Evolution of the revenue/expenditure structure and passenger cost coverage ratio of regular passenger transport between 2007 and 2022

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SUMMARY: This article presents a general methodology for aggregating the actual costs and revenues of public transport in Hungary, which allows to calculate a realistic passenger (user) cost coverage ratio for the main players in the domestic market (MÁV-Volán Group, GYSEV, BKK). After an international perspective and a presentation of the specificities of the domestic market, it is concluded that the cost coverage ratio for fixed rail transport is significantly lower than for public transport services on road. The main reason for this is that rail infrastructure is expensive to develop and operate and is mainly used by public passenger transport. The ridership ratio is significantly reduced by significant investments, and this has been analysed both on a time series and average basis. We present the timetable, tariff changes and major investments that have had an impact on ridership rates, typically only to a small extent. Our analysis is financially oriented and only touches on positive externalities, social benefits and the general government balance.
KEYWORDS: bus; financing; user cost coverage ratio; scheduled transport; rail; railways
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Introduction, objective

Every year, two billion journeys are made in public transport in Hungary, and all citizens are involved as users (passengers) or just as taxpayers, benefiting from externalities. The operation and development of the system, which covers 20 billion passenger-kilometres a year, can be ensured with a significant annual public and municipal expenditure of around HUF 800 billion. In comparison, there is very little publicly available data on the operation and performance of market players, and in many cases the content of this data is unclear and open to misinterpretation. There is little in-depth scientific analysis of the financing of the system, not only at national level but also at international level, and the relevant literature tends to be sub-sectoral, focusing on railways or urban transport rather than on the public transport system as a whole.

This article aims to fill this gap. To do this, we have researched, interpreted and organised the data available for the past 15 years, and we have also taken stock of and analysed the internal and external processes and events that influence the data, and examined the structure of the market, both in long-distance, regional and urban transport. We present a methodology to calculate the cost recovery ratio of each operator based on passenger-kilometre performance. In terms of revenue, the focus is on user (passenger) payments, and the ratio of this to the cost of the service, the financial passenger user cost coverage ratio, is examined, including the accounting of investments over many years.

Our analysis is financial in nature, dealing with specific revenues and costs, we do not calculate social returns, but in the first chapter we emphasise that the return on public transport is mainly through externalities. In the second chapter, we provide an international perspective on the practice in other countries, in the third chapter we present the domestic market players, and in the fourth chapter we present the structure of revenues and costs. In chapter five, we present the methodology, in chapter six the results, in chapter seven the additional factors influencing them, and in the conclusion we provide a summary and suggestions for the way forward.

The relevance of the research lies in today's search for a new way forward, which is also felt internationally. Public transport was one of the sectors most severely affected by the coronavirus pandemic worldwide, and is still underperforming in 2024, at a time when the importance of public transport is growing considering the climate crisis. Free or very low-priced tickets and season tickets, which are being introduced in more and more cities and countries, are so new that their impact on financing needs can hardly be estimated, but the trend is clear, with a corresponding decrease in passenger coverage and an increase in customer intervention and value.

At the beginning of the 20th century, passenger transport services were mostly profitable, but nowadays it is more typical that the payments made for tickets and passes by users (passengers) no longer cover the operating costs, and the costs of building and developing the infrastructure are not covered at all. This diminishing profitability initially led to a worldwide reduction in the supply of passenger services with lower traffic volumes and profitability, through timetable rationalisation and line closures on the railways, and thus to a further reduction in demand, creating a vicious circle. This

is a classic market failure, however, since it is a service of general economic interest, a public service, its continuation is the public interest of society to some extent, state intervention has become a feature of this market in order to break and reverse the vicious circle. The use of state, regional or local government aid has thus become widely accepted, its cornerstones are laid down in the EU in Regulation (EC) No 1370/2007.[3]

Subsidies are needed primarily because without them, based on market-based passenger revenues, the minimum level of service provision would not be reached. By subsidies competent authorities may provide the basic mobility (especially in rural areas) or even a public service that is competitive with car use (in metropolitan areas).

Another rational reason why financial support for public transport is generally accepted is the social benefit of the service. In today's climate crisis, it is becoming increasingly clear that it is acceptable to maintain, support and develop financially unprofitable public transport services because of their significant positive externalities.

Taking all this into account, an internationally accepted methodology has been developed and is gradually evolving in the EU, which takes into account the positive external social impacts of public transport development, and considers social (economic) benefits and returns in addition to the financial aspects (e.g. European Commission, 2015). This makes development projects possible and financially eligible, which would not be profitable only from the cash flows they generate (e.g. from increased passenger revenue). In our article, however, we will only address the financial coverage level, accepting that there is a substantial, even multiple, difference between the social and the financial coverage level.

International outlook

Data on passenger fare recovery in public transport are scarce in international comparison and difficult to interpret, requiring a thorough knowledge of local conditions. Even in Europe there is no uniform definition of local and interurban transport, and the concepts of long-distance bus, rail and tram (LRT, tram-train) are not clearly defined.

Low levels of user cost recovery are typical for local (urban) public transport and, on a sub-sectoral basis, for passenger rail services. There are exceptions where urban rail services can be financially profitable, given sufficient volumes, and this is typical in the densely populated Asian cities. In Europe, long-distance and international passenger services, especially road and air passenger services are more likely to be market-based, but there are also success stories in rail transport.

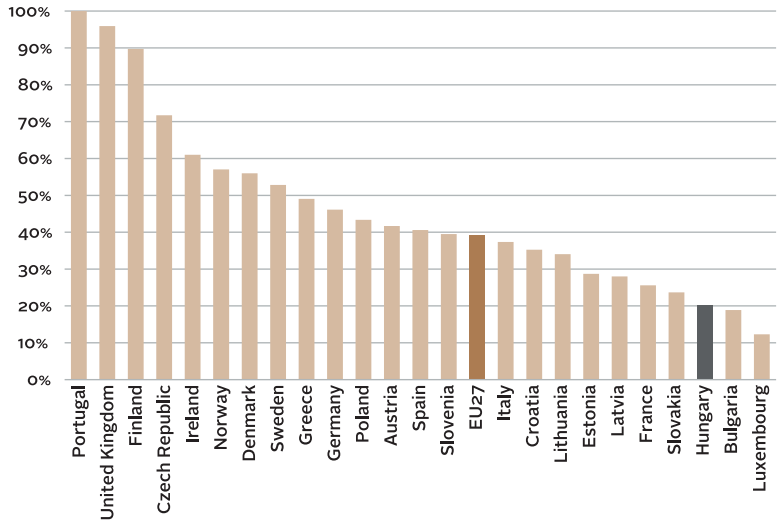
The European Commission (2016) regularly examines the impact of rail market opening and analyses the related financing processes in its 2-3 yearly report. In the 2016

