



# OPEN ACCESS: A CAUSE FOR PROGRESS?

*THE COMPETITION FOR LONG-DISTANCE DOMESTIC PASSENGER RAILWAY TRANSPORT*

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## Samenvatting

*Open access: a cause for progress?* is geschreven naar aanleiding van het Europese Vierde Spoorwegpakket. Dit pakket moet de weg vrijmaken voor zogenaamde 'Open Toegang' in de landen van de Europese Unie. Open Toegang vervoerders bieden hun diensten aan zonder concessie, ontvangen geen subsidie en concurreren niet *om* het spoor, maar *op* het spoor. Hoewel Open Toegang voor veel landen een onontgonnen terrein is, biedt deze studie 10 case studies waar open toegang reeds werd ingevoerd. Dit onderzoek steunt op inzichten uit case-literatuur, officiële documenten en verschillende gesprekken met betrokkenen. Het vertrekt vanuit de complexiteitstheorie en gebruikt één van haar meest veelbelovende methodologieën, Qualitative Comparative Analysis (QCA), om tot haar conclusies te komen. Op basis van gegevens over de toegankelijkheid van de markt, de al dan niet geïntegreerde eigendomsverhoudingen, het sturingsregime en de complexiteit van het open toegangssysteem worden de noodzakelijke en voldoende voorwaarden bepaald voor open toegang competitie. Uitkomst is dat toegankelijkheid van de markt een noodzakelijke voorwaarde is voor succes, en dat combinaties met pro-open toegang sturing en/of niet-geïntegreerd eigenaarschap van infra-en infostructuur voldoende zijn voor succes van open toegang. Het laatste hoofdstuk biedt aanbevelingen voor de Nederlandse overheid ten aanzien van haar keuze voor meer of eerder beperkte Open Toegang.

## Abstract

*Open access: a cause for progress?* Has been written in light of the European Fourth Railway Package. This package enables so called Open Access throughout the European Union. Open Access Operators offer their services without franchise, do not receive any subsidy and do not compete *for* the track, but *on* the track. Although Open Access is unknown territory to most countries, this study offers ten case studies where open access has already been introduced. This research builds upon insights from case-specific literature, official documents and multiple conversations with stakeholders. It departs from the complexity theory and utilizes one of its most promising methodologies, Qualitative Comparative Analysis (QCA), to come to its conclusions. Based on data on market accessibility, ownership, oversight and complexity, this studies seeks to distinguish necessary and sufficient conditions for open access competition. The conclusion is that market accessibility is a necessary conditions, and is sufficient in combination with pro-open access oversight and/or unbundled ownership. The final chapter offers recommendations for the Dutch government for either more or rather limited Open Access.

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## 1. INTRODUCTION: THE EUROPEAN FOURTH RAILWAY PACKAGE AND OPEN ACCESS ARRANGEMENTS

*“You can’t imagine how strange it seemed to be, journeying on without any visible cause of progress other than the magical machine, with its flying white breath and rhythmical, unvarying pace”.*

Actress Fanny Kemble was only 20 years old when she so eloquently articulated the astonishment of her and her contemporaries over the newest mode of transportation that, in all its grace, connected Britain in a pace that was simply unmatched. She continues:

*‘The engine was set off at its utmost speed, 35 miles an hour, swifter than a bird flies’* (Cited in Allen, Masset & Pryke, 2005, p.62).

The wonders of the train however, were also quickly matched with questions on the matter of regulation and policy. Initially a free market (Grant, 2000), governments quickly gained control over the railway systems in their country and opted in many cases for nationalization (Yuzawa, 1999). The role of the governments changed yet again, when Thatcher’s successor John Major privatized the British Railways in 1993, with which the British set an example that was quickly followed by many other countries.

The most preferable way to organize railway transport remains an open question and the countries of the European Union know a vast variation in their ‘handling’ of transport. One common denominator, however, is that every country is on the doorstep of an overhaul of their railway system fueled, by the ambitious rail agenda of the European Union. In the last two decades the European Commission published so called Railway Packages in an attempt to realize their ambition of an integrated European railway system.

