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HOW TO ESTABLISH AND OPERATE CROSS-BORDER PUBLIC TRANSPORT IN A PERIPHERAL RURAL AREA? THE EXAMPLE OF THE CENTRAL AND SOUTHERN SECTION OF THE BORDER BETWEEN AUSTRIA AND HUNGARY

Jak zorganizować i zarządzać systemem transgranicznego transportu publicznego na peryferyjnych obszarach wiejskich? Przykład środkowego i południowego pogranicza austriacko-węgierskiego

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Abstract: Based on the Interreg Central Europe Territorial cooperation Programme's CONNECT2CE project the current paper analyses the existing passenger traffic flow across the border which is among the TOP10 busiest border section of the EU. It provides an overview of the main socio-economic characteristic of the peripheral border area and identifies the factors which are leading to the continuous growth of cross-border traffic. Based on previous research and travel surveys it collects the past service attempts offered to tap the growing cross-border travel demand. It also presents the most recent passenger counts and relational (Origin-Destination O-D) ticketing statistic in order to get precise knowledge about the usage level of the existing service which helps to understand the rapidly changing mobility patterns and spatial structure. Finally, it takes into account the existing EU conform legal and organisational challenges for offering competitive public transport services on a cross-border route and proposes two new solutions as a contribution to achieve a sustainable modal shift towards public transport in the peripheral border area.

Key words: Austria, cross-border traffic, Hungary, O-D, traffic flow

1. Introduction

Cross-border travels generally require more effort in planning than a similar distance domestic journey. In Central European context until the 1990s the cross-border journeys constituted only a minor segment of the overall travel patterns. The numerous legal, administrative and partly financial constraints made it available to only to a small part of the population with very limited frequencies. There was no legal base for everyday work or school activities in another country than the citizen's own country. Due to political, social and economic changes in the former communist countries of Central Eastern Europe this situation has changed fundamentally. Earlier studies (Hardi, Nárai, 2001) shown that the drastic change in cross-border connections started well before the EU accession of Hungary in 2004 (Hardi, 2017). The traffic flows including the new daily commuting flow between Austria and Hungary has increased substantially. The

increase in cross-border commuting is largely fuelled by a narrowing yet still existing a roughly three fold gap in the available wages and standard of living between Austria and Hungary. The growing number of commuters with an overwhelming majority of private car users are making a growing public demand for a shift to other alternatives primary the more sustainable public transport modes.

By partly building on the EU's ongoing Interreg Central Europe territorial cooperation programme's CONNECT2CE (2019) project which main aim is to support modal shifts to public transport modes in peripheral border areas the main territorial focus of this paper is to focus on peripheral rural border areas. Therefore, the more urbanised Northern section of the Austrian-Hungarian border (Nordburgenland and Győr-Moson-Sopron NUTS3 County) crossed by two main transport East-West corridors is not taking part in the current analysis (Fig.1).



Fig. 1. NUTS3 regions of Western Hungary and Eastern Austria. Current research area includes Vas County in Hungary and Südburgenland and Mittelburgenland regions in Austria.

Source: INTERREG Austria-Hungary 2014-2020.

With a territorial focus on the peripheral and rural border regions of Central and Southern sections of the Austrian-Hungarian border, the paper is divided as follows: reviews the past research projects done and the existing academic literature about the cross-border mobility patterns of the region. Based on the available regional statistics it identifies the main factors affecting cross-border commuting and the commuters modal choice. Then with the help of timetable archives, the current paper endeavours to overview the past and current traffic flow with the use of the most recent passenger counts and relational (Origin-Destination O-D) ticketing statistic. Later on, it takes into account the existing EU conform legal and organisational challenges for offering competitive public transport services on a cross-border route and proposes planned service and infrastructure developments in the Central and Southern section of the Austrian-Hungarian border. Finally, the paper concludes with the results of the aforementioned chapters reflecting the main aim of the paper the identified success factors in order to establish a financially and legally sustainable cross-border passenger transport service in a peripheral rural border area.

2. Literature review

The regional railway company GYSEV (or Raaberbahn in German) has a special situation as it is owned by Hungary and Austria since the beginning of its cross-border operation from 1872. It was one of the very few companies that could maintain operation as a mixed (capitalist and communist country-owned) even in the strictest cold war period of the 1950s and 1960s (Locsmándi, 2009). Until the millennium only operated its East-West mainline between Győr, Sopron and Ebenfurth but as of 2019, it operates most railway lines in the research area (Fig. 4.). However most of them have been given only to operation from 2001, 2006 (the examined Szentgotthárd-Szombathely line) and 2011 from the other Hungarian incumbent state-owned operator MÁV group.

Building on the previous ESPON and TRACC researches' indicators and databases, in their wider European analyses R. A. Castanho et al., (2017) found that many critical factors can influence the success of cross-border cooperations and transport (of different) modes is only one of them. M. Więckowski et al. (2014) analysed road accessibility in the Slovak-Polish borderland but with a tourist focus with short-, mid-, longer-term timeframes. In their earlier work (Więckowski et al., 2012) they made analysis with isochrones and identified the full range of natural and socio-economic conditions that influence cross-border tourism-related mobility.

Due to different historical development, theoretical interaction potential models can show different places for less intensive cross-border interaction than it was measured by commuting flows between the Czech Republic and Slovakia, particularly in the Northern area of that border section (Halás, 2006). This situation is not unique as it was pointed out by A. Uszkai (2015) who analysed the current and historical relations along several Central European bordersections. More recent studies about cross-border passenger rail transport have confirmed an improving tendency about connectivity over the past 25 years at the Polish-Czech Intra Schengen borderland (Smolarski, 2018).

Nevertheless, at other intra-EU and intra-Schengen border relations, it was found that a number of legal, financial and organisational issues are hampering the cross-border public transport services (Gabrovec, 2013). Not surprisingly the scale of the obstacles can grow further. Based on the accurate research and data collection (Gumenyuk, Studzieniecki, 2018) found that an extra-EU (Polish-Russian, Lithuanian-Russian) relation needs far more coordination and cooperation than similar intra-EU cross-border transport. Luckily the current intra-Schengen research area is in a better position but the EU borders does not automatically mean good connections (Hardi, Lieszkovszky, 2019) which can be explained by the lack of competent cross-border public service order bodies (e.g. a working EGTC) what could compensate the inadequate operators on the commercially not viable routes (Barth, 2014).