3 Regulation (EC) No 1370/2007 of the European Parliament and of the Council on public passenger transport services by rail and by road and repealing Council Regulations (EEC) No 1191/69 and (EEC) No 1107/70 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02007R1370-20171224

report, Hungary was named as the country with the lowest cost coverage ratio of rail passenger services (below 20%[4]). The same report states that in other countries this level can be as high as around 90%, but for methodological reasons it should be added that public services in those countries typically do not pay, or only symbolically pay for access to the rail infrastructure network (track access charges, TAC), because they are financed through other channels. Taking this into account, the situation of domestic rail transport may be more favourable in international comparison, but since for the main Hungarian Train operating company, MÁV-START, TAC is only one third to one quarter of the total costs. Even correcting for this, Hungary would still be among the countries with a very low level of user cost coverage (below 30%).

Steer Davies Gleave (2016) assessed the impact of Regulation (EC) No 1370/2007 for the European Commission. Their research focused on the proportion of operating cost covered by fares, which typically ranged from 33-39% in Central and Eastern Europe (Czech Republic, Slovakia, Poland), Lithuania and Belgium, above 50% in Sweden, Ireland and Spain, 71% in Italy and 77% in Germany, while the coverage of local bus services of Hungarian cities (excl. Budapest) was found to be around 65%. Referring to data from the 2018 statistical publication accompanying the 7th Report (European Commission, 2021), the following graph on the fare recovery of European railways (Figure 1) shows significant differences. Regulatory differences, such as the significant differences in track access charges, contribute to this.

Figure 1. Fare recovery of operating costs of public rail passenger transport (2018)

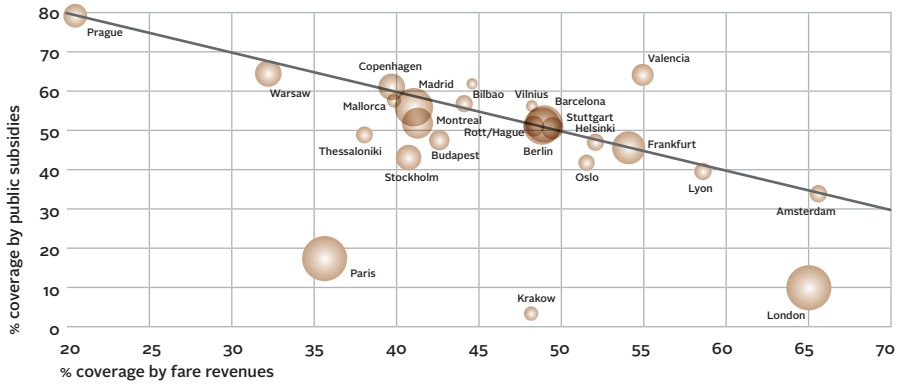


Source: European Commission (2021)

4 "The share of revenue from ticket sales in total revenue varies between more than 90% in Lithuania, the Netherlands and the United Kingdom and less than 20% in Hungary"

For urban and agglomeration transport, international comparative data from the European Metropolitan Transport Authorities (EMTA, 2021) are available for each metropolitan agglomeration, showing the following trends in 2019 for the operational cost coverage and subsidies (Figure 2)

Figure 2. Coverage of operating costs by public subsidies vs coverage by fare revenues of public transport services in metropolitan areas (%), 2019



Source: EMTA (2021)

For the cities on the line subsequently drawn in the figure, the two factors combine to give 100% cost coverage. Above the line, there is overcompensation or, in the year in question, a profit for the service, and below the line, there is undercompensation or there are other revenues in cost recovery.

In EMTA's graphs of annual fare and subsidy cost coverage (Figure 3), Paris and Stockholm are always shown below the line indicated. Since the 1970s, the Île-de-France Mobilités (IdFM, formerly STIF), which manages public transport in the Paris agglomeration, has had a public transport contribution *(versement mobilité)* paid by employers with more than 11 employees. The annual revenue of IdFM arising from this contribution is around € 5 billion per year. EMTA counts the revenue from the *congestion charge* in Stockholm as other revenue too. However, these are in fact subsidies from *earmarked taxes*, which are paid even if the taxpayer is not a user of public transport. However, these types of taxes – where the public purpose of the tax is specified and the regular taxpayer stands a good chance of benefiting from it – are more useful and beneficial in terms of social acceptance.

Domestic market players, their shares and performance

In this article, we are mainly concerned with public passenger transport services in Budapest organised by BKK, and non-urban (long distance, regional and suburban) services supervised by the Ministry of Transport, where the dominant operator is

the MÁV-Volán Group, including two train operators (MÁV-START, MÁV-HÉV), and also a bus and coach operator (Volánbusz). In addition, GYSEV and 4 smaller private bus companies provide interurban public passenger transport services under PSO (contrancts for public service obligations). Our analysis does not cover local (urban) transport services in smaller towns, contracted and chartered passenger transport, special services, nostalgia trains and narrow-gauge forest railways.

The BKK (Budapest Transport Centre) is the transport organizor commissioned by the Budapest Municipality, responsible for a wide range of local transport issues in Budapest, the most important of which for the purposes of this article are the planning of timetables, the development of the fare system and the collection of revenues. BKK's two main service providers are BKV Zrt., which is owned by the capital and operates all modes of transport in Budapest, and ArrivaBus Ltd, which is privately owned bus operator.

MÁV-START is a subsidiary of MÁV Co Ltd, which is mainly engaged in domestic and to a lesser extent international passenger rail transport, mainly with its own rolling stock (locomotives, wagons, EMUs, DMUs) and personnel (drivers, wagon and train inspectors, vehicle maintenance staff, etc.), but also provides traction services for partner railways and is also capable of manufacturing railway vehicles (IC+ wagons). It keeps its costs and revenues separately in its general legder for public service obligations and, to a much lesser extent, non-public service, this latter is out of the focus of this article.

