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Regional Railway Transport in Czech, Austrian and German Decentralised and Regionalised Transport Markets[1]

Daniel Seidenglanz, Tomáš Nigrin, Jiří Dujka[2]

Abstract: The article analyses railway transport markets in three neighbouring Central European countries: the Czech Republic, Austria and Germany (specifically Bavaria and Saxony), with a focus on regional transportation. It examines the organisational form of public transport resulting from regionalisation and provides comparative case studies of regional train services in these countries. The article points out the organisational differences in public transportation between the studied regions and tries to connect these results with the supply of regional train services on various types of lines and in different geographical areas.

Key words: Railway transport; Regionalisation; Decentralisation; Regional train services; Czech Republic; Austria; Germany

JEL Classification: R41, R42, R48

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Introduction

Railway transport has become a traditional mode of transport, which has been in use in Europe for almost 200 years and is, moreover, closely connected to the fundamental modernisation of society that began in the 19th century in the form of the industrial revolution (Grandjot and Bernecker, 2014; Knowles, 2006). The fact that it is labelled as a traditional transport mode, however, does not mean that it is static or stagnant nowadays. Indeed, almost the opposite is true in the case of the European railways – the construction of high speed lines (Perl and Goetz, 2015; Guirao, 2013; Cascetta et al., 2011), the growing supply of urban and suburban trains and the increasing demand for them in many metropolitan regions (Seidenglanz, Chvátal and Nedvědová, 2014; Schwedes,

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[2] DS and JD: Masaryk University, Faculty of Science, Department of Geography, Kotlářská 2, 611 37, Brno, Czech Republic, e-mail: seidenglanz@geogr.muni.cz, tel.: +420 549 497 228 (first author); TN: Charles University, Faculty of Social Sciences, Institute of International Studies, U Kříže 8, 150 00 Praha 5, Czech Republic, e-mail: tomas.nigrin@fsv.cuni.cz (corresponding author)

2011), the cancellation of some minor branch lines in peripheral areas (Taylor, 2006; Patmore, 1965) and emerging competition whether in the form of tenders or open access (Tomeš et al., 2014; Alexandersson and Hultén, 2007) are at least some examples of the high dynamism of today's European railway networks.

All these dynamic changes are also more or less related to European transport policy, among whose aims is that railways should have a higher share (modal split) in passenger transport; ways to achieve that include the thorough liberalisation of the railway sector (Grandjot and Bernecker, 2014; Kvizda et al., 2013 and many others – see the section 2 of this article). The implementation of European transport policy is, however, carried out by individual EU member states. This process can lead to certain differences among the countries, as the final implementation of European directives and recommendations is modified according to their national political, economic, social, legal and geographic contexts (Ollier, 2008; Kvizda et al., 2013). Thus more or less substantial differences are emerging between European countries in terms of the organisation and structure of the liberalised railway sector and, moreover, these differences necessarily affect the train services offered in each country and in their regions. Although the structure of the railway sector in different European countries has often been studied, detailed analyses of the regional consequences of structural differences either in general or in the relation to train services supplied are much more infrequent in the literature.

This paper's main aims are, therefore, (i) to examine the differences in organisational background in the provision of regional railway transport between three neighbouring Central European countries – the Czech Republic, Austria and Germany (Bavaria and Saxony), and (ii) to analyse and interpret the regional train service provision from a geographical point of view (looking at variation between services in national metropolises and their hinterland, between important centres in the national settlement system, at the end of lines or sections crossing regional borders, and on branch lines, and considering total provision of public transport services in particularly peripheral regions) in these three countries.

Each of these countries represents an original case study of a specific type of liberalised railway market; accordingly, we believe they are worthy entities for a detailed scientific comparison. In the Czech Republic, the transport market has gradually been transformed according to Common European transport policy, and is now strongly decentralised with the responsibility for the regional transport given fully to geographically rather small regional administrations (*kraje*). Contrary to this model, Austria has approached the regionalisation of its railway transport market in a more "centralised" way, and all its regions (federal states) are required to follow common rules so that the whole system, although regionalised, works on the same principles. Germany has a very specific railway transport system, within which responsibility for the provision of railway transport is now held by individual federal states that have developed their own systems (we focus only on two states from this large mosaic: Bavaria and Saxony). The final result is, therefore, very heterogeneous, and thus somewhat similar to the situation in the Czech Republic, however, the German regions (federal states) are much larger and politically more powerful than the Czech regions (*kraje*). Our selection of countries to study in this paper is therefore primarily based on their suitability for a comparison of different organisational structures, rather than to these countries' common political or historical

development or neighbouring geographical location. Other Central European countries such as Poland, Slovakia or Hungary are, for the same reason, not included in the analysis.