3. Research methodology

The real flow of people, goods, information, money, phone calls, etc. helps geographers to read the world (Dobruszkes, 2012). The most frequently used type of flows is the flow of people which in most cases comes from the 10 yearly national censuses. The work and education flows are the most numerous ones thus the most often analysed in the literature yet they have a shrinking share due to the ageing population and atypical working hours and schemes (Kraft, Marada, 2017). The flow of people in public transport can be known from the railway or bus operator's Origin-Destination ticketing statistics although many times these kinds of valuable data is not accessible due to the operator's business interests (on a competitive market environment) or simply due to the lack of the adequate ticketing infrastructure (Berényi, Oszter, 2017). Alternatively the service offer (Seidenglanz, 2010) is researched by the normally freely available timetable information but the number of services without information on their exact capacity a load

factor not to mention transferring passengers can be misleading as some other research (Yang et al., 2018) has shown. In this paper, the ticketing statistics and onsite passenger count data is used to get travel demand-side or with other words the exact number of the existing cross-border bus passengers.

In order to create an attractive and successful scheduled public transport service, it is essential to know what the main expectations of the customers are. T. Petersen (2016) highlights the need for periodic (pulsing) timetable structure with secured intermodal connections. These main factors along with several other kinds require a stable or at least well-known travel demand. Due to the lack of recent and sufficiently detailed surveys, the past 15 years of intra-EU cross-border service attempts give some kind of starting points to observe the Spatio-temporal variation of the supply side. The data gathered is presented by thematic maps, tables and diagrams.

4. Delimitation of the research area

The current intra-EU and intra-Schengen Austrian-Hungarian border did not exist as a strict external border as it was an internal border of the Habsburg's Austria-Hungary Monarchy located at the current Western provincial border of Burgenland.

The border between Austria and Hungary has been drawn after the First World War (WWI). Due to numerous civil uprisings, several public votes had been held which made modifications of the exact alignment which included transferring 10 villages to Hungary and 3 to Austria along the border section of Vas County (Tóth, Jankó, 2017). Since 1923 the border is firm but its role changed fundamentally during the past nearly 100 years. Until the end of WWII, the border was relative well passable but due to the social and economic changes, the newly introduced communist regime built the so-called "iron curtain" (military fence system with land mines) in order to

prevent its population illegally emigrate to Western capitalist countries. R. Győri and F. Jankó (2017) analysed the development of regional disparities on both sides where they found that the Southern and Central part were continuously less developed than the Northern part with its new centre Eisenstadt and the main crossroad and towns located along them (e.g. Neusiedl am See). Unlike the Northern part which could be easily joint to Vienna's outer urban core together with parts of Lower-Austria (e.g. Wiener Neustadt) the Central part couldn't replace its historical centres (Szombathely and Kőszeg) with similar settlements on the Austrian side only the Southernmost part could replace Szentgotthárd with Fürstenfeld and Graz. Today the total length of the border between Hungary and Austria is 354.9 km half of which 177.3 km relates to Vas County and to the currently analysed Central and Southern section.

5. Socio-economic characteristics influencing mobility patterns in Vas County and in Central and Southern Burgenland

Commuting patterns generally show a growing tendency in the share and the absolute number of commuters not just from Hungary to Austria but also from Slovakia to Austria (Michniak, 2016) and also from Slovakia to Hungary. The general commuter's modal split is growingly private car-oriented since 1990 not just in Hungary (Kiss, Szalkai, 2018) but also in other new member states in Central Europe like Poland and Slovakia (Michniak et al., 2015).

In the case of the research area in Vas County, the settlement structure is composed of micro and small settlements with 85.65% of under 1000 inhabitants (Hungarian Central Statistical Office, 2019) while on the Austrian side there is a strong network of medium and large size villages with regional sub-centre towns (Tab.1).

Tab.1. Settlements population categories in the absolute number of settlement's and their share in % in Vas County (Hungary) and in Burgenland (Austria).

Population category of settlements	Burgenland	Vas County	Burgenland %	Vas County %
Micro 0-499	16	134	9.36	62.04
Small 500-999	38	51	22.22	23.61
Medium 1000-1999	75	16	43.86	7.41
Large 2000-4999	37	9	21.64	4.17
Small towns 5000-9999	4	1	2.34	0.46
Towns 10000-50000	1	4	0.58	1.85
County centre 50000+		1	0.00	0.46
Total	216	171		

Source: Kovács, 2017 with own compilation.

On the other hand in Vas County the regional centre Szombathely is far the biggest city with ca. 80.000 inhabitants and 3 more regional centres towns of ca. 10.000 are located near the border (Szentgotthárd, Körmend, Kőszeg). The settlement network of Vas county is very fragmented: the high number – 6.5 – of the settlement per 100 km² is nearly twice of the Hungarian average – 3.4 / 100 km². On the other hand in Burgenland, this value is 4.3 nearly the double of the 2.3 / 100 km² Austrian average whose relative low value is explained by the large mountainous areas of the Alps where there are hardly any settlements outside the valleys. In Vas, the 61.5% urbanisation rate is below the 'country approx. 70% average', furthermore the rate shows uneven split: for example, Szombathely district has 70% rate and Órség area (Szentgotthárd and Körmend LAU1 micro-regions) has 18%. In Burgenland the urbanisation rate is low – only 22.5% – but if the population living in settlements with more than 2000 inhabitants (and not just with city legal status) is measured than its value reached 52.3% urbanisation rate in early 2015 (Kovács, 2017).