Volánbusz, tha main bus and coach operator reached its current size in 2019 by merging the formerly county-based Volán companies and the regional transport centres that were formed from them, and since 2020 it has been part of the MÁV-Volán Group. In addition to its core business of providing scheduled public passenger transport services, it also operates contracted and chartered special services. Volánbusz also operates local (urban) passenger transport in around 50 cities, but this is not covered in this article, the focus is on the state-funded scheduled interurban (lomng-distance, suburban and regional) public service obligations.

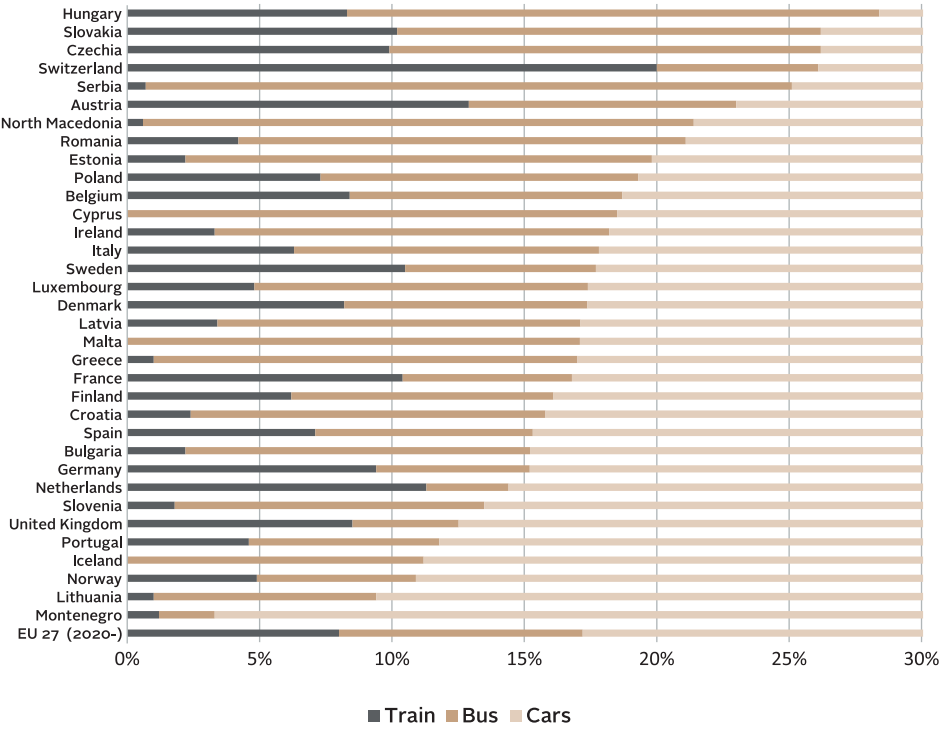
Other important operators are MÁV-HÉV and GYSEV, the former providing suburban rail services in the Budapest area, the latter does regional and suburban rail services in Western Hungary and Austria. The size and operational nature of each public service operator varies considerably, as shown in Figure 3.

Table 1. Main natural variables of domestic public services, averaged over 2007–2022 (based on public service reports, own collection)

Main indicators	MÁV-START	GYSEV	Volánbusz	BKK	MÁV-HÉV
passenger-km performance (billion passenger-km)	7.0	0.2	7.4	5.1	0.4
number of passengers carried (million)	133.5	4.7	386.8	1379.5	63.3
average travel distance (km)	52.8	41.7	19.1	3.7	6.5

In this article, we consider passenger kilometres, not number of passengers carried, as the main indicator of public passenger transport services. Both passenger kilometres and numbers of passengers are typically derived from sales data, multiplied by a number around 1 for tickets and around 50 for monthly tickets, occasionally corrected by data from physical (even mechanical) passenger counts. Passenger kilometre is the more complex indicator, which is the product of the number of passengers carried and the average distance travelled, and can therefore be interpreted as a true product, blurring the sharp distinction between the different functions of local and interurban operators and also between road and rail operators, thus making them comparable.

Figure 3. Distribution of rail, bus and car passenger-kilometres in Europe in 2019.



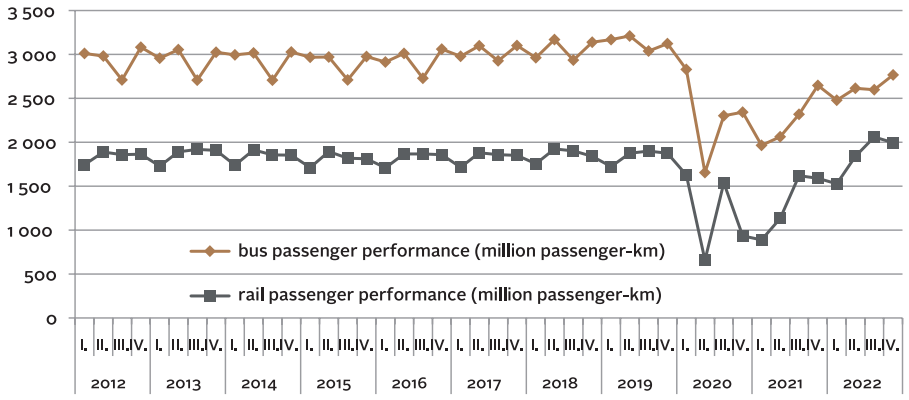
Source: Eurostat[5]

5 Modal split of inland passenger transport https://ec.europa.eu/eurostat/databrowser/view/TRAN_HV_PSMOD/default/line?lang=en

Based on the passenger-kilometre values calculated using the above method, the market shares of road and rail operators are shown in Figure 4, which shows that Hungary has the highest share of public transport in the EU, the share of bus transport is about twice the EU-27 average, and the share of rail transport is also above the EU average. Hungary is also among the best in the EU in terms of rail and bus network density.

Quarterly data on the performance of domestic intercity passenger transport can be found on the KSH (Hungarian Central Statistical Office) website (Figure 5). The content of these data – mainly for road transport – is significantly more than the data set for scheduled public services, which is the main subject of this article, and includes non-public buses (Kövesdi – Oszter, 2023).

Figure 4. National interurban passenger transport performance (million passenger km per quarter)



Source: HCSO, Transport performance[6]

Components of revenues and costs

In this article, we look at how much of the total cost of public transport can be covered by passengers, called the passenger contribution rate.

In the transport system, passenger revenue is any (net) payment that is collected directly from users (passengers) by transport operators or transport organizors through any sales channel, regardless of whether the passenger is reimbursed in full or in part by a third party (e.g. his/her employer) before or after the purchase.