The structure of this paper is based on its primary aims. Following this introduction we provide a *Literature overview* focused on the analysis of existing texts relevant to railway sector liberalisation and its impacts on (regional) train services in various European countries. The next chapter *Organisational background in the provision of regional railway transport in the Czech Republic, Austria and Germany* describes the conditions in our three selected countries in detail and highlights the different policies and approaches applied in these countries to the provision of regional train services. Special attention is paid to the way regional railway carriers are contracted, and how the supply of regional train services is coordinated between different regions within each country. Extensive empirical evidence showing how the different supply of train services in each country affects various types of relations between the three selected countries is presented in the section *Analysis of regional train services in the Czech Republic, Austria and Germany*. In the section *Conclusion* we identify key findings and interpret the above described differences.

From a methodological point of view the study of appropriate textual documents was used in the *Literature overview* and for the section *Organisational background in the provision of regional railway transport in the Czech Republic, Austria and Germany*. In the latter chapters, this method was supplemented with semi-structured interviews with relevant representatives of railway sector bodies in the studied countries, such as ministries of transport, regional transport ordering parties, regulators, carriers etc. The section *Analysis of regional train services in the Czech Republic, Austria and Germany* is based on a very detailed empirical analysis of data sets obtained from railway transport timetables valid in 2014 in the given countries. These empirical findings were broadly interpreted to reveal insights into the issue and identify key conclusions.

Literature Review

The main stimulus behind the current development in transportation services has been initiated by European transport policy adopted by the European Union. This reform induced the liberalisation, regionalisation and privatisation of the railway industry in all EU member countries. Many books, articles and studies have looked at this reform, its rationale, effects and consequences both at EU level and at the level of individual countries. Kvizda et al. (2013) discuss the European railway reform in general and, more specifically, its implementation in Sweden, the United Kingdom and Germany. Similarly, liberalisation, regionalisation and privatisation are the focus of Tim Engartner's monograph on the reform of *Deutsche Bahn* (Engartner, 2008). Grandjot and Bernecker (2014) and Schwedes (2011) also focus on German speaking countries, and both discuss the broader context of transportation and political decisions made in this field in the relevant countries. While the former approaches the issue primarily from a political and economic point of view, the latter discusses transportation policy as a research field in various disciplines. There have also been several studies on central European transportation policy and reforms, including a recent one by Tomeš et al. (2014), which describes

in detail competition in the railway passenger market in the Czech Republic where an open access competition was introduced on the route Prague – Ostrava in 2011.

The process of liberalisation of regional train services, which is closely related to the topic of this paper, has also been widely researched in the literature. Particular attention has been paid to the issue of proper procedures for regional carrier selection and to the consequences of such procedures. Alexandersson and Hultén (2007) discuss this issue in the case of Sweden and conclude that competitive tendering has becoming an almost universal selection method there. In contrast, contracting is the prevailing method used in the Helsinki region (Finland) to manage public rail transportation, though the region has considerable experience of tendering in bus transport (Sinisalo, 2007). Guihéry (2011, 2014) summarises positive experiences with regional train carrier tendering in the Leipzig region of Germany, emphasising a reduced level of subsidy and steadily increasing number of passengers. A quite different experience is, however, outlined by Desmaris (2014), who reviews the positive development of passenger rail transport in Switzerland. He concludes that performance in regional railway transport increases largely due to the nature of public governance and not due to liberalisation. Furthermore, competition in the passenger railway sector is completely missing in Switzerland. Other authors describe the growing role of regional bodies in more detail, as something that can cause institutional difficulties as more public actors are involved in the process of regional train carrier contracting (Van Dijk, 2007; Ollivier-Trigalo and Barone, 2011).

The role of regional railways is also discussed occasionally in the literature. There are more or less realistic scenarios differing from each other according to the overall geographic context of considered transport market or actual transport situation. Some authors propose that regional rail transport should be more closely interconnected with light rail solutions and other types of urban railways (Vermote et al., 2014; Hebbert, 2014), while others suggest they should be rebuilt into regional high-speed lines (Fröidh, 2005). Both above mentioned examples are feasible only in the case of large metropolises and their densely populated hinterlands. In contrast, regional lines in rural or peripheral areas with low population density tend to encounter more complex problems and in these areas regional trains are frequently cancelled or noticeably reduced (Taczanowski, 2012; Horňák and Tóth, 2013). Greater potential for maintenance and growth is brought by tourism, therefore regional railway lines in attractive destinations tend to attract greater numbers of passengers and have a higher chance of survival (Michniak, 2014; Michniak and Rosik, 2012).