The predominantly flat and partly hilly terrain with limited historical destruction makes the settlement structure sparse. Therefore the commuting patterns are also sparse from many small-sized settlements to the regional centre towns or in a growing share to another small village's touristic workplace (e.g. pension staff) or to changing workplace as the Hungarian Central Statistical Office showed. The domestic commuting (to another than home LAU2 settlement) in Hungary affected 35.2% of the workforce in 2016 according to the microcensus. In Vas County, this value was over the country's average at 47.2% of that 12.94% is a cross-border commuter to Austria. This value is up from 8.4% of the full NUTS2 region in 2011 which made the region already at the 10th highest share of cross-border commuters among all the NUTS2 regions in the EU (Eurostat, 2019). Unfortunately, data from 2016 is not yet available for commuting for all the EU. Burgenland province itself is also a heavy commuter area with around two-thirds of the employees work in another settlement half of them outside the province, mostly in Vienna and its suburban area in Lower Austria and from the Southern part to the surroundings of Graz in Styria (Pogátsa, 2017).

The main employment categories of the cross-border commuters are summarised here but it should be taken into account that the results of Census 2011 and the EMAH Project (2014) show a little bit different pictures about the split of the commuters by profession (industries) – the reason could be a sampling issue. According to the Hungarian Central Statistical Office, the workers employed in agriculture takes 7.1%

share while in EMAH Project (2014) it did 11% – both are far higher than the country commuter average of 3.7%. The Census 2011 measured 31.1% portions on industry and construction, EMAH Project (2014) did 38% – the country commuter average is 38.4%. Thus there is an approx. 7% digression between the two surveys: the Hungarian Central Statistical Office data assessed 58% of the cross-border commuters from the tertiary economy while the EMAH Project (2014) did it 51%.

According to the Microcensus (Hungarian Central Statistical Office, 2019) the cross-border commuters' gender balance is also worse than the domestic commuters division (61.6 vs. 71.5% male dominance) while is still moderate compared with South Burgenland's other neighbours, namely Slovenia's even higher cross border male dominance of 81.5 % Republic of Slovenia Statistical Office (2019). In certain sectors and employment types, the females' cross-border commuters' share is significantly higher with around 50% in tourism and even higher in cleaning and elderly care work positions (Hungarian Central Statistical Office, 2019).

According to Eurostat (2019) the GDP per capita on PPS level for Western Hungary in 2017 was 21.500 EUR (not PPS 13.400) in Western Hungary NUTS 2 region while in Burgenland NUTS2 region 30.000 EUR and 27.100 EUR (on PPS) ca. 90% of the EU's average. The general and also the median wage level in Burgenland is slightly above the Austrian average as well as the activity rate 74.3% for males and 64.9% for females (Pogátsa, 2017) some 4-5% higher than in Vas County where there is steadily growing activity rate. Despite the higher unemployment rate (7,6% in Burgenland with over 9% in most parts of Central and Southern Burgenland in March 2019, (Services für Arbeitsuchende in Eisenstadt, 2019) versus 2.5% in Vas County for 2018 (Hungarian Central Statistical Office) due to the better wages and working conditions still more and more cross-border commuters are heading to Austria.

On the other hand, it should be underlined that the low-skilled workforce is overrepresented among them with less middle and far less highly qualified workers. The lack of language skills often create problems in finding proper employment option for the majority of the workers as the historical Hungarian ethnic population in Burgenland has shrunken from 8.4% in 1920 to 2.4% in 2001, thus a minimum level of German language skills are essential. It is important to note that the roughly 6-7 thousand persons native Hungarian ethnic group has significant population share only at 4 settlements in Central & Southern Burgenland (Oberwart, Unterwart, Oberpullendorf, Siget in der Wart) and due to natural assimilation

and (partly temporary) cultural change their share in Burgenland has decreased to 0.5% by 1971 and since then is slowly growing predominantly due to the migrant Hungarians who acquired Austrian citizenship from Hungary and from the ethnic Hungarian communities of Slovakia, Serbia, Ukraine and Romania. The real Hungarian ethnic population is unknown but in all Austria, this might reach 50-60 thousand persons who are migrant workers around Vienna and the other major economic centres (Kocsis, 2017).

According to The European Job Mobility Portal (2018) "71% (2018) of the additional jobs will be filled by people who do not have Austrian citizenship". This forecast together with the existing growing trends in commuting particularly cross-border commuting in the current research area requires an increasing number of policy and transport organisation intervention in order to ensure the sustainability of the changing spatial dimension of the workforce demand. Specific financial, legal and operational issues for organising cross-border public transport services.

In an earlier bilateral Slovenian-Italian cross-border study found that the cross-border public transport faces more barriers than their domestic counterparts (Gabrovec, 2013). The service tendering and finance is usually completely different thus the offered social discounts can vary fundamentally on either side of the border which makes the tariff system hard to offer competitive and simple alternatives to private car usage. Even the ticket media (e.g. traditional paper ticket versus electronic chip card) and the currency difference can be an obstacle as well as the passenger information systems with different technical standards and a travel planner with incidental e-ticket sales channels (Cavallaro, Sommacal, 2019).

As a consequence, the cross-border service offer and the modal split achieved is always worse for public transport modes even if it is compared to their respective border regions' domestic regional modal shares (Barth, 2014).

It is known that under present tax and policy environment the operational costs of the expected income from fares is not able to cover the cost of operation which varies a wide range (EUR/km in Hungary vs. EUR/km in Austria) with varying quality options (Smart Shopping Mobility..., 2018). The loss-making operations can be entitled to compensation from the public body who orders public benefit transport service. The details are well-defined by the 1370/2007 EC Regulation about PSO (Public Service Obligation) and 1073/2009 about bus service provision. However, there is no exact indication about cross-border services (Pucher et al., 2017) and the respective mem-

ber states own complying legal framework also not focusing on the cross-border services. There are different authorities (Regional Authority in Austria vs. Central Ministry in Hungary) with different territorial and service focus. The level and the finance of certain social groups discount scheme largely differ. Thus, the wage difference which is the main factor for the growing cross-border commuting applies also to the bus operator staff, primary to the bus drivers who should be ideally bilingual at least till a certain daily level. The legal need for paying at least the local wage over 3 hours of work in the other country makes the service with cheaper Hungarian staff a nearly immediate return trip which is at some cases not even published in the timetable thus they are no revenue service.