Essential to the European railway packages is the gradual opening of the railway markets. This market oriented legislation establishes, according to the European Commission (2016):

*“the general right for railway undertakings established in one Member State to operate all types of passenger services everywhere in the EU, lays down rules aimed at improving impartiality in the governance of railway infrastructure and preventing discrimination and introduces the principle of mandatory tendering for public service contracts in rail”*

Although many European Countries opened up their railroads to some sort of market rational, this directive also poses a leap into the unknown for the majority of the member states. Most countries still favor their former national railways through directly awarding them concessions and on-track competition is traditionally rather limited on the European railways (Casullo, 2016). However, some countries did not wait for the European legislation to open up their markets, and have already experimented with on-track competition without concessions. We refer to on-track competition without the necessity of a concession with the concept of ‘Open Access’.

This study aims to compare the frontrunner cases. It compares and evaluates various open access systems in a variation of countries in order to distinguish necessary and sufficient conditions for success.

This research contributes to an understanding of different outcomes of a variety of open access systems. It does so by placing these particular policies in a complex environment, thereby shifting “our analysis from individual parts of a system to the system as a whole” (Geyer & Cairney, 2015). Complexity also takes into account external factors and, by applying path dependency to policy studies,

also the historical weight that influences outcomes today. The notion of complexity is discussed more elaborately in chapter 2.

Given the specific nature of each case, but at the same time the need for a systematic comparison, we opted for the Qualitative Comparative Analysis (QCA) methodology, developed by Ragin (i.e. Ragin, 2008). QCA mediates between the understanding of complexity and a knowledge of generality (Gerrits & Verweij, 2016, p10). It seems an appropriate design for complexity-informed research and is also considered quite promising for the analysis and evaluation of policies (Gerrits, 2012). What delineates QCA from other, more conventional methods, is its focus on configurations rather than on the individual impact of singular variables (Gerrits, 2012; Wagemann & Schneider, 2012). More on QCA and the way it works can be found in chapter 4.

## 1.1 RELEVANCE

The relevance of this study is both academic and for matters of public administration. Its academic relevance lies in the fact that QCA as a method for policy evaluation is currently a nascent field that is promising, yet in need of more applications to prove its merit, although there is a clear proliferation of its applications and an increasing number of articles and books (Verweij, 2015).

One interesting application is Verweij's study (2015), who himself studied and evaluated management of complex implementation processes of PPP infrastructure projects using QCA. Together with his work, this study is one of the first applications of QCA in the infrastructure domain. However, to our knowledge there are currently no QCA-studies in the field of Open Access arrangements. Furthermore, this study is also grounded in the comparative public policy field. While QCA is by definition comparative, this research explores the usefulness of the QCA tradition in comparing policies of different European nations. The assumption underpinning this application is that QCA allows for complexity by taking a rather humble stance in what it can and cannot conclude. It is imperative to take such a position due to the possibly enormous number of variables that you would have to take into account in a more conventional research design.

This research is also relevant from the perspective of governance. Many European ministries of Infrastructure are currently exploring various scenarios for the implementation of the Fourth Railway package. A study into the experiences with open access abroad offers valuable lessons for any ministry that is weighing the options for the implementation of the fourth railway package.

## 1.2 RESEARCH QUESTIONS

The goal of this thesis is an exploration of open access on the long-distance domestic railway markets in multiple countries. The introduction of open access will be evaluated using a QCA methodology. Furthermore, it is important to note that this thesis transcends 'just' academic purposes and also seeks to formulate measures that can be implemented in the member states against the backdrop of the approaching overhaul of their railways policies. All in all the central research question of this thesis is:

*What are necessary and sufficient conditions for success for open access in the context of long-distance domestic passenger railway transport and which recommendations can be formulated to either promote or limit open access?*



The conditions for success are those configurations that are sufficient to achieve a certain threshold. First of all, it is imperative to define what success is in this context. The definition of 'success' is mostly based on the goals as formulated in the policy document of the European Fourth Package. Establishing a definition of success for open access policies allows us to evaluate open access policies in various countries. The definition of success forms the threshold to which cases are measured and compared. The first five sub-questions are thus as follows:

- i. What is considered 'success' for Open Access on the railways according to the European commission?
- ii. Which conditions impact the outcome of open access according to the academic literature and in what way?
- iii. What is the status of these conditions in ten selected case studies?
- iv. Which condition or combination(s) of conditions have proven to be sufficient for success of Open Access on domestic railway markets?
- v. Which condition or combination of conditions are necessary for success of open access on domestic railway markets?