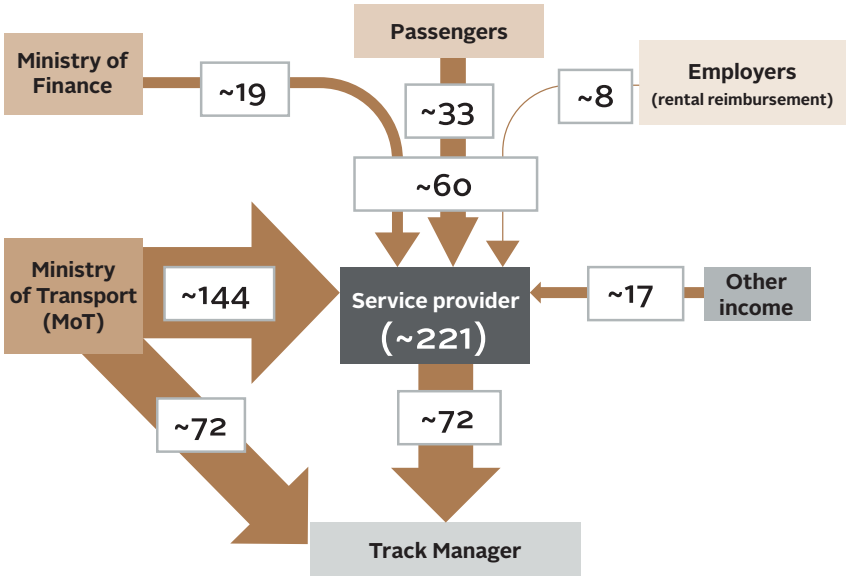
This is a key issue in Hungary, where legislation requires employers to reimburse 86% of the cost of commuter travel passes for employees, and to reimburse the cost

6 National interurban passenger transport by mode of transport quarterly, Hungarian Central Statistical Office https://www.ksh.hu/stadat_files/sza/en/sza0063.html

of the typical weekend 'home-journey' under certain conditions. In addition, the cost of tickets and season tickets for which passengers request an invoice is passed on to third parties. Nevertheless, in our methodology, all these receipts are considered as passenger receipts.

A special case is the issue of the social policy fare subsidy (SFS). For certain social groups (students, pensioners, handicapped people, etc.) the Hungarian state offers a discount on tickets and/or season tickets, typically at a rate of 50%, 90% or 100%. The "revenue loss" related to these discounts thus redeemed, compared to full price tickets or season tickets, is compensated by the state (through the Ministry of Finance) in the form of a "SFS" (until 2012, a 'consumer price supplement')[7]. According to our methodology, we do not consider the SFS as passenger revenue, but as a form of state aid, although the passenger may be considered as a beneficiary. In fact, the SFS is a price subsidy, a method of keeping fares low to increase the demand for services (Szeri – Dancz, 2023). In recent decades, it has often been suggested to reduce the number and range of social policy discounts for reasons of austerity, but this would also reduce the expected revenue from passengers (who would see it as a fare increase or price rise).

Figure 5. Cost and revenue structure of MÁV-START between 2014-2017 (HUF billion)



Source: Ács (2018) based on MÁV-START annual public service reports

7 Between 2005 and 2021, the Ministry of Transport reimbursed only part of the cost, the remainder being paid by the Ministry of Transport under the heading of justified costs not covered by revenue.

The main cash flows of MÁV-START are schematically shown in Figure 6, which shows that the state finances the railway track operator both directly and through the public passenger transport operator. In some countries, where the track manager is financed directly by the state, the public operator's passenger cover is higher.

It is important to distinguish between social policy discounts and business policy discounts. The former are linked to SFS, but the latter are not. The loss of revenue from business policy discounts is not (or not directly) compensated by the state, it is supposed to be covered by the additional sales (or some other source) generated by the discounted price.

The aggregates presented in the international outlook are mainly based on data published by operators and transport managers and only include actual costs at the operational level, while the improvements, capital replacements and debt consolidations needed to maintain public services are also financed by public or EU subsidies. These factors should also be taken into account when aggregating the actual costs.

The analysis of operating costs alone distorts the actual passenger coverage of public services, since, like all activities, public transport has maintenance and investment needs, a significant part of which is also subsidised and not included in the reimbursement. For example, in the case of Budapest, the renovation of metro line 2, the construction of metro line 4, the extension and modernisation of tram line 1 and the renovation of tram line 3 were implemented through the Municipality of Budapest (with EU, state and municipal support). The renovation of metro 3 was financed through BKV, and the tram and trolleybus purchases through BKK, also with EU, state and municipal funds, none of which came from passenger fares, which were not even enough to run the tram.

Methodology

The following methodology was used to calculate the real user cost coverage ratio (RUCCR).

$$RUCCR_{PT} = \frac{R_U}{C_O + S_{OT} + S_I + S_C + S_V} \tag{1}$$

where

R_U user revenue (fare revenue)
C_O operating costs (part not covered by other market revenues)
S_{OT} operational subsidy for the maintenance of the tracks of public service
S_I investment subsidy of public service
S_C capital subsidy of public service
S_V other subsidy of public service (e.g. wage increases)

As passenger transport services are subject to VAT, both revenues and costs are calculated on a net basis; revenues do not include VAT payable and costs do not include deductible VAT.

It is important to clarify that the methodology deducts other revenues from the operating costs. The term 'other revenue' is not used as in accounting, but represents

other market revenues of the public service (e.g. advertising). Neither subsidies nor revenue from taxes collected for public transport purposes (which are in fact also subsidies, Figure 3) counted as other revenue.

If the public service operator's reasonable costs (and profit) not covered by revenue are reimbursed in accordance with TFEU and Regulation (EC) No 1370/2007, i.e. they are always fully reimbursed but not overcompensated, the operating costs (C_O) can be calculated in a simplified way as follows.

$$C_O = R_U + S_F + S_O \tag{2}$$

where

S_F the fare subsidy

S_O the (operating) subsidy

i.e. in this case, the total of the costs in denominator (1) can ultimately be written off by the sum of user revenues and the various forms of operating, investment and other subsidies.

$$RUCCR_{PT} = \frac{R_U}{R_U + \sum_{i=1}^{x} S_i} \tag{3}$$

In this case, as a further simplification, the sum of the user payment and the subsidy automatically gives 100%, i.e. the real subsidy cost coverage ratio (RSCCR)

$$RSCCR_{PT} = 100\% - RUCCR_{PT} \tag{4}$$

An important condition for the simplified calculation is that

- it is an unprofitable public service (local transport, rail transport is almost always like this)
- the loss should always be compensated in some way (preferably when it occurs), but not overcompensated
- the subsidies cover only the reasonable costs of the public service
- the total of the other revenues of the public service (e.g. advertising) should not be significant and should not in themselves cover the total cost.