As already pointed out, discussion of regional rail transport is not marginalised in the economic and geographic literature overall, but some significant topics have attracted limited attention so far. Among the more important of these rather overlooked topics is the issue of train frequency, or the service provided on regional lines in various geographic contexts, in liberalised transportation markets. Appropriate train service frequency is an influential factor in regional rail user satisfaction and may have serious consequences for the demographic development of the region's settlements, especially in distant peripheral regions (Šťastná, Vaishar and Stonawská, 2015; Fröidh and Byström, 2013). The extent to which a suitable timetable is crucial in liberalised regional transport systems is supported by Križan and Horňák (2012), who believe that the increase in train frequency on the Bratislava – Dunajská Streda – Komárno route in Slo-

vakia after a new private carrier (*Regio Jet*) entered the market in 2012 was a vital factor in contributing to the subsequent growth in the number of passengers on that line. Detailed research into differences in train service provision in the hinterlands of Czech and German metropolises is presented by Seidenglanz, Chvátal and Nedvědová (2014). A noteworthy comparison of regional rail connections in Poland, the Czech Republic, Slovakia and Austria is also provided by Taczanowski (2015).

This paper attempts to overcome the existing gap in the literature by providing a brief overview of differentiated regional train frequency in three liberalised railway markets. It offers detailed analysis of the regional train service provision and its relationship to the geographical conditions of the regions in question.

Organisational background in the provision of regional railway transport in the Czech Republic, Austria and Germany

Regionalisation has always been a feature of railway reform in European countries. The organisational systems of regional railway connections were previously centralised and services were usually organised by national railway companies (Engartner, 2008). The recent railway reforms initiated by the European Commission have led to the introduction of different types of organisation in regional railway transportation with varying results (Grandjot and Bernecker, 2014). In this paper we focus on case studies from three Central European countries – the Czech Republic, Austria and Germany (Bavaria and Saxony). We compare the organisational structure, responsibilities and service situation in these countries.

Regionalisation in the Czech Republic

The passenger rail market in the Czech Republic was formally opened to competition in 1994 (Railway Act 266/1994). This was followed by the most important step in the liberalisation of the Czech railway transportation sector, with the unbundling and creation of a railway operator in 2003 (Railway Transformation Act 77/2002). The last step was full regionalisation in 2005: this meant that the regions (in Czech *kraje*) became responsible for organising and co-funding regional passenger regional transport, including both bus and rail connections (Tomeš et al., 2014 and Act 194/2010).

The year 2005 was the most important in Czech regional transportation terms for many decades, because it saw this level of responsibility for the organisation and funding (co-financing with central authorities) given to regional institutions. The Czech regions have an average population of 714 000 inhabitants. At that time, there was no unifying or detailed conception of regional transportation in the Czech Republic. As a result, 14 different systems came into existence. In some regions (e.g. the South Moravia, Liberec or Ústí regions) rail connections became established as the core of the whole regional transportation system, while some regions actively refused to take this approach (the Vysočina region) and some remain undecided today (the Central Bohemian and Karlovy Vary regions). Moreover, there are huge differences in the extent to which regions have introduced tariff integration and organisational integration: some regions have implemented full scale integration (the South Moravia, Hradec Králové and Prague regions), some have only integrated bus transport (the Central Bohemia region) and some have no relevant activity in this field (the Vysočina region) (Nigrin and Dujka, 2014).

The system of long-distance passenger trains remains in the control of the Ministry of Transportation of the Czech Republic. This system is not intentionally coordinated with the 14 independent regional systems, and it is therefore not rare for passengers to encounter problems in connecting between regional and long-distance trains due to different connection priorities on regional and national level or between regions. Tariff integration is secured only through the services of the former national rail transport provider, the Czech Railways Company (in Czech *České dráhy*). Approaches towards liberalisation and tendering are also not unified on both levels or in all regions. New companies bring lower prices for their services to the ordering party, but also result in tariff disintegration across the Czech railway system.

Regionalisation in Austria

Austria began to reform its regional transport system in 1999 (Öffentlicher Personennah- und Regionalverkehrsgesetz). As in the Czech Republic and Germany, responsibility for regional transportation was given to the 9 Austrian federal states (average population 940 000). The Austrian reform law, however, demanded a common approach to transport provision. Thus the federal state authorities did not have an entirely free hand in making their decisions, as they had to follow a given centralised model. This model required trains to form the core of the regional transport system, and full tariff integration across all transportation modes, together with one of two types of tariff structure and a common system for timetabling. This level of regulation aimed to achieve a common, similar structure for public transport across all federal states in Austria. It has brought many benefits to the public transport system, including transparency from the passenger point of view and the opportunity for the authorities to further improve and develop the infrastructure based on long-term demandsfor public transport (Nigrin and Dujka, 2014). 16 years after its reform began, Austria's regional transportation system is the most coherent. The regional transportation systems of all its federal states are fully integrated, with the same system and a very clear tariff structure.