6. Past and current public transport service supply

In the past 10 years, the state-owned regional bus provider company ÉNYKK (Északnyugat-magyarországi Közlekedési Központ, 2019) and its legal ancestor Vasi Volán has operated eight (8) scheduled cross-border bus routes of which two remained in service for school traffic.

The main aim in the region is to keep commuters using public transport which seems to be challenging as the number of passengers decreases by 3-4% each year yet passenger kilometres are relatively stable.

Concerning cross-border traffic with the exception of Szentgotthárd railway border station the commuters are using nearly always private cars. Due to the increased traffic, Austria has limited the use of public roads leading to the border in certain sections for private cars. An overview of road border crossing points between Austria and Hungary can be observed on the following map (green is usable by private cars, red is for only non-motorised modes) (Fig. 2).

The main consequence of the situation presented on the map above is that the use of private car has fewer options for being the fastest and the shortest mode of travel. Yet bus cross-border bus services are currently limited but there were attempts to establish services along certain routes. There was an interregional cross-border touristic service to the nearby foreign bigger cities of Vienna (AT), Maribor (SI) and Bratislava (SK). Other regional cross-border destinations included shopping tourism service to the following Austrian micro-centre towns of Oberpullendorf (AT) and Oberwart (AT) and student commuters to Feldbach (AT) (Tab. 2).

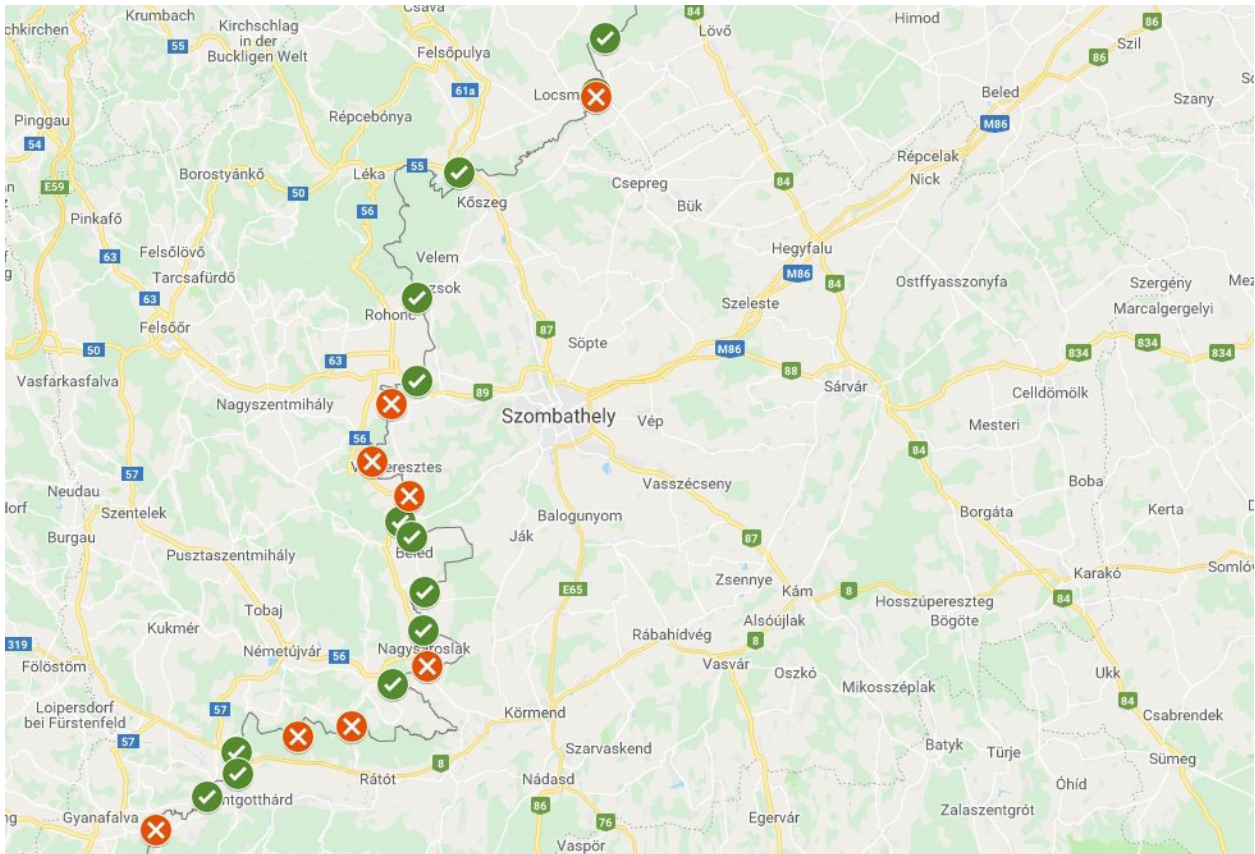


Fig. 2. Road border crossing points between Hungary and Austria at the Pilot location area along the border section of Vas County.

Source: Google Maps.

Tab. 2. Austrian-Hungarian cross-border regional bus timetable offers and service attempts from the 1990s till 2019.

Route (timetable number)	Service offer	Status
Körmend–Feldbach (708)	School bus on weekdays only	Stopped in 2010
Kőszeg–Oberpullendorf (724)	Everyday shopping tourism	Stopped 2010, but until 2017 one service per first Saturday of the month
Szombathely–Kőszeg–Rechnitz	3 Daily service (with domestic tariff) shopping/work	Stopped in 2009
Szombathely–Kőszeg–Vienna (725)	Wednesday and Saturday service shopping service	From 2009 only Wednesday in December ran until 2017
Oberwart–Szombathely–Bük	Workdays midday shopping and spa tourism (Austrian operator Südburg)	Stopped in 2017
Szombathely–Oberwart (715)	From 2014 school service, until 2010 private operator only Wednesday & Saturday, 2010-2014 Saturday only to the flea market	Operates on Austrian schooldays only
Szombathely–Eberau (717)	School service since 2011	Operates on Austrian schooldays only

Source: own elaboration.