Although public passenger transport services by rail and road are subject to specific regulation in the EU, compensation for loss-making public services is similarly applied in other sectors. Thus, the above method can be applied to all loss-making public services (e.g. the operation of theatres, supply of energy to the public) where the justified operating costs not covered by revenue do not include certain major investments (e.g. theatre renovation, power plant construction) because they are linked to the financial facilities of public service contractor.

Returning to public passenger transport services, in our methodology any subsidy for railway track maintenance should also be accounted for as a proportion of the use of the public service, since railway track maintenance is also typically a loss-making service, serving only rail passenger and freight transport, and public passenger transport as part of rail passenger transport. The share of rail passenger

transport and, within this, of public service should be fixed on the basis of a long-term average over time. In the case of Hungary, a rail passenger transport rate of 75%, and typically a public service rate of 90%, has been taken into account for the whole time series, although the share of public passenger transport in rail usage has increased over the years. For railway infrastructure used exclusively for public services (tram, metro, HÉV), track maintenance is typically also a directly eligible and eligible part of the public service.

On the other hand, subsidies for road infrastructure should only be counted if it is unprofitable. In the case of Hungary, it has been justified that the maintenance of the road network is not unprofitable due to the significant excise tax, toll and vehicle tax revenues (Kövesdi – Horváth, 2023). Moreover, some of the concession motorway sections with the highest unit costs are not used by the public bus service.

Among the subsidies for investment (S_I), it is useful to distinguish subsidies made directly to the public service operator or transport manager, which are shown in the annual accounts, from subsidies made outside the company or transport manager.

The real user (passenger) cost recovery ratio (RUCCR) should typically be examined at the level where the fare revenue is recognised in the profit and loss account: at the transport manager or at the operator.

For the Hungarian public operators (MÁV-START, MÁV-HÉV, GYSEV's Hungarian operation, Volánbusz interurban), the passenger cost coverage ratio is examined at the level where fare revenue is reflected and where operating costs can be aggregated. This is the level of the public service operator in the case of interurban transport and, as of May 2012, the level of the transport manager (BKK) in the case of local transport in Budapest.

The revenues, costs and subsidies examined are accrual-based, as the data are taken from the company accounts.

Direct (passenger) revenues include fare, ticket and surcharge revenues. Surcharge revenues are direct revenues if only because the cost of control is part of the operating cost and some level of control is necessary even without the phenomenon of fare evasion.

Direct revenue also includes revenue transferred and reimbursements received as other revenue from fare revenue.

The fare revenues of MÁV-HÉV and Volánbusz have been corrected for this reason, as the fare revenues transferred by BKK only include local fares, not local fares, which account for a more significant amount. The local revenue and SFS are estimated based on the 2016 annual report of BKK (2017), when the total agglomeration fare revenue was still reported directly to BKK and separated by segment. These amounts were subsequently estimated and deducted from the HUF 4,220 million (MÁV-HÉV) and HUF 2,160 million (Volánbusz) per year since 2017, which BKK pays as a cost contribution for local transport performance. Consequently, the revenue data for MÁV-HÉV and Volánbusz (and also for MÁV-START due to the HUF 200-400 million per year share of season tickets transferred) include revenue from local transport in Budapest, as does the passenger performance data for interurban transport in Budapest and other local passenger performance.

Among the subsidies received by public service operators, operating subsidies include the social policy fare subsidy (SFS; until 2012, the consumer price supplement) and the (operating) cost reimbursement. As the operating loss is systematically accounted for, it is simplified as revenue (R_U), the sum of fare subsidy (S_F) and the operating subsidy (S_O), and is defined as operating costs (C_O) (not covered by other market revenue).

Investment and other subsidies are accounted for as follows for the national railways. 75% of the annual operating cost compensation for railways is attributed to passenger transport, of which 90% (95% for GYSEV) is attributed to public service (in the case of HÉV and urban rail services, since there are no other services on the line, the public service for passenger transport includes the operation of the line, while for national rail only the network access charge paid for this is included).

In the case of investment subsidy, 100% of the subsidy received by the passenger transport operator is counted to the public service, in the same way as track access charges in the case of railway infrastructure investment, and according to the purpose of the subsidy in the case of other subsidies.

Within the investment subsidies, a distinction is made between subsidies received directly (from the owner, the budget and the EU) and subsidies received through investment by an external organisation (in the case of MÁV-START, subsidies from MÁV Co Ltd are also included proportionally).

In the case of the public service of MÁV-START, investment by an external entity is the investment made by state organizations like NIF in the railway network, which over time has been transferred to the assets of MÁV Co Ltd on the balance sheet, but typically much later. In the case of BKK, such 'external investments' include major investments (construction of metro line 4, renovation of metro line 2, 'vehicle renovation' of metro line 3) carried out by the owner, the Municipality of Budapest with (EU and state) subsidies, without BKK, and investments by BKV, also with EU subsidies (in particular the renovation of metro line 3).

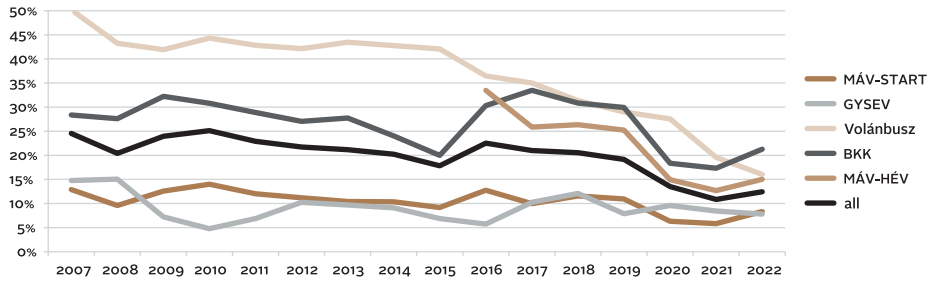
Capital subsidies (S_C, typically capital increases and debt assumption) and other subsidies (S_V, e.g. for wage increases) are aggregated as other subsidies.