Regionalisation in Germany

Germany began to reform its railways at the beginning of the 1990s and followed this with the regionalisation of regional public railway transport in 1994 (*Regionalisierungsgesetz*). The era before 1994 was dominated by the Deutsche Bahn Company, with low attention given to the needs of specific regions. In 1994, responsibility for regional passenger transport was given to Germany's 16 federal states. Their population differs widely, since three are city-states and some have a limited area (such as Saarland) or low population density (such as Mecklenburg-Vorpommern).

Regionalisation in Germany resulted, as in the Czech case, in the development of many individual models of public train transport organisation: each state chose a different way to secure its public transportation. Some states delegated organisation of regional railways on the transportation unions (e.g. North-Rhine Westphalia or Saxony) while other chose a mixed model of the railway transportation centralised planning only. Regionalisation thus has long tradition making local authorities experienced on the subject of tendering regional transportation. Long-distance trains operation, on the other hand, is purely commercial-based. Fares are usually integrated in two ways: the railway act

demands one-ticket check-in in all train types, and there are tariff establishments in all states which also apply to railway transportation (Grandjot and Bernecker, 2008).

Our case study will be carried out on the examples of Bavaria and Saxony. The first of these regions has a similar population (12 million inhabitants) and geographical situation to the Czech Republic and Austria. There is no united tariff or transportation union in Bavaria. The state is divided into numerous regional unions with many specifics, but these bodies only organise bus transportation. Regional rail transportation is organised by the Bavarian Railway Company (*Bayerische Eisenbahngesellschaft*), which is a state owned company. Rail transport is, therefore, a core-network for all types of public transportation in Bavaria and there is a common tariff offer, the so-called Bayern-Ticket, which is valid on all types of transport in Bavaria (except long-distance trains run on commercial principles) (Nigrin, 2013).

Saxony is a state with 4 million inhabitants and with full-scale integration in its public transportation. There are 5 passenger transport executives (in German *Verkehrsverbund*) that organise public transport in its territory. These were established between 1994 and 1998. Unlike Bavaria, Saxony is one of the so-called new federal states (in German *neue Bundesländer*), which were part of the German Democratic Republic until 1990. The organisation of public transportation in this part of Germany changed dramatically after the reunification of Germany, therefore it was very easy for the region to follow a united concept and to establish executors on the "green field" with a completely new organisational structure for regional transport. Full tariff integration was implemented across all transportation types and emphasis was placed on regional train services as a core network for other transport types (Nigrin, 2013).

Analysis of regional train services in the Czech Republic, Austria and Germany

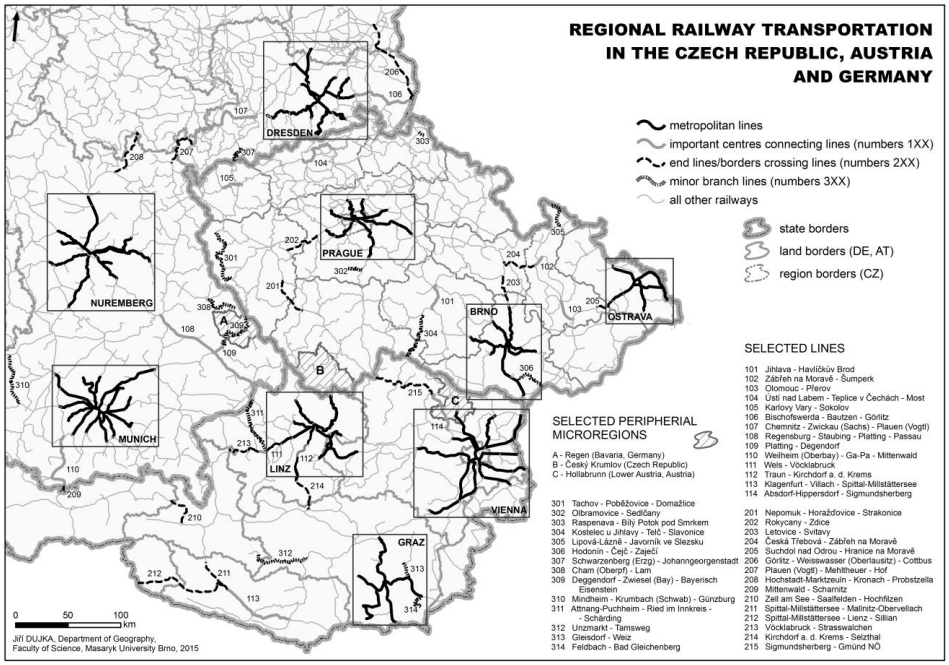
The aim of this section is to empirically analyse the various regional train services on offer in geographically different types of railway lines within the regions of the Czech Republic, Austria and Germany (Bavaria and Saxony). We consider differences between these three countries to be likely as a consequence of their varying organisational background in providing regional railway transport, as discussed in the previous section. We analyse train services offered on two different days in 2014 – Wednesdays and Sundays, representing an ordinary working day and a weekend day respectively. We collected data on the total number of train services during these days and on their operational regime, i.e. their temporal distribution within the given days. We were primarily interested in comparing the regional train offer on:

- lines serving national metropolises and their immediate hinterland (three metropolises of primary significance were selected – Prague, Munich and Vienna – and six metropolises of secondary significance – Brno, Ostrava, Nuremberg, Dresden, Graz and Linz);
- lines connecting important, but not primary, centres in national settlement systems;
- end line sections or sections crossing regional borders (borders between states – *Bundesländer* – in Germany and Austria, and borders between regions – *kraje* – in the Czech Republic);
- minor branch lines;

moreover, our research also compares the total public transport service on offer, i.e. bus and train services considered together, in three particularly peripheral regions with rather small city centres (Český Krumlov, Regen, and Hollabrunn); we incorporate this analysis into our research because we want to gain deeper knowledge of the minimum level of public transport provided in truly peripheral and remote regions.

All lines involved in our analysis of regional train supply and the three peripheral regions mentioned are depicted in Figure 1. It should be noted that when we refer to regional train services, we include in this term only the following train categories: *Os* and *Sp* in the Czech Republic, *S-Bahn*, *R* and *REX* in Austria and *S-Bahn*, *RB* and *RE* in Germany; these types are selected because the majority of these trains are subcontracted by the regional transport ordering bodies.

Figure 1 Overview of railway line types involved in our analysis of regional train services in the Czech Republic, Austria and Germany (Bavaria and Saxony)



Sources: Správa železniční dopravní cesty (2014), Österreichische Bundesbahnen (2014), Deutsche Bahn (2014)

Although regional railway transport within the hinterlands of metropolises of primary and secondary significance is generally provided to a high standard, its quantitative parameters in Germany differ markedly from the Czech Republic and Austria. The regional railway service provided in the German cities Munich, Nuremberg and Dresden, measured by the number of trains run as well as their operational times, is clearly higher than in broadly comparable cities like Vienna, Prague, Brno, Ostrava, Graz and Linz.

The average interval between trains is under 20 minutes in Munich and partly in Nuremberg and, moreover, the whole system is operated for more than 20 hours daily in these cities, while the same is not true elsewhere. The last trains to the hinterland leave these cities as late as between midnight and half past two in the morning. At the other end of the scale, the average interval between trains exceeds 60 minutes (1 hour) in the Austrian cities of Graz and Linz, and the number of trains run on Sundays is considerably lower in Graz, Linz and Brno in comparison with the service provided on Wednesdays. The operational periods for Czech and Austrian trains are also shorter. Tables 1, 2, 3 and 4 present key figures on the services operating in all three countries' metropolises and surrounding areas.

Table 1 Regional train services in primary metropolises

Metropolis	Country	Number of sections included	Total regional train service supply on:		Regional train service supply (average on 1 section) on:		Difference in regional train service supply (average on 1 section):	
			WED	SUN	WED	SUN	SUN – WED	in % (100 % = WED)
Prague	CZ	17	789	565	46	33	-13	71,6
Vienna	AT	24	1 258	855	52	36	-16	68,0
Munich	DE	32	2 465	2 149	77	67	-10	87,2

Notes (valid for tables 1 to 10):
WED – Wednesdays, SUN – Sundays
CZ – Czech Republic, AT – Austria, DE – Germany
h – hour, m – minutes
number of sections included – individual sections are parts of railway lines included in our analysis of regional train services; the division of one railway line into sections is based on differing numbers of train services offered on particular parts of the line (e.g. Prague – Kolín line within the Prague metropolitan region is divided into 3 sections according to services run: Prague – Úvaly, Úvaly – Český Brod and Český Brod – Kolín).

Sources (valid for tables 1 to 10): Správa železniční dopravní cesty (2014), Österreichische Bundesbahnen (2014), Deutsche Bahn (2014)

Table 2 Regional train services in secondary metropolises

Metropolis	Country	Number of sections included	Total regional train service supply on:		Regional train service supply (average on 1 section) on:		Difference in regional train service supply (average on 1 section):	
			WED	SUN	WED	SUN	SUN – WED	in % (100 % = WED)
Brno	CZ	15	567	351	38	23	-15	61,9
Ostrava	CZ	11	324	255	29	23	-6	78,7
Graz	AT	10	315	140	32	14	-18	44,4
Linz	AT	15	394	233	26	16	-10	59,1
Nuremberg	DE	22	1 347	1 055	61	48	-13	78,3
Dresden	DE	21	810	655	39	31	-8	80,9

Table 3 Regional train services in primary metropolises – operational times

Metro-polis	Country	Regional train service supply (average on 1 section) in:							
		travelling to the metropolis on:				travelling out of the metropolis on:			
		WED		SUN		WED		SUN	
		operation duration	train interval	operation duration	train interval	operation duration	train interval	operation duration	train interval
Prague	CZ	19h 05m	25m	18h 40m	34m	19h 57m	26m	19h 44m	36m
Vienna	AT	18h 04m	21m	17h 16m	29m	18h 27m	21m	18h 06m	30m
Munich	DE	20h 02m	16m	20h 39m	18m	20h 31m	16m	21h 07m	19m