The necessary and sufficient conditions point to the paths for success, but do very little to explain costs as the result of open access. In order to come to recommendations, possible unanticipated effects are also interesting to take into account. Therefore, the fourth sub-question is:

- vi. Which unanticipated effects have governments encountered as the result of the introduction of open access?

Finally, based on the answers of the above, this thesis offers recommendations for ministries who are currently calibrating their focus on the future. Therefore, the last sub-question is

- vii. Which recommendations could be considered for the direction of open access on domestic railway markets?

In order to find meaningful answers to these research questions, an elaborate exploration of relevant theory is found in the next chapter.

### 1.3 STRUCTURE

This thesis can be roughly divided into four parts: theory, methodology, case studies and discussion of the results. Chapter 2 offers a theoretical framework of the theory that forms the foundation for this thesis. It briefly discusses complexity theory, the definition of success and four variables that are used as 'conditions' in this thesis: accessibility, (unbundled) ownership, complexity and oversight.

This is then followed by the conceptual framework in chapter 3, where the hypotheses that underpin this thesis are also discussed. Chapter four discusses the qualitative methodologies that are used for this thesis such as the use of interviews and (policy) documents. Most notably, it also discusses the use of Qualitative Comparative Analysis, a data analysis methodology known for its tolerance to complexity.

Chapter 5 forms the core of this thesis by offering analyses of open access in Austria, Bulgaria, the Czech Republic, Germany, Great-Britain, Italy, Poland, Romania, Slovakia and Sweden. Each case is unique in its own way, although some significant similarities can also be derived.

The data gathered in chapter 5 is subsequently used in chapter 6 to conduct a fuzzy set QCA analysis, with which the necessary and sufficient conditions for success are found. Also discussed in this chapter are the unintended effects with special attentions to the challenges that open access has produced.

We conclude our research in chapter 7 with our conclusion and shortly the value of thesis. Also discussed are the policy choices that the governments face to either promote or restrain open access.

## 2. WHAT DETERMINES SUCCESS FOR OPEN ACCESS IN COMPLEX RAILWAY SYSTEMS

### 2.1.1 DEFINING OPEN ACCESS

As discussed in the introduction, open access is not the first attempt to bring market dynamics into the railway systems. One form that has been implemented rather extensively, is the organisation of the railways in so called concessions. This chapter clarifies the difference between concessions on the one hand and open access on the other.

According to Gómez-Ibáñez (2016, p.312), open access requires at a minimum “independent companies to use its [the infrastructure manager’s] network.” However, that does little to delineate open access operators from most operators under concessions, because concessions have to negotiate access to networks too in most cases.

Concessions are, according to Veraart (2007, p58), ‘in-betweens’ of the private and the public sphere, and are characterized by a network in which the owner grants another party the right to exploit its network. Concessions do induce market incentives, because operators risk losing their right to exploit if certain goals are not achieved (Veraart, 2007). The degree to which operators are incentivized, varies between the different forms of concessions. Most are for instance not subject to public tenders, but are rather directly granted to the railway incumbent<sup>1</sup>. A practice that is according to Casullo (2016, p.7) necessary because of “a lack of participation by non-incumbent operators.”

Some authors delineate the two by describing concessions as *for-the-track* competition and open access as *on-the-track* or *head-on* competition (see for example Casullo, 2016). While it is true that many open access operators (OAOs) indeed compete with the incumbent (or each other) on certain lines, other OAOs operate on lines abandoned by the incumbent before their entry (in the case of Slovakia, see Taczanowski, 2015) or after (in the case of the Prague-Kosnice line in the Czech Republic for instance). Similarly, it is important to note that concessions also engage in head-on competition, depending on the exclusivity of their concession. The East-Coast main line in the United Kingdom is operated by no less than 18 different operators, only two of which under open access provisions.

One key difference between OAOs and concessions is that while the former is subject to little quality or fare regulation, the latter is obliged to offer a certain standard. If the conditions of the contract are not fulfilled, the operator is obligated to pay a punitive fine. In contrast, open access operators do not have similar obligations and can even decide to cease their operations at any given moment, while concessions are bound by their contract.