Within the passenger performance of the service provider, the passenger performance of the public service under investigation was taken into account in the calculation of the specific indicators.

Results: Determining the real user (passenger) cost coverage ratio for the main Hungarian public service operators

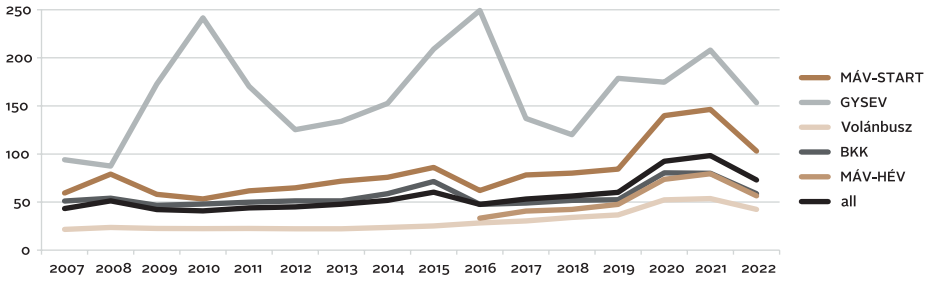
The calculations have resulted in the following real user cost coverage ratios (RUCCR) for the total cost (Figure 7).

Figure 6. Real user cost coverage ratios (of the total cost) of each public transport service (%)



As the tariffs of none of the operators increased between 2010 and 2022, the clear downward trend in the level of coverage can be seen, which raises the possibility of even cheaper public service pricing (Ács – Kövesdi, 2022). The fluctuations are partly caused by investments, with metro 4 and trams 1-3 together accounting for above average investments in Budapest local transport in 2014-2015, which also visibly changes the aggregate data. In 2020-2021, the coronavirus pandemic led to a significant drop in passenger numbers and hence passenger revenues, while vehicle kilometre performance and costs did not decrease significantly and actually increased on rail. The epidemic has had a more negative impact on bus passenger traffic than on rail, mainly due to a decrease in the commuter flow traffic that is the backbone of the Volánbusz traffic (mainly due to the expansion of the home office). Long-distance traffic, which is more typical of rail, has become highly competitive due to attractive tariff products, a significant increase in the frequency of routes and high fuel prices. The closing of the gap between rail and bus transport has been facilitated by the timetable and tariff measures introduced in recent years in favour of rail, and by some changes in the accounting within the MÁV-Volán Group.

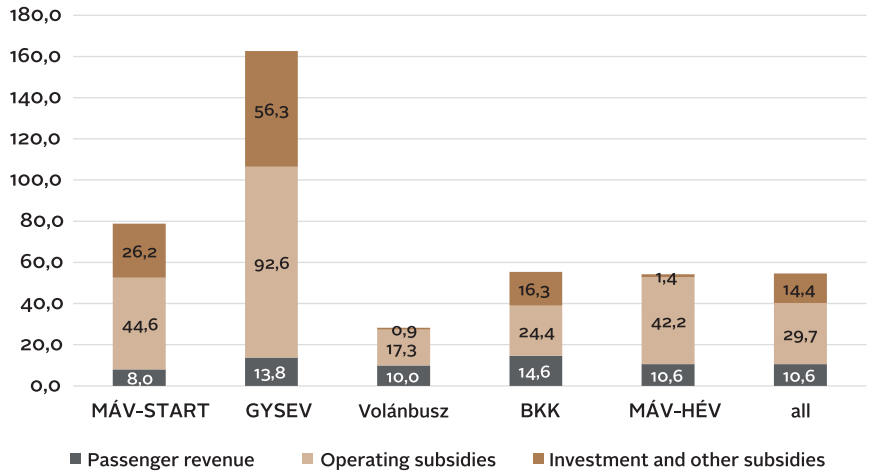
Figure 7. Total cost of each public transport service in real terms in 2022 (HUF per km)



EU-supported investments and wage growth have contributed to the long-term increase in costs in real terms (Figure 8). Another important factor is that the adjustment for harmonised index of consumer prices (HICP, inflation) is not complete (it does not include the increase in assets such as housing prices above inflation, or partly the increase in wages), and therefore previous years are underestimated.

It can be seen how the fluctuation of investments changes the annual cost of the service, in the case of GYSEV the modernisation of the Sopron – Szombathely – Szentgotthárd railway line (2009-2011) and the purchase of the EMUs in 2015-2016 are the main reasons for the significant increase. For this reason, it is worth looking at the average over a longer period, which gives a more realistic picture (Figure 9). Even in this case, we see some distortion, as even over 15 years, GYSEV has recorded investments around or above the long-term average, while MÁV-START has recorded investments below the long-term average. For MÁV-HÉV, the average only covers six years (2017-2022), but in the absence of track renewal and rolling stock replacement, it is also below the long-term average. The unit cost of GYSEV is therefore extremely high, but the quality of service is also higher due to the significant investments and the specific operating environment (integrated, border railway company without suburban transport in Hungary).

Figure 8. Average of total costs and subsidies for each public transport operator from 2007 to 2022 at 2022 real prices (HUF per passenger kilometre)



The unit cost (per passenger kilometre) of rail transport is much higher (at least double) than that of bus and coach services, so the 10-15 Ft per km paid by passengers is a much smaller proportion of the total cost. However, rail has an additional value added and a significant positive external effect in suburban and long-distance transport. In particular, its high capacity significantly reduces road congestion and investment needs and, at current technology levels, it is more environmentally friendly than road transport in this segment thanks to electrified rail lines. By the electrification of road transport underway, this disadvantage is expected to diminish in the future.

Within BKK, the higher cost of fixed rail can also be stated if we consider that the total bus passenger performance is close to the joint performance of metro and tram, while the majority of investments have been made on fixed rail. In the case of the bus, the operating costs include the cost of replacing almost all the vehicles and the cost of the bus operating model, but all these have a positive impact on revenues.

MÁV-HÉV has low unit costs, mainly due to its suburban operating environment and underinvestment.

During the period under review, Volánbusz's passenger cost coverage of coach services also decreased significantly but is still the highest in relative terms.