Over the past few decades, the regional cross-border routes of the buses have also changed considerably, primarily due to the transformation of the social (e.g. the role of daily commuting) and the transformation of the economic environment (e.g. motorization processes). The current 3 services serve school commuter traffic from Hungary to Austria and they run on concession under permissions from the Ministry (Hungary) and Province (Austria). Some students are transferred further into Austria (to Oberschützen and Pinkafeld) based on a bilateral agreement between the Austrian and Hungarian bus operator. The stops are used under a non-public agreement and the services are harmonised with the domestic services.

7. Present cross-border demand

For the ÉNYKK, the travel pass sales statistics for the period 2013-2018 (student passes) are illustrated in below, where the annual change in the passes of the students heading Oberwart, Eberau and Oberschützen/Pinkafeld, which is served by the co-operator (Fig. 3).

However, this value includes the Oberschützen passes (average 28 units/month), since students are on the same route. The number of season tickets sold in international traffic dropped from 1.614 in 2016 to approximately 1.542 in 2017, which is a decline of approximately 4.5%. Comparing the latest data for 2018 with 2017, it can be concluded that there was a further decline (similar to the domestic drop in passenger numbers) of ca. 4% in ÉNYKK's sales data of international travel passes. The phenomenon behind the steadily decreasing trend in sales data is that parents of children studying in Austria often also work in Austria. Therefore the parent can provide one-way or return transport for their children. between the place of residence and education. This phenomenon is complemented by another one, namely the use of own car which is getting increasingly common in the age group of 17-18, thus reducing the demand for public transport. By analysing daily traffic variation it can be seen that the morning services towards Austria have a relatively higher load factor than the afternoon services on the way back. Not surprisingly the seasonal operation (only on Austrian schooldays)

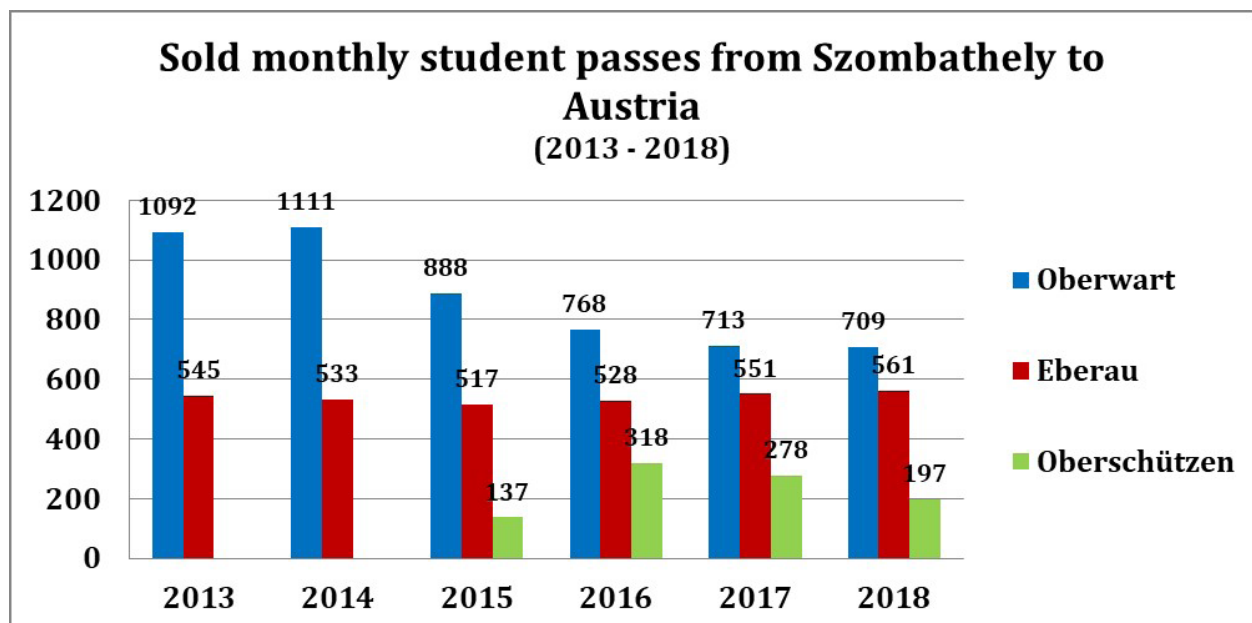


Fig. 3. The number of sold monthly student passes per route

Source: Északnyugat-magyarországi Közlekedési Központ.

After a boom in the initial period, there was a slight downturn for all destinations, while the most significant drop was in the number of Oberwart passes whereas with Eberau passes there was another upswing. Approximately 110 passes got sold on a monthly basis in the Szombathely – Oberwart relation in 2013, which decreased to 72 on in 2017.

variation makes the ticket sales highly unequal during school holidays of winter and summer.

8. Discussion

Connecting cross-border regions is one of the European Union's most important aspirations, while cross-

border road, rail and water infrastructures have been set in a “traditionally” set of bilateral agreements, the same cannot be said of public transport links. Usually, there is a supply-driven regional cross-border passenger service, where on one side of the border there is a larger settlement with cross-border suburban journeys. Such a role is played by Sopron on the Hungarian-Austrian border (at the Northern edge of Central Burgenland) where trains from Austria arrive from three directions (Fig. 4.) which even offer a possibility of transferring to each other (transferring for during an Austrian domestic journey at a Hungarian station).

Szombathely is so far away from the Austrian border that it could not become one of the service centres for Austrian border settlements. Although Kőszeg is close to the border the size of the settlement is not so large that it would generate significant travel demand from Austria. Thus, regional public transport links between Vas County and Burgenland provide only school access at present, while improving the “general” interoperability of the border would certainly be necessary. On the Hungarian side, there is a greater service supply of timetables (in terms of frequency and operating hours see Figure 4 and Fig-



Fig. 4. Győr-Sopron-Ebenfurth Railway (GYSEV) regional operator’s network in Western Hungary and Eastern Austria.