Finally, it is important to note that concessions are either subsidized or required to return revenues (Nash, 2007). In contrast, open access operators are by definition purely commercial parties and do not have the obligation to return revenues nor the right to subsidies. The clear profit-oriented focus means that open access operators are in principle only active on commercially viable lines, a phenomenon that is known as ‘cherry-picking’ (Bergantino, Capozza & Capurso, 2015). The remainder

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<sup>1</sup> Incumbent refers to the (former) national railway company (in the Netherlands the Nederlandse Spoorwegen (NS)), not to be confused with *political* incumbent.

of this chapter places open access in a European context and briefly discusses the Fourth Railway Package.

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### 2.1.2 OPEN ACCESS: A EUROPEAN AMBITION AND THE FOURTH RAILWAY PACKAGE

The European fourth railway package is the logical result of a long lasting wish to enhance competition on the European rail markets. The European vision on the railway reforms was elaborately laid-out in the 2011 White Paper that states that 'A lot needs to be done to complete the internal market for transport' (European Commission, 2011). In the strategy designed to fulfil this ambition, the European Commission says

*"The area where bottlenecks are still most evident is the internal market for rail services, which must be completed as a priority in order to achieve a Single European Railway Area. This includes the abolishment of technical, administrative and legal obstacles which still impede entry to national railway markets"* (European Commission, 2011, p.12).

While the White Paper is relatively vague on the necessary means to impose a strategy for the achievement of a single European railway market, the so called railway packages are of more practical by nature. The most recent railway package is the fourth that has been launched in 2014.

Directive 2016/2338 is dedicated to the opening of the market for domestic passenger transport. However, opening of the railway market is for historical reasons rather difficult. Despite the introduction of market incentives in one way or another, most railway systems are to this day dominated by one operator that owes its position to its historical legacy (i.e. Nicita & Belloc, 2016). The European Commission understands that this inheritance limits the possibility of a complete overhaul of the system, at least in the short-term. The Fourth Railway package will therefore allow member states to carefully balance the interests of the concessions with the introduction of open access.

Discussion has erupted between advocates for more deregulation versus staunch defenders of the concessions on the other hand. Both sides claim that competition is unfair. Open Access Operators have complained in the past that countries pay lip service when it comes to opening their markets but do not do much in practice to create a level-playing field between concessions and new entrants (ALLRAIL, 2018).

The market pillar of the Fourth Railway Package must level the playing field between all competitors, enabling a European market in which operators from the one member state are able to engage in competition in another (European Commission, 2016). This has so far been possible in thirteen member states (IRG, 2018) of which ten are further discussed in this thesis. Following this more practical introduction is the theoretical footing of this thesis, with attention to the complex property of railway systems and conditions for open access success.

## 2.2 COMPLEXITY IN SYSTEMS

Building on academic literature, the purpose of this chapter is to contribute to the comprehension of unexpected or even unwanted outcomes of policies and their causes. This thesis is rooted in the assumption that railway systems are complex by nature. Complexity theory is a distinct field in contemporary science and is the product of the incremental progress in system thinking (Gerrits, 2012). This chapter first discusses system thinking, followed by an exploration of the elements of complex systems.

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### 2.2.1 SYSTEMS

The concept of system is so commonplace that it is often not defined at all (Gerrits, 2012) and without defining what a system is just yet, the concept itself often resonates a notion of interlinked elements. In academic literature, system thinking is seen as an alternative to reductionist tendencies of conventional science. Protagonists of the systemic paradigm claim that reductionism is not an accurate representation of the reality, but caters to the cognitive limitations of the human mind that seeks to understand the world around us (Gerrits, 2012). Ludwig von Bertalanffy, for instance, writes that ‘the problems and modes of thought occurring in the biological, behavioural and social sciences require equal consideration and simple ‘reduction’ to the elementary particles and conventional laws of physics does not appear feasible’ (Von Bertalanffy, 1972). System thinking refrains from focussing on singular variables and rather focusses on interactions and relations between elements (Gerrits, 2012).