Table 4 Regional train services in secondary metropolises – operational times

Metro-polis	Country	Regional train services supply (average on 1 section) in:							
		travelling to the metropolis on:				travelling out of the metropolis on:			
		WED		SUN		WED		SUN	
		operation duration	train interval	operation duration	train interval	operation duration	train interval	operation duration	train interval
Brno	CZ	17h 17m	27m	16h 54m	43m	18h 29m	29m	17h 48m	46m
Ostrava	CZ	18h 22m	37m	18h 16m	47m	18h 24m	37m	18h 16m	47m
Graz	AT	17h 43m	34m	14h 51m	64m	18h 15m	35m	16h 07m	69m
Linz	AT	16h 26m	38m	14h 56m	58m	17h 00m	39m	15h 54m	61m
Nurem-berg	DE	19h 24m	19m	18h 42m	23m	20h 07m	20m	19h 23m	24m
Dresden	DE	18h 25m	29m	17h 39m	34m	18h 10m	28m	17h 52m	34m

We will now turn our attention to the regional railway service provision in the Czech Republic, Austria and Germany (Bavaria and Saxony) on other railway lines, i.e. (i) lines connecting important, but not primary, centres, (ii) end line sections or sections crossing regional borders and (iii) minor branch lines. The level of services on these lines is naturally lower than the service level provided in the metropolises and, moreover, drops obviously with the decreasing importance of analysed railway line type. The number of trains and their operational times are, therefore, consistently highest on lines interconnecting important centres and lowest on branch lines. To illustrate this statement, there are typically 30 trains on Wednesdays on the first type of line, and these operate for approximately 18 hours per day; meanwhile, on the third type of line there are usually 10 to 15 trains operated over a period of just 12 or 13 hours. The variation in the supply of regional train services on these railway lines between the Czech Republic, Austria and Germany is, however, slightly lower than was the case for metropolises, as Germany's dominating position almost disappears – regional railway transport provision on these lines in the Czech Republic is distinctly similar to the service provided on equivalent lines in Germany. Only Austria shows certain weaknesses in this field, in particular an incredibly low number of trains on minor branch lines on Sundays and a late start for their operation, at 9 or even 10 a.m. For detailed figures describing the situation on these lines in the Czech Republic, Austria and Germany, see tables 5, 6, 7, 8, 9 and 10.

Table 5 Regional train services on lines connecting important, but not primary, centres

Country	Number of sections included	Total regional train service supply on:		Regional train service supply (average on 1 section) on:		Difference in regional train service supply (average on 1 section):	
		WED	SUN	WED	SUN	SUN – WED	in % (100 % = WED)
CZ	7	226	172	32	25	-7	76,1
AT	6	156	80	26	13	-13	51,3
DE	13	452	357	35	27	-8	79,0

Table 6 Regional train services on end lines or regional border crossing sections

Country	Number of sections included	Total regional train service supply on:		Regional train service supply (average on 1 section) on:		Difference in regional train service supply (average on 1 section):	
		WED	SUN	WED	SUN	SUN – WED	in % (100 % = WED)
CZ	8	159	129	20	16	-4	81,1
AT	9	120	72	13	8	-5	60,0
DE	9	180	171	20	19	-1	95,0

Table 7 Regional train services on minor branch lines

Country	Number of sections included	Total regional train service supply on:		Regional train service supply (average on 1 section) on:		Difference in regional train service supply (average on 1 section):	
		WED	SUN	WED	SUN	SUN – WED	in % (100 % = WED)
CZ	12	123	81	10	7	-3	65,9
AT	6	59	18	10	3	-7	30,5
DE	7	103	81	15	12	-3	78,6

Table 8 Regional train services on lines connecting important, but not primary, centres – operational times

Country	Regional train service supply (average on 1 section) in:							
	direction 1 on:				direction 2 on:			
	WED		SUN		WED		SUN	
	operation duration	train interval	operation duration	train interval	operation duration	train interval	operation duration	train interval
CZ	19h 15m	36m	18h 54m	46m	18h 53m	35m	18h 15m	45m
AT	17h 09m	40m	16h 03m	72m	17h 15m	40m	16h 28m	74m
DE	18h 53m	33m	17h 48m	39m	18h 41m	32m	17h 32m	38m

Table 9 Regional train services on end lines or regional border crossing sections – operational times

