 2: Education

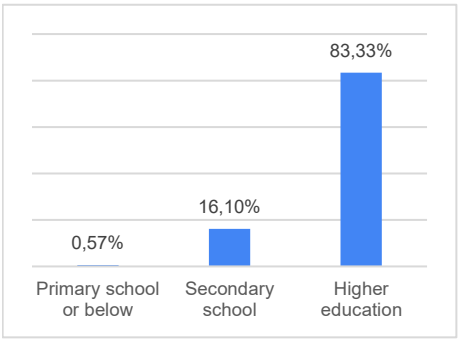
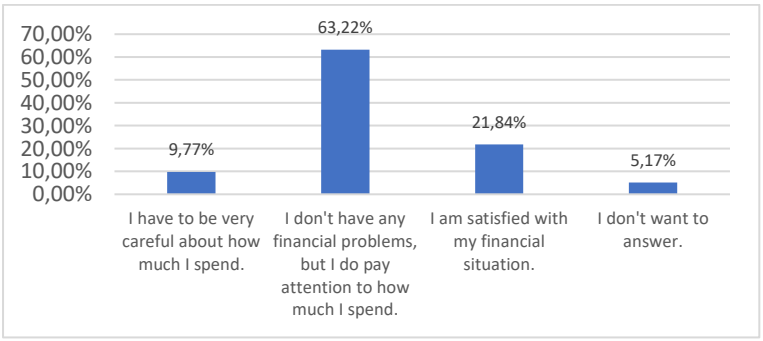


Figure 3: Annual income of respondents



In the question 'How often do you travel by plane in a year?', all five possible answers were selected by several respondents, which confirms that a heterogeneous group was successfully targeted in terms of travel habits (*Figure 4*). One of the options was 'more than 12 times,' which was specifically intended for those who travel more than once a month on average. 1.7% of respondents chose this option, and when adding those who travel 7-12 times per year, it becomes clear that more than 6% of respondents fly somewhere at least every two months.

A surprising result came from the question about how respondents get to the airport. Slightly more than half of frequent travelers (at least 3 times a year) travel to

the airport by private means (*Figure 5*), while 79% of all respondents do the same (*Figure 6*).

Figure 4: Yearly frequency of travelling by plane

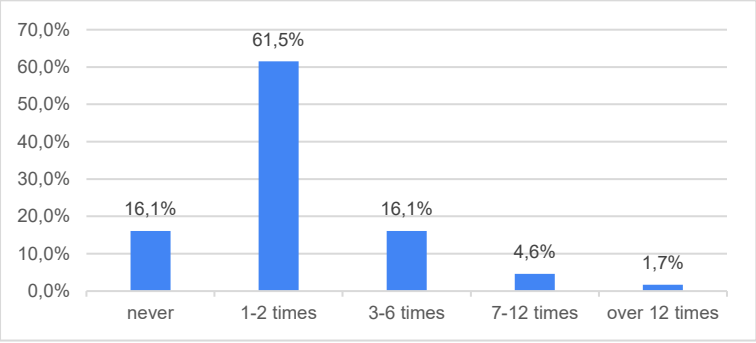


Figure 5: Airport access habits of those who travel at least three times a year

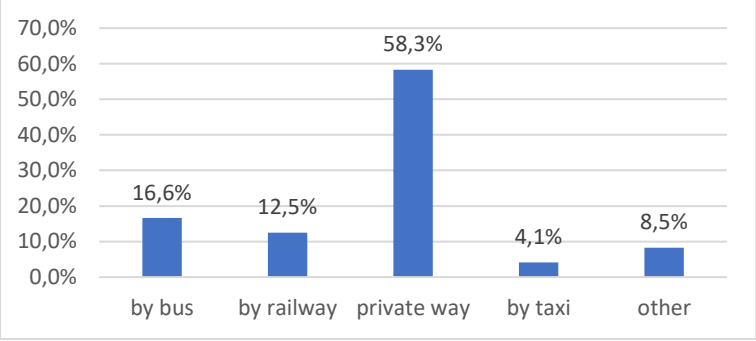
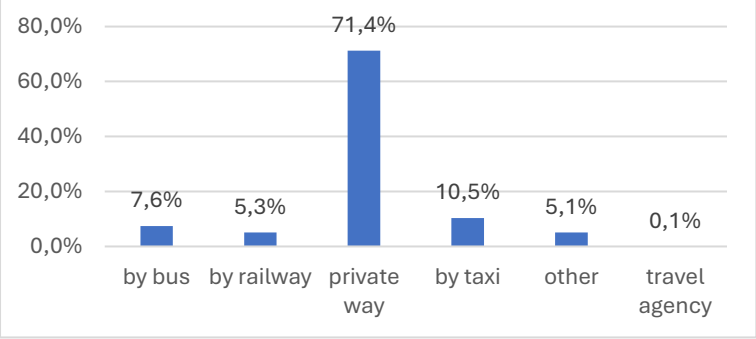