Some systems are easier to demarcate than others. While it is fairly simple to determine which parts constitute the motor of a car, it is obviously more complicated to determine the elements in, say, a subculture. Who belongs to the system and who does not? Where do you draw the line? The question what a boundary of a system is and where it has to be drawn, has sparked considerable debate amongst theorists of system thinking. Central to Bertalanffy’s ‘general systems theory’ is the very idea that systems are completely open (Gerrits, 2012). However, according to Cilliers (2005) “There is no accurate (or rather, perfect) representation of the [complex] system, which is simpler than the system itself”. Taking an open system as the starting point of analysis is thus impossible due to the potentially infinite amount of elements and variables one would have to take into account. Boundaries are necessary to come to meaningful research. However, these boundaries are social constructs in the sense that their positioning is open to debate and negotiation (Cilliers, 2005). Gerrits for instance says:

*“If we accept that systems are open and that their boundaries are social constructs that emerge through semiotics, a person who defines systems as coinciding with formal organizations and acts accordingly has a different real system than a person who uses a different definition and who acts according to his or her own definitions”*

According to Gerrits (2012, p.52), organisational boundaries are, for instance, determined by what members of the system feel part of. This could be a blueprint of the organisation in the formal sense, but could also include people from outside the formal organisation who are involved through the exchange of resources. Considering that people thus ‘construct’ boundaries when thinking of systems, one could argue that systems thus emerge through individual judgements. Boundary judgement and rejudgement enhance the understanding of systems (Gerrits, 2012, p.48) because shifting boundaries is essentially zooming in and out of the system one wishes to observe. Systems might be complicated and difficult to grasp, but that does not mean that they are necessarily complex. What characterizes complex systems is discussed below.

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### 2.2.2 BETWEEN CHAOS AND ORDER: UNDERSTANDING COMPLEXITY.

Unsatisfied with the rigid schemes of most (empirical) theories in social sciences that have a tendency to portray the world as mechanical and orderly, some system thinkers have sought to reshape our perception of the world. This school, commonly known as complexity theories, adds understanding to the ontological world by capturing the real world’s volatility, fuzziness and fluidness in their theories, thereby positioning complex systems ‘on the edge of chaos’. Complexity is often defined by four – rather abstract- characteristics: emergence, coevolution, non-linearity and path dependency.

- i. Emergence from interaction between parts and subsystems

The whole of a complex system is greater than its sum. Parts within complex systems interact with each other and cluster with other elements to form so-called subsystems (Gerrits, 2012). Interaction between elements and between subsystems lead to "the arising of novel and coherent structures, patterns and properties" which is commonly described as 'emergence' (Gerrits, 2012, p.124). How emergence works can be exemplified by taking the notion of 'nation' in regards. A nation is not simply the sum of its people. The people who constitute a nation need to connect and have to collectively 'imagine' that they are a community (Anderson, 2006). A nation itself does not have intelligence or a will, but emerges from the interaction of its constituent parts.

A peculiar type of emergence is so called 'self-organization', which is described as 'a dynamical and adaptive process where systems acquire and maintain structure without external control' (De Wolf & Holvoet, 2004). Nationstates interact with other states and need to adapt to their environment in order to survive. They attempt to maintain their structure by organizing defense and emphasizing the importance of their culture. Emergence is in that sense a way to bring structure to chaos. .

## ii. Coevolution and public policy

The nature of complex relation between elements or subsystems and their environment is reciprocal: friends are both influenced by their peers and exert influence on them. This pattern is what is commonly known as coevolution (Gerrits, 2012; van Buuren et al., 2012). The driving force of coevolution is reciprocal selection. As environments constantly change, its subsystems and elements seek to improve their fit. However, their ability to 'achieve fitness' is also dependent on the position and relation with other actors or elements in the system. In Gerrits (2012, p.145) words this means that (a) 'an agent's ability to achieve its goals depends on its position relative to other agents, not just its intentions or deliberative design', and (b) that coevolution determines outcomes.

In public policy, co-evolution can be understood as the selection of solutions to certain problems, known as Problem-solution-combinations (PSC) (Gerrits, 2012). According to Gerrits (2012, p.140) "problem definitions refer to the way that issues are perceived and framed so that they become policy problems" whereas solution definitions "refer to the way solutions to these problems are envisaged.

Since actors in complex environments often depend on others, it is important to note that the perception of the appropriate PSCs often vary between actors (Gerrits, 2012). One example is nuclear power: to some it is a solution to the disastrous environmental effects of fossil fuels, while others see nuclear power as a huge liability to environment after the Fukushima-drama. This shows that actors have to deal with very different perceptions of PSCs of other actors they share a system with.