Factors affecting the results

The time frame of the study covers the period from 2007 to 2022. The two extremes of the interval are marked by a major global political event, the global financial and economic crisis beginning in 2008, and a new crisis linked to the coronavirus pandemic beginning in 2020, but in between there was a relatively stable period of

economic activity, which in Hungary also meant political stability. Looking back over this period, it is worth noting the events that, in addition to the above, may have influenced the level of passenger cover.

2007 was a significant year for domestic interurban transport, as a number of important changes took place. From December 2006, a paradigm shift in rail timetable planning took place, with the start of a continuous expansion of services based on the principles of integrated periodic timetables, the Taktfahrplan concept (Kormányos – Tánczos, 2007), which was expected to lead to a significant increase in passenger traffic, which also affected the level of coverage. However, this effect was modified by the significant fare increase (34% in total) introduced in two phases in 2007, the reduction of social policy discounts and the closure (partial or total substitution of service by bus) on 40 rail branch lines in 2007 and 2009.

During 2010, rail services were restored on 11 lines, followed by a significant timetable correction in 2012 and a minor one in 2015. Apart from these and the period 2015-2017, MÁV-START's timetable offer has been continuously expanding, with basically stagnating passenger numbers and decreasing passenger-kilometres. From 2019 onwards, the growth in supply of train services became even more dynamic, not even reversed by the coronavirus crisis, and by 2023 it reached a record-breaking 90 million train-kilometres (16% more than in 2017). It meant that in 2023 the expanded train offer was able to absorb and satisfy the surge in demand, largely due to the very low-priced county- and country-passes leases, without significant congestion problems.

In the meantime, Volánbusz's (non-urban) bus and coach performance, both in terms of passenger numbers, passenger-kilometres and timetable offer (useful kilometres), has stagnated at first, then rather declined. Passenger numbers and the revenue on which they are calculated started to decline from 2015 (after the regional merger of the county's Volán companies). From 2019 onwards, with the creation of the 'big' Volánbusz and its merger into the MÁV Group from 2020, the timetable and tariff integration processes accelerated, and the processes of rationalisation of the bus timetable and expansion of the railways' offer gained new momentum, with a slight shift of passengers from buses to trains.

In Budapest, a major timetable reform took place in 2008, followed by the creation of BKK in 2010, which set a new direction, and from May 2012 BKK took over the role of transport organizor. The timetable and network started to expand, vehicle demand increased, congestion decreased, and the image of public transport in Budapest improved significantly, and it was reflected in passenger numbers.

From November 2016, the HÉV was transferred from Budapest to the state ownership and at the same time to the state's order, similar to the suburban 'blue bus' services with 160 buses and a capacity of 12 million kilometres per year, which Volánbusz had already been operating since April 2014 as the service provider of BKK, replacing BKV.

A significant impact on the level of coverage was that, although a tariff adjustment (a small price increase) was still made in Budapest in 2013, the basic long distance and regional tariffs remained practically unchanged from the beginning of

2010 until mid-2023. opposing to (Previously there were annual inflationary tariff increases.)). Thus, over the period under review, public transport became cheaper and more attractive on the one hand, and revenues decreased in real terms on the other. This has been influenced in a barely detectable way by the introduction of bus supplementary tickets in 2012 and then fast train supplementary tickets in 2013 (and their complete phasing out by 2022), the phasing out of 'virtual discounted rail mileage' scheme on routes competing with coaches in 2013, and then reintroduction in 2020, the introduction of the 'discounted regional fare' in two phases in 2013-2014, and the continuous refinement of the pricing of seat reservation.

Hecticity was observed in the movement of fuel prices, which are considered to be the 'competitor' of public transport. The coronavirus pandemic initially caused a significant drop in fuel prices - and a collapse in public transport passenger traffic and revenues (Kövesdi - Oszter, 2023) - and in 2022 the Russian-Ukrainian war caused record energy prices. Price controls were introduced for fuel prices (Kövesdi, 2023), even though the price without the price cap did not reach its previous maximum in real terms in 2012. On rail, the surge in electricity prices added tens of billions of forints in 2022, but even this did not offset the expansion in train supply. (Meanwhile, for example, the rise in gas prices has led to the closure of a significant proportion of compressed natural gas (CNG) buses in some cities.)

All these exceptional events have fundamentally changed the coverage ratios after 2020, so the data for the last three years should be interpreted in this light. The period under review also saw a significant increase in the number of cars put into circulation, as well as in the use of cars.

In recent years, the member companies of the MÁV-Volán Group have made significant wage increases - in several cases double-digit percentage increases - which have significantly increased costs and further reduced the passenger coverage level, while still failing to solve the shortage of travelling staff.

In terms of investment, there has been a significant upgrade of rolling stock between 2007 and 2022, with 183 modern commuter train sets and nearly 100 IC+ coaches. GYSEV has almost completely replaced its rolling stock fleet, including the purchase of second-hand IC wagons. Volánbusz had a small volume of rolling stock upgrades until 2012, after which the process was frozen for several years, but from 2018 onwards the procurement of new rolling stock has been proceeding at a very good pace. In the case of the HÉV, there have been no vehicle upgrades in the last 40 years, apart from 1 experimental refurbishment. The fleet managed by BKK has evolved significantly and has become 100% low-floor in terms of buses. The launch of the bus operation model in 2012 has contributed to this, raising costs as well as quality.

There have also been major rail investments, mainly on main lines and suburban lines. The suburban developments on the Székesfehérvár, Esztergom and Pusztaszabolcs lines have significantly increased the role of the railways and reduced journey times, while on the Budapest - Debrecen line, despite the reconstruction, no significant reduction in journey times or structural changes in timetables can be observed. Only minor improvements have been made on the HÉV lines.

In Budapest, major investments have been made in urban rail (tram) lines and rolling stock, the 'Buda overlapping network' and tram line 1. The most significant, however, is the construction of metro line 4 and the impact of the complete renovation of metro line 3. Also worth mentioning is the development of the sales and passenger information system of BKK, which will be followed by MÁV, but not Volánbusz, which will be connected to MÁV's system.

Conclusion

An analysis of the real user (passenger) cost coverage rates (RUCCRs) of the main domestic public transport operators over a longer period (2007-2022) shows that RUCCR of the major rail operators are 10.1% (MÁV-START) and 8.6% (GYSEV), while RUCCR of MÁV-HÉV is about twice as high at 19.6%. BKK, which organises several sub-sectors, has a RUCCR of 26.4%, with the highest rate being achieved by the bus and coach service of Volánbusz, at 35.5%. To summarise, the costs of public rail transport services (MÁV-START, GYSEV) are covered by passenger revenues to a significantly lesser extent than those of public transport services that are partly rail-based (BKK) or road-based (Volánbusz).