Country	Regional train service supply (average on 1 section) in:							
	direction 1 on:				direction 2 on:			
	WED		SUN		WED		SUN	
	operation duration	train interval	operation duration	train interval	operation duration	train interval	operation duration	train interval
CZ	16h 37m	50m	15h 33m	58m	17h 20m	52m	16h 15m	60m
AT	15h 14m	69m	13h 29m	101m	15h 29m	70m	13h 17m	100m
DE	16h 42m	50m	16h 10m	51m	17h 06m	51m	16h 07m	51m

Table 10 Regional train services on minor branch lines – operational times

Country	Regional train service supply (average on 1 section) in:							
	direction 1 on:				direction 2 on:			
	WED		SUN		WED		SUN	
	operation duration	train interval	operation duration	train interval	operation duration	train interval	operation duration	train interval
CZ	14h 51m	87m	12h 00m	107m	14h 55m	87m	12h 16m	109m
AT	12h 13m	75m	8h 00m	160m	12h 19m	75m	8h 07m	162m
DE	16h 00m	65m	14h 45m	76m	15h 39m	64m	13h 55m	72m

Table 11 Regional transport service supply in the hinterlands of small city centres – total number of buses and trains to specific centres

	Total regional transport service supply on:	
	Wednesdays	Sundays
Czech Republic – centre Český Krumlov	12	5
Austria – centre Hollabrunn	12	2
Germany – centre Regen	13	3

Source: Nigrin and Dujka (2014)

The following section addresses the total public transport service offered, i.e. both bus and train transport, in the peripheral regions of the small city centres of Český Krumlov (the Czech Republic), Hollabrunn (Austria) and Regen (Bavaria, Germany). These particular cities were selected because the public transport provision in their hinterlands is problematic, largely due to low population and bad transport infrastructure. Smaller, peripheral settlements were chosen for this part of our analysis because we suppose that the local public transport supply in these areas is exemplary of the minimum standard in this field in each country. The results confirm our expectations, as public transport supply in these three regions is indeed limited. The highest level of service is provided during morning and afternoon peak hours on working days, but the supply of public transport in evening and early night hours is very low. There are, moreover, hardly any trains or buses provided for passengers to travel on Sundays in the majority of the settlements in these areas. Regional railways are fairly important in the Český Krumlov, Hollabrunn and Regen regions, as the remote settlements that are served by rail services enjoy a generally higher quantitative standard of public transport provision than settlements served by bus. Thus the position of a settlement within the regional transportation system, or more precisely, its location on a serviced railway line, plays a significant role in its accessibility. In conclusion, it can be argued that the differences in the total supply of public transport between three studied peripheral regions measured in average values are, perhaps surprisingly, more moderate than we saw in our analysis of services provided to metropolises and other regional railway lines, as analysed earlier in this paper. Detailed figures on public transport services in the Český Krumlov, Hollabrunn and

Regen regions are provided in table 11, and a deeper discussion and interpretation of these results can be seen in Nigrin and Dujka (2014).

Conclusion

In summary, the most prominent finding gained from our detailed analysis of regional railway transport supply on geographically different types of railway lines within the regions is that there are apparent similarities between the Czech Republic and Germany and specific differences between these two countries' regional rail transport provision and Austria's. The best level of train service supply and the longest daily operation period, both on regular working days and at the weekend, was found in the German regions of Bavaria and Saxony. The second best levels of train service provision were found in the Czech Republic and the poorest in Austria. Our interpretation of these differences in regional railway transport service between the Czech Republic, Austria and Germany focuses mainly on the interplay of two groups of factors: organisational background, including transport policy approaches, and geography (in a broad sense), including social and economic aspects.

It is increasingly evident that a partial explanation for these differences is grounded in the three countries' distinct approaches to the organisation of regional train provision – strongly decentralised approaches have been adopted in the Czech Republic and Germany, while Austria's system is at least to a certain extent coordinated on a nation-wide level. The Czech and German ordering bodies (regions/*kraje* and federal states/*Bundesländer* respectively) have their own responsibilities and sovereign power in the regional transport field, whereas the Austrian federal states/*Bundesländer* have had to follow a centralised model with defined rules for regional train scheduling. It is therefore highly likely that local political approaches to regional railway transport differ in the individual regions or federal states of the Czech Republic and Germany, while this is less likely in the case of Austria. There are many examples of contrasting approaches to regional railway transport in the different regions of the Czech Republic. Regions such as the South Moravia region or the Ústí region see rail transport as the reasonable and natural backbone of a functional public transport system and support it widely (KORDIS JMK, 2014). This contrasts strongly with the situation in certain other regions, including the Vysočina and South Bohemia regions, where regional railway transport is gradually being reduced (Centrum pro regionální rozvoj, 2011). Similar, although smaller, differences may exist in Austria, despite the country's efforts to centralise conditions in regional railway transport. Taczanowski (2015) briefly compares the situation within Austria and concludes that various approaches are applied in this field – Salzburg supports its regional railway lines (including the reconstruction and reopening of the Zell am See – Krimml line) whilst Lower Austria offers less support to rail transport services (e.g. narrow gauge lines were overtaken from national rail operator ÖBB and the Ober Grafendorf – Mank line was closed to passenger transport immediately).