Figure 6: Airport access habits of survey participants

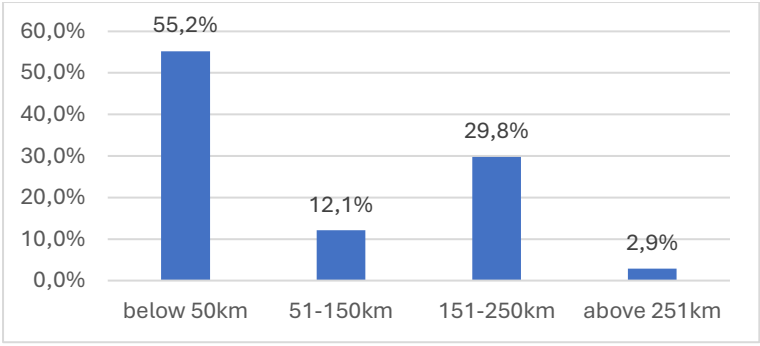


This means that they approach the airport either in their own car or with the help of someone they know, avoiding public transportation options. The decision is likely

influenced by convenience, as frequent travelers are aware of the high costs of airport parking and taxis.

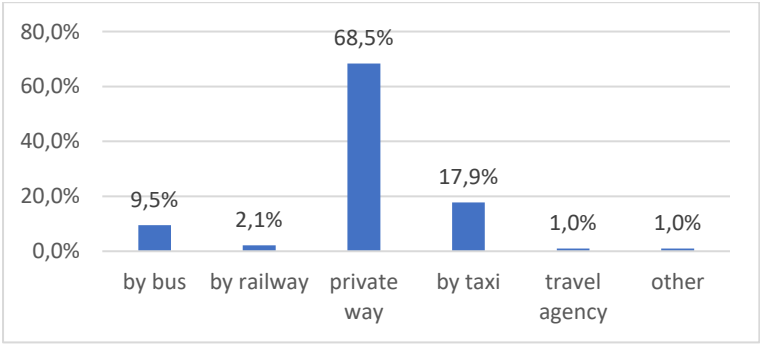
In terms of the distance to the airport, we were able to address multiple target groups (*Figure 7*).

Figure 7: Distance to the airport from the respondent's place of residence



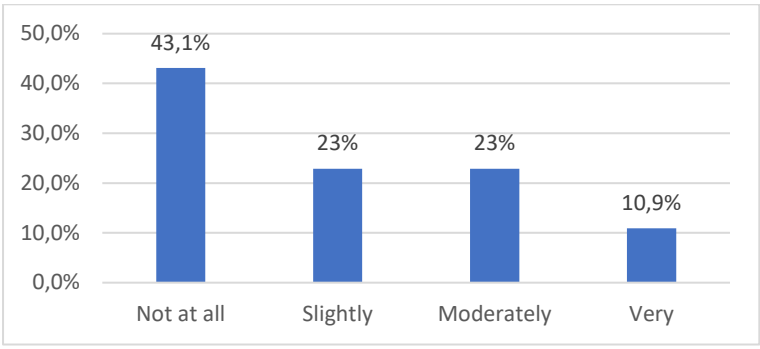
For most respondents, the airport they typically use is relatively close, within 50 km. Of these, only one respondent chose rail transport, and none of those living 50-150 km away chose this option (*Figure 8*). This is likely because airports do not have direct rail connections and are only accessible by bus or other road transportation. It is noteworthy that despite the relatively short distance, almost 70% of respondents avoid public transportation to the airport even when the round-trip distance is 100 km, which cannot be considered 'neighboring.' Factors such as the extreme arrival and departure times of many flights (early morning or late at night) may also play a role in this avoidance.

Figure 8: Airport access habits of those traveling within 50km



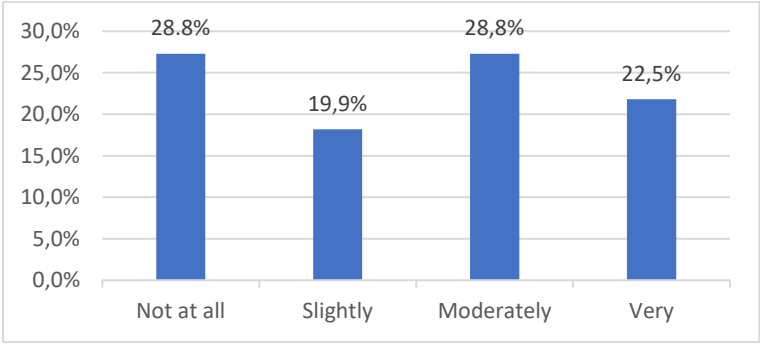
The results of the research have revealed that the distance to the airport is not a real obstacle to air travel. In response to the question 'I would travel more by plane if it were closer to my place of residence,' most respondents answered that it was 'not a determining factor' (*Figure 9*).