Source: Győr–Sopron–Ebenfurti Vasút Zrt.

ure 5 than in Austria. This situation makes it more difficult the harmonisation of the timetables (securing transfer from Austrian to Hungarian buses) without adding completely new cross-border PT connections between the closest regional micro-centres. Then the

Hungarian and Austrian regional public bus services could become interoperable at the respective LAU1 centres- which is currently provided only at the railway station at Szentgotthárd on the Szombathely – Körmend – Graz railway line.

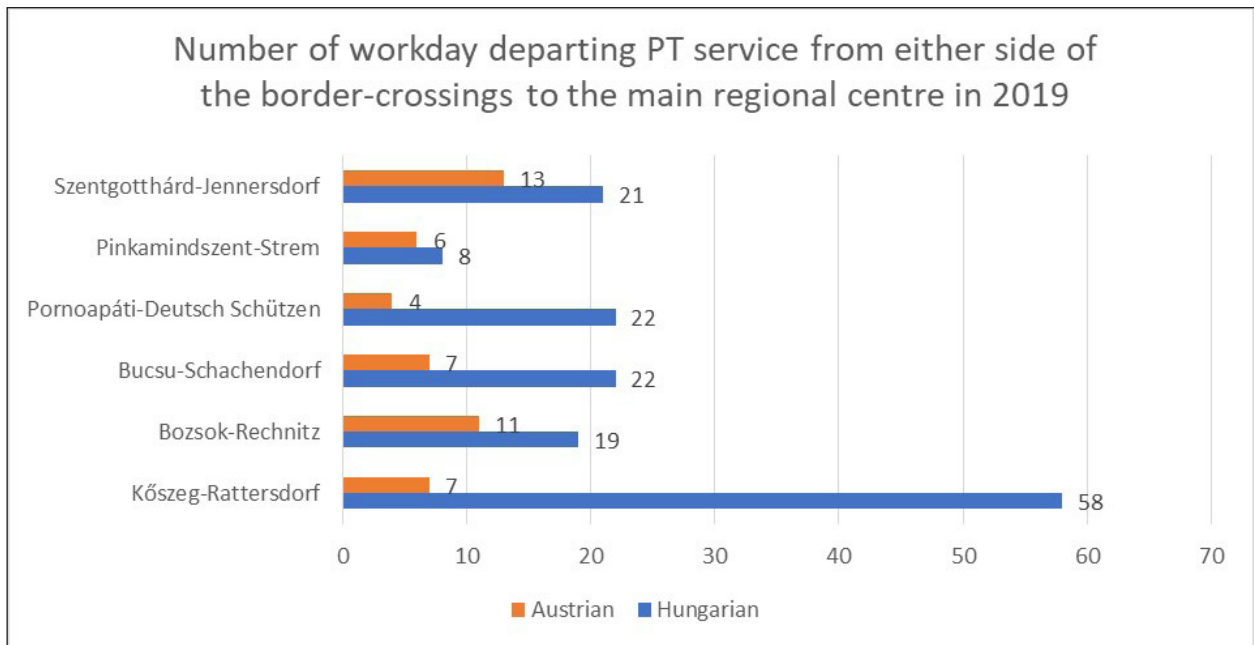


Fig. 5. Service frequencies at the analysed border crossings.

Source: menetrendek.hu, anachb.vor.at.

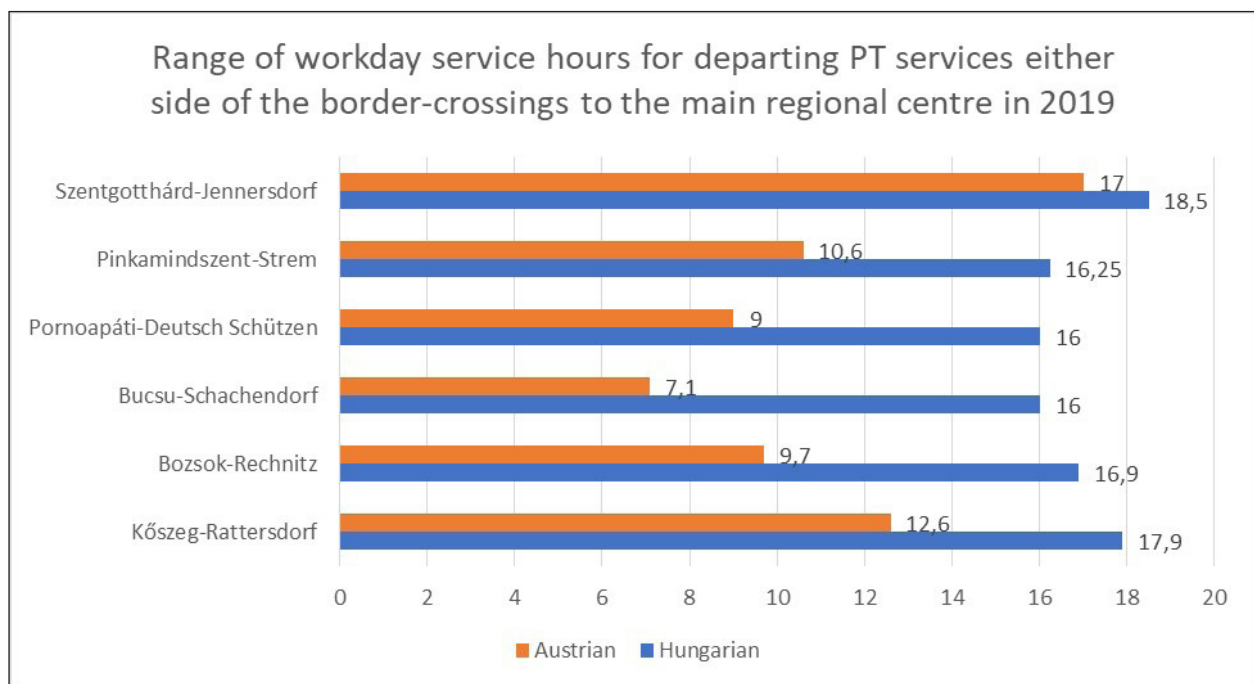


Fig. 6. Service hours at the analysed border crossings.