Although the above evidently affects regional transport provision, a second group of factors – broadly defined as geography, including economic and social factors – is in our opinion much more influential, as the empirical data we have presented in this paper closely reflect the geographical situations in the Czech Republic, Austria and Germany.

The highest supply of regional trains in Germany corresponds well with its urban pattern, the size of the metropolitan regions featured, and their high population density (see also table 12). The number of regular commuters is very large since Munich, Nuremberg, Dresden and many other cities are substantial job, economy and service centres. The geographical situation is somewhat different in the Czech Republic and Austria, with the exception of these countries' national metropolises of primary and secondary significance, most notably Prague and Vienna, and their respective hinterlands; the remainder of the cities and line sections included in our analysis for these countries connect less important centres in broadly less inhabited regions. This is particularly true of the mountainous and rural parts of Austria, on end line sections, sections crossing regional borders and minor branch lines, and is vividly illustrated by the low number of train services in these areas and their rather short operational times. This feature of the Austrian regional railway system is exaggerated when we focus on train supply on Sundays, when some short sections have no service at all. The relationship we have discussed between the level of regional train services and the geographical conditions within the analysed areas is also generally supported by the steady decline seen in the number of train services offered as we move from examining more important railway lines to less important ones.

Table 12 Population and population density

	Population	Area (km^2)	Population density (inhabitants/km^2)
Czech Republic	10 538 275	78 864,92	133,62
Austria	8 499 759	83 878,99	101,33
Bavaria	12 443 372	70 551,53	176,37
Saxony	4 054 182	18 419,76	220,10

Source: Geohive (2014)

A further geographical factor which differs markedly across the three countries is that of national or regional mobility habits (mobility behaviour) and the (related) historical development of the specific regional transport markets. The relatively high supply of regional trains on less important railway lines in the Czech Republic, at a level almost comparable with German service provision, could be attributed to a surviving tradition of public transport that was considerably strengthened during the communist era, when the availability of passenger cars and their utilisation was generally low (Fava, 2013; Maddison, 2003; Mitchell, 2007; Brinke, 1999). The growing availability of passenger cars and increasing reliance on them, which developed over a long period following the Second World War in Austria (the emergence of automobility culture, see in general Urry, 2007) could on the other hand explain the lower supply of trains in rural Austria. A similar trend, where the increasing importance of passenger cars for daily mobility affects use of public transport services, is in progress nowadays in the Czech Republic, where some people perceive cars as symbols of high social status (Urbánková and Ouředníček, 2006; Doležalová and Ouředníček, 2006); however, a relatively large pro-

portion of the Czech population is still used to commuting at least partly by train or bus (Marada, 2006).

The whole situation is, however, even more complex than this, since there are a number of other factors that may influence the differences in regional railway transport supply between the Czech Republic, Austria and Germany. One of these is the provision of railway infrastructure and its suitability for regional transport. The lack of appropriate tracks in certain urban and suburban sections makes it impossible for regions to introduce intensive and effective regional transport; this particularly affects the metropolises of primary and secondary significance in the Czech Republic. A high proportion of single-track routes and the low capacity of existing central railway stations are one example of these deficiencies, which can be seen in particular in the technologically and infrastructurally underdeveloped Brno Railway Hub (Seidenglanz Chvátal and Nedvědová, 2014; Dukát, 2005). Furthermore, the amount of money invested in the provision of regional railway transport is necessarily also extremely influential. We suppose that there are great differences between the Czech Republic, Austria and Germany in this respect.

Although the Czech Republic, Germany and Austria have all followed the common framework of the European transportation policy and regionalised their public transportation systems at roughly the same time, their organisational approaches vary from a rather centralised form (Austria) to deep decentralisation (the Czech Republic and Germany). Public transport development in the German federal states provides a particularly interesting example, as the federal government enabled each state to develop its own system of public transportation, and the result is very heterogeneous. A similar situation found in the Czech Republic, but to a lesser extent. The most structured and centralised transportation system is observed in Austria and its federal states.

The case studies we have conducted have shown that geographical factors, including social and economic aspects, seem to be more influential for regional rail service provision than organisational form. The size and population of the connected region is the most decisive factor in determining the number of connections offered. The reason for this is most likely the different level of development of transport connections in the regions, their population structure and density and a high level of continuity in transport behaviour based on mobility behaviours. The regional bodies, while working under different conditions and with different systems, evidently do reflect the regional geographical conditions in their transport planning.

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Monopollkommission (Advising administration for the Federal Government)

Deutsche Bahn, DB Regio Chemnitz

Bundesnetzagentur