One of the reasons for this is that the construction, development and operation of fixed rail infrastructure is so resource-intensive that it requires financial support in itself, while the public finance balance of maintaining the road network is typically not even negative (Kövesdi – Horváth, 2023). The second reason is that buses only have a very low share in the use of public roads, so the costs are covered jointly by many more operators and users, on the other hand rail infrastructure is largely (or in the case of MÁV-HÉV entirely) occupied by public rail operators, so they bear a significant share of the infrastructure costs.

The decreasing or persistently low financial contribution of the passengers raises the possibility of a further shift towards social, economic and environmental efficiency in line with national and EU transport policy objectives (Ács – Kövesdi, 2022). The role, ideal size and sustainable financing of public transport is being redefined worldwide in the light of the climate crisis and urban transport problems. Over the past decades, it has become accepted that passenger transport services, except for a few specific submarkets, cannot operate at a financial profit. The levels of cost coverage (RUCCR) in our paper are not extremely low and this situation is now accepted by financiers.

In economic terms, the two main questions may arise. The first is the quality (and hence the cost) of the transport system, including the modal mix. The second is the extent to which the costs of developing and operating the system should be covered not only by taxpayers but also by those, who actually use the public service, i.e. passengers.

By making passenger-friendly, passenger-attractive changes to fare systems and by reducing ticket and pass prices, passenger numbers and passenger kilometres can be increased, and the environmental burden of private transport reduced. This is

the basic aim of flat-rate, area-based tickets and season tickets, such as the German Deutschland Ticket, the Austrian Klimaticket, or the Hungary pass or County pass (monthly tickets), or the Hungary24 and County24 day tickets. Data are not yet available to analyse the impact of these on passenger cost coverage ratio, and further research is needed to filter out the recovery trend after the coronavirus pandemic.

Another further line of research is the question of the utilisation and ideal size of rail and road infrastructure. The level of construction and maintenance of road and rail infrastructure, and the passenger and freight transport on it, are dynamic factors that influence each other, and the optimal ratio between them is also the subject of further research in technical areas. In addition, it is appropriate to put public transport in a broader context and to look beyond the financial perspective to its level of social coverage, considering externalities, especially environmental impacts. ■

References

1. Ács B. (2018): Who pays the ferryman? - or the financing paths of intercity passenger transport, European Transport Congress, 8th International Conference on Transport Sciences - Győr 2018, pp. 1-12 https://cots.sze.hu/2018
2. Ács B. – Kövesdi I. (2022): Can public transport be free? Közlekedés és Mobilitás, 1:6, pp. 72-79. https://doi.org/10.55348/KM.6
3. BKK (2013-2023). [previous year] Annual Report of BKK (Budapest Transport Centre).
4. Municipality of Budapest (2008-2023): The [serial number] Municipal Decree of the General Assembly of the Municipality of the Capital of Budapest on the implementation of the [serial number] Municipal Decree on the consolidated budget of the Municipality of Budapest [previous year]
5. EMTA (2021): EMTA Barometer 2021 - Based on 2019 data, 15th edition, European Metropolitan Transport Authorities, 8 p. https://www.emta.com/wp-content/uploads/2021/11/211007-barometeremta-2019.pdf
6. European Commission (2015): Guide to Cost-Benefit Analysis investment projects. Economic appraisal tool for Cohesion Policy 2014-2020, Publications Office of the European Union, Luxembourg, 358 p. https://ec.europa.eu/regional_policy/sources/studies/cba_guide.pdf
7. European Commission (2016): Report from the Commission to the European Parliament and the Council: Fifth monitoring report on the development of the rail market https://op.europa.eu/en/publication-detail/-/publication/80b58c26-bd30-11e6-a237-01aa75ed71a1/language-en/format-PDF/source-search
8. European Commission (2021): Report from the Commission to the European Parliament and the Council: seventh report on monitoring the development of the rail market pursuant to Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council, COM(2021) 5 final, Brussels, 13.1.2021, https://transport.ec.europa.eu/transport-modes/rail/market/rail-market-monitoring-rmms_en https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0005

9. European Commission (2023): Report from the Commission to the European Parliament and the Council: Eighth report on monitoring the development of the rail market, based on Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council, COM(2023) 510 final, Brussels, 13.9.2023, COM(2021) 5 final https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0510
10. Kormányos L. – Tánczos K. (2007): Conditions of a quality public railway service in Hungary, Periodica Polytechnica Transportation Engineering, 35(1-2), pp. 23-34. https://pp.bme.hu/tr
11. Kövesdi I. (2017): The public balance of transport in Hungary 2004-2015, Conference on Transport Economics - Győr 2017, pp. 1-13. https://cots.sze.hu/2017
12. Kövesdi I. (2023): Greener car taxation in Hungary, Közlekedéstudományi Szemle, 1/2023., pp.4-20. https://doi.org/10.24228/KTSZ.2023.1.1
13. Kövesdi I. – Horváth B. (2023): Public revenues and expenditures of transport between 2004 and 2021, 13th International Conference on Transport Economics - Győr 2023, pp.235-248. https://cots.sze.hu/downloadmanager/download/nohtml/1/id/44021
14. Kövesdi I. – Oszter V. (2023): the impact of the coronavirus pandemic (COVID19) on transport services, Transport and Mobility, 2023, 2:1, pp. 34-48. https://doi.org/10.55348/KM.26
15. Public service reports (2011-2023): MÁV-START, GYSEV, MÁV-HÉV, Volánbusz and its predecessors
16. Steer Davies Gleave (2016): Study on economic and financial effects of the implementation of Regulation 1370/2007 on public passenger transport services, Final Report https://transport.ec.europa.eu/system/files/2016-09/2016-02-effects-implementation-regulation-1370-2007-public-pax-transport-services.pdf
17. Szeri I. – Dancz Á. (2023): Modernisation possibilities of the domestic public passenger transport discount system, Közlekedéstudományi Szemle, 4/2023, pp. 14-27 https://doi.org/10.24228/KTSZ.2023.4.2
18. Company annual accounts (2008-2023): Annual accounts [previous year] closing the general business year (MÁV-START, GYSEV, MÁV-HÉV, BKK, BKV, Volánbusz and its predecessors)