Figure 9: I would travel more by plane if it were more accessible nearby



86% of those traveling to the airport from a distance of 50-150 km traveled privately, as did 69% of those traveling from a distance of 150-250 km, and 80% from a distance of over 250 km also traveled by private means to the airport. However, all other respondents chose rail travel in every case. This fact supports the assumption that there would be significant demand for rail connections, provided it was of high quality, comfortable, and accessible. This is further reinforced by the fact that even regular rail travelers (those traveling 6-15 times per year or more) rarely (only 11%) choose rail transport to reach the airport. However, a surprisingly large number of them flew after reaching the airport by train. Over half (52%) of frequent rail travelers answered 'definitely' or 'more likely' to this statement. These are likely to involve airports abroad, typically transport hubs where intermodal transfer opportunities are well established. The proportion of such experiences among frequent rail travelers is detailed in *Figure 10*.

Figure 10: I have started my air travel with a train connection (Frequent rail travelers)



Among all respondents, however, this proportion was significantly different. Here, 'less likely' and 'not at all' dominated, together making up 74% (*Figure 11*).

One of the most important elements of the research is the following survey. The statement, to which respondents had to indicate the most appropriate answer, was:

'I would be happy to travel combining train and air travel if such a ticket were available.' Many respondents chose all four options, but slightly more would appreciate this opportunity and would take advantage of it (*Figure 12*).

Figure 11: I have started my air travel with a train connection (All respondents)

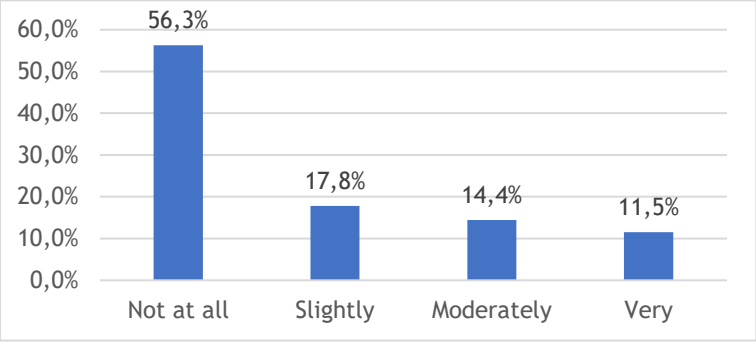
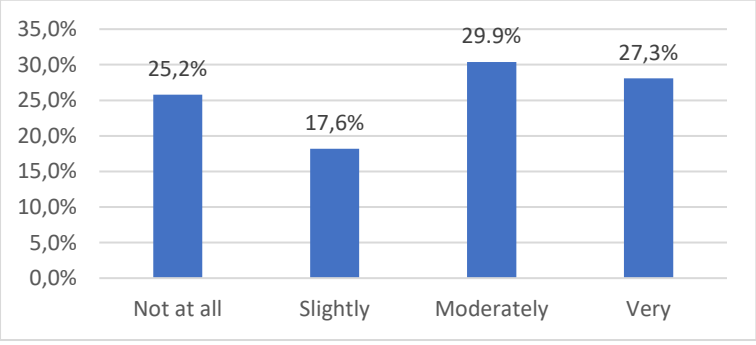


Figure 12: Responses to the question 'I would be happy to travel combining train and air travel if such a ticket were available'



Among those who have not yet traveled with a combined train-air ticket or who travel with it less frequently, more than half of the respondents would be open to this option: 27% would definitely use it, and 30% would probably use it (*Figure 13*). More than half of the 'never' respondents (52.2%) never travel by train.

These values indicate that there is demand for this service, but it needs to be communicated to the traveling public. An interesting result emerges when we examine the responses from those who fly at least three times a year (*Figure 14*). In this group, the proportion of those completely rejecting the option is slightly lower, and the number of fully open respondents is also smaller.

To the question, 'I would travel more by plane if it were available closer to my place of residence,' the majority of respondents answered "no": 43.1% answered 'no' completely, and 22.9% selected 'less likely' (*Figure 15*). This indicates that the

difficulty of access (time, cost, inconvenience, etc.) is generally not relevant to the frequency of air travel.