Source: menetrendek.hu, anachb.vor.at.

The Hungarian microcensus of 2016 (Hungarian Central Statistical Office) registered 7.505 daily commuters to Austria from Vas County who represents 12,94% of all commuters in Vas County. Their modal choice is over 97% car which is not surprising due to the higher wages and the second-highest car ownership rate in Hungary (403 vs. the national average of 355 cars per 1000 inhabitants in 2017). According to previous surveys and the Austrian Employment

distance Graz-Budapest service via Szentgotthárd. In the Interreg Central Europe CONNECT2CE (2019) project the project partners from Austria and Hungary including transport authorities, operator companies and the Ministry are working on two new cross-border public transport direct connections on the above mentioned two main commuters axes.

The new services would start from Graz the centre of Styria province which is far the biggest centre

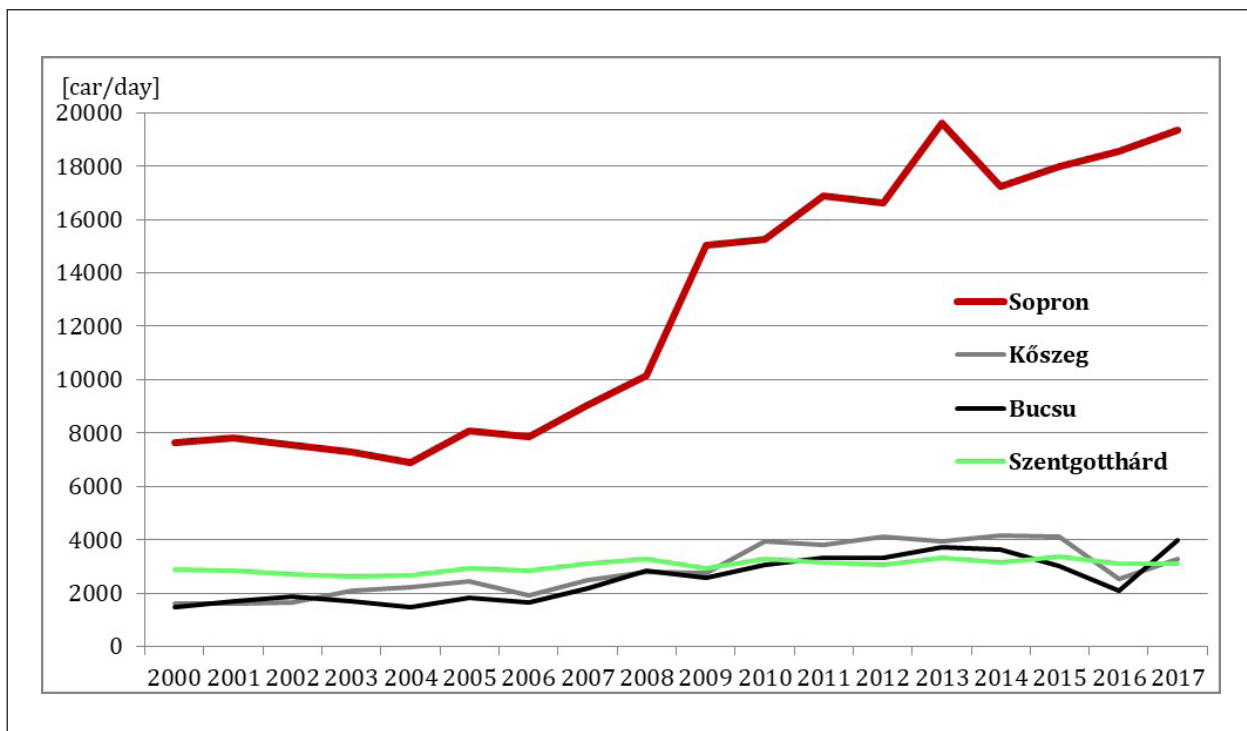


Fig. 7. Private car traffic at selected important road border crossings in Central and Southern Burgenland and by reference at Sopron between 2000 and 2017.

Source: Magyar Közút Nonprofit Zrt.

Agency information in 2016, there were about 1760 daily commuters from Hungary to Oberwart area mostly via Bucsú border crossing and 713 daily commuters to Güssing area in Southern Burgenland partly via Szentgotthárd (Rábafüzes) and Pinkamindszent. These numbers can be confirmed by the data-provision of the Hungarian Roads automatic cross-border counting (Fig. 7).

As it was described above the current public transport offer is limited except for Szentgotthárd rail border crossing yet the modal share is still significantly lower due to the shorter cross-border operating hours and the not fully harmonised connections between ÖBB and GYSEV 13-13 pairs of daily theoretically connecting trains partly because of infrastructure restrictions of the single-track railway line. Furthermore, there is only one daily direct long-

close to Southern Burgenland. They would be zoning fast bus lines via Hartberg (and not the longer A2 highway) from Graz till the province border towns of Fürstenfeld and Hartberg respectively from where on two separate routes they would serve the intermediate towns and cities via its regional centre towns of Oberwart and Güssing. Then most of the services would continue to Hungary by serving the currently underserved villages in Eastern Austria (Fig. 5.) connecting them with most of their workforce origin in Hungary (Szombathely via Bucsú and Körmend via Pinkamindszent). The services in Hungary would be also operated under a new Public Service Obligation (PSO) contract as they would be loss-making otherwise. On the other hand particularly between Körmend and Pinkamindszent they would replace the existing branch bus lines which are not efficient

due to the unequal passenger load (Fig. 8). In the mornings only towards the regional centre in Hungary, Kőrmend but following the opening the route in the morning the other direction towards the border with Austria would be efficient similarly to the reverse afternoon scheme. Future plans include the re-establishment of the cross-border buses from Kőszeg to Oberpullendorf on mid-term.