Figure 13: Openness to the service from those who have never traveled with a combined ticket

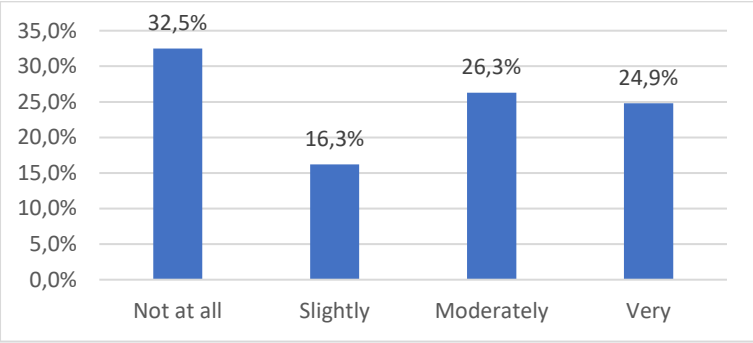


Figure 14: Openness to the combined ticket among those who fly at least three times a year

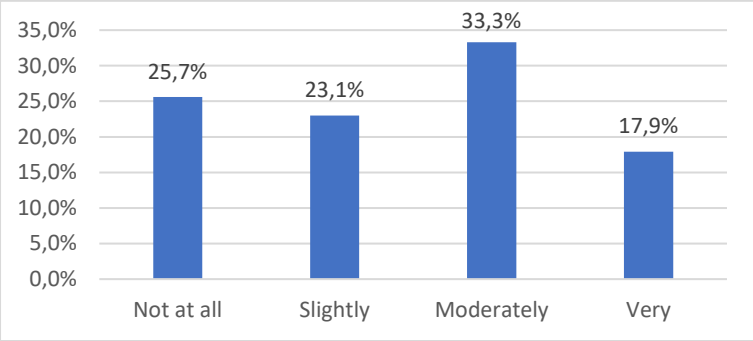
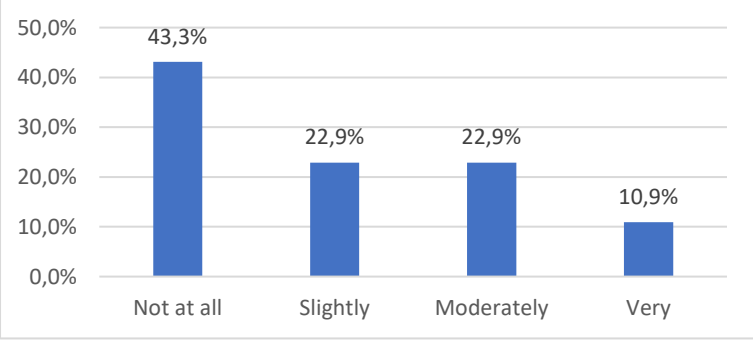


Figure 15: I would travel more by plane if it were more accessible nearby



The Likert scale questions analysis resulted in *Table 1*.

Table 1: Likert scale analysis results

Deviation	Ticket price	Safety	Distance from airport	Experienced Combi travellers	Interested in Combi services
Mean	2.80	1.74	2.02	1.81	2.61
Standard	1.04	0.86	1.05	1.06	1.15
Mode	4	1	1	1	3

As a result of the chi-square analysis, I have concluded that no strong relation can be identified between the different positions. When examining the strength of association between the questions "How do you get to the airport?" and "Above what distance would you rather choose flying?", I obtained only a 0.18 Cramer's V value. Regarding the latter question, the inquiry "Would you use the combined service if this option were available?" yielded the same value, while checking those who have never used the combined service, their usage resulted in only 0.24 if this option were available. Further analyses, for example examining airport access habits of those who travel at least three times a year, resulted in an even lower Cramer's V value (0.11).

Based on the interviews, we have come to the conclusion that regional airports see great potential in the combined ticket solution. The managers of Hévíz-Balaton, Pécs-pogány, Sármellék, and Debrecen Airports also reported that they were optimistic about traffic growth, to which - in addition to appropriate marketing and infrastructure development - the combined ticket could also contribute. MÁV's business development expert also considers the concept viable but sees a great challenge in technical implementation. The head of the Hungarian regional airline, Aeroexpress, would actively participate in the implementation.

CONCLUSIONS

As a result of the research, it has been determined that there is a clear demand for combined ticket services from the traveling public. Nearly two-thirds of respondents to the question said, „I would be happy to travel combining train and air travel if such a ticket were available' and expressed interest in such a service. Many would also support the more intensive development of air travel, which could be supported by an increase in the number of passengers arriving by train. Similarly, the significant presence of air passengers in rail transport (instead of road transport) could improve the cost-effectiveness of rail transport, contributing to quality improvement. Last but not least, the environmental impact is also significant: those who choose trains over road transport leave a much smaller ecological footprint during their travel, simply by using public transportation rather than using an individual vehicle, a private car in most of the cases. With these factors in place, the combined ticket service could be successful for both organizers and users. However, developing a universal travel pass accepted by all transport modes would be a huge challenge. Coordinating the

different pricing models would be a monumental task and would likely meet with significant resistance from profit-driven companies. The feasibility of this idea could be the subject of a separate study. However, a good domestic example is the introduction of county and national passes, which ensure seamless access between road and rail transport with a single ticket.

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