Nevertheless, the certain connections in a sparsely populated region cannot be competitive without

Conclusions

The literature review has confirmed that the growing borderless travel does not automatically go in pair with improving cross-border public transport options. In some cases, the opposite tendency can be observed. The consequence is that the growing demand for cross-border commuting yet the spatial arrangement not necessarily facilitate to serve it by public transport. The main criteria namely the ser-

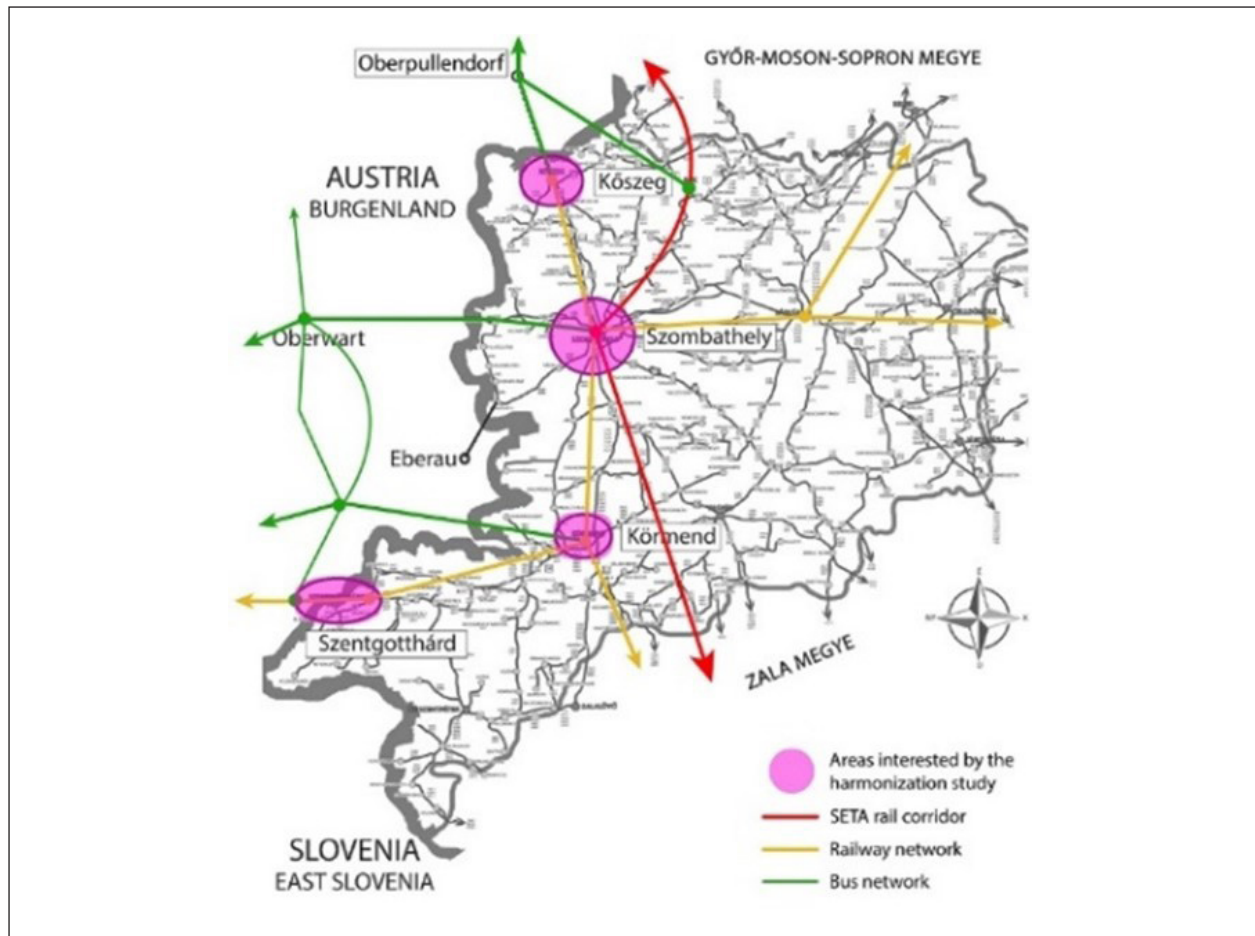


Fig. 8. Planned cross-border and current Hungarian domestic bus network and the existing railway lines in Vas megye (NUTS3 County).

Source: own elaboration from INTERREG Central Europe, CONNECT2CE Project.

a network that enables to offer reliable and attractive connections between most places. In the Interreg Central Europe CONNECT2CE (2019) project a multimodal timetable harmonisation is ongoing to ensure better connectivity at 4 border hub stations. These places are the hubs where in case of pulsing (periodic) timetables the passenger can easily transfer which is preferably supported by an integrated tariff and by today real-time passenger information covering all modes.

vice frequency, route, operating hours and last but not least its tariff and robustness supported by ITS devices cannot be easy to organise efficiently even under domestic service role. Strong professional and political support is required if the dimension extends to a cross-border level which is not easy to achieve without competent authorities who has right to organise cross-border transport services.

The existing yet shrinking gap of cross-border economic disparities in the research area showed an

increasing daily cross-border travel demand which is realised nearly fully by private car. Beside one regional railway crossing only a few scheduled cross-border buses serve the sparsely populated rural border area on Austrian schooldays only with more or less stable passenger numbers which are known exactly from Origin-Destination ticketing statistics and passenger countings. In order to overcome the current unsustainable modal share by building on the previous research projects results and best practices together with an overview of the current EU legal background and on the available regional statistics plus the timetable archives, the main points (and places) of interventions have been identified as follows.

In the case of the peripheral border area of the Central and Southern section of the Austrian-Hungarian border, the main proposed solution is to employ two new frequent cross-border bus routes integrated into the domestic services both from the financial and operational point of view. They would partly replace the existing inefficient branch line bus services by adding frequencies, particularly on the currently underserved Austrian side in Southern Burgenland. By a careful timetable harmonisation, the hub locations of Körmend and Szombathely in Hungary and Güssing and Oberwart in Austria will be able to ensure the maximum potential connectivity for the settlements served on the route with a priority on the regional centres where attractive P & R and feeder services are provided. Together with the parallel railway line in the south, the two new cross-border bus lines may contribute to a sustainable modal shift in an environmentally sensitive area.

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