## iii. Dynamics and non-linearity

In complex systems, there is no proportionality between changes in input and outcome, a phenomenon that is called non-linearity (Gerrits, 2012, p.83). Input can be dampened or amplified through feedback (Geyer & Cairney, 2015). Feedback is a mutual causal process that is the very cause of a system's dynamics. Positive feedback causes systems to change because it amplifies input. Negative feedback, in contrast, causes stasis because it stimulates the system to return to its original state (Gerrits, 2012).

Non-linearity is not necessarily unique for complexity theorists though. Theorists of the so-called chaos theory share this view. A chaotic world is characterized by elements that are void of stable relations to other elements. Such a non-linear world would be completely unpredictable and human control is nearly impossible. The idea of chaos is often exemplified by the commonly known 'butterfly effect'. Theorists of the chaos theory claim that minor perturbations -such as a butterfly moving its wings in the African jungle- can ultimately lead to catastrophic events -such as a tornado in the US- due to the

non-linear relations between these elements. In other words, chaos theory expositis the idea that 'simple laws can have complicated, unpredictable consequences' (Anderson, 1999). However, chaos is a different state than complexity. Waldrop (1993) says

*"chaos by itself doesn't explain the structure, the coherence, the self-organizing cohesiveness of complex systems. Instead all these complex systems have somehow acquired the ability to bring order and chaos into a special kind of balance."*

This balance is fairly stable on the one hand, but dynamic and changeable on the other. Waldrop (1993.p12) continues:

*"The edge of chaos is where centuries of slavery and segregation suddenly give way to the civil rights movements of the 1950s and 1960s; where seventy years of Soviet communism suddenly give to political turmoil and ferment; where eons of evolutionary stability suddenly give way to wholesale species transformation. The edge of chaos is the constantly shifting battle zone between stagnation and anarchy, the one place where a complex system can be spontaneous, adaptive, and alive"*

#### iv. Path dependency

Events in the past often shape the possibility of outcomes in the future. While the notion of path dependency is common place in social sciences, its origins can be traced to the work of David (1994) who applied this notion in economical science and its institutions. Path dependency, in Gerrits (2012, p.89) words, "refers to the impact of the previous state of a system on any changes that occur".

Path dependency is the result of accumulative positive feedback loops (Gerrits 2012). As paradoxically as that may sound, Gerrits (2012) and Pierson (2000) use the phenomenon of increasing returns as an example. Increasing returns occur when every extra unit of input results in a proportional higher output. Since increasing returns are thus self-reinforcing, the costs to stray from the chosen path is relatively high inspiring conservative tendencies.

A static system is in other words not only caused by negative feedback loops, but can also be caused by an abundance of positive feedback loops. On a less abstract and more concrete level, path dependency refers to the phenomenon that the past influences the current situation. Decisions made in the past curtails the possibilities of the future (Gerrits & Marks, 2014). This is no different for railway systems where both decisions in the physical and regulatory aspects yield influence on decisions regarding, for instance, rolling stock. The next chapter shows how complexity is reflected in the railway system by using the example of the Fyra.

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#### 2.2.3 COMPLEXITY AT WORK: THE CASE OF THE FYRA

Complexity is a rather abstract term. It is therefore imperative to apply the concepts explained above on the real railway system. One particularly rich example of complexity in the railway system is the case of the Fyra.

The idea of this high speed rail line was conceived as early as 1973. The idea further developed in the 80s when four studies explored the feasibility of the project. The decision to go ahead with the project was taken in the early 90s. While initially deemed a prestigious HSR-project for the Netherlands, this mega project quickly turned into a nightmare when the project was riddled with costly delays and non-functioning rolling stock. Eventually the Dutch railways and the Belgian railways were forced to pull the plug on the project. Gerrits and Marks (2014) explain how a sequence of decisions led to the procurement of the Fyra-train from the Italian company AnsaldoBreda.

### *Rising costs for the infrastructure*

The Dutch authorities chose to only take rail track variants in regards that cater top speeds of above 250 km/h. Although it is technically possible to use slower trains on this path, it would cause backlash over the enormous additional costs that this particular kind of tracks bring (Gerrits & Mark, 2014). One extra disadvantage of the chosen rail structure is that it directly cuts the so called *Groene Hart*, a rural and recreational area in the West of the Netherland. The then government assumed that tunnelling a significant part of infrastructure was the necessary condition for parliamentary consent, but this came at very high financial costs. These costs were only expanded further when the project was hindered by technical problems and the European choice for a new but costly safety system. These unanticipated events eventually lead to a doubling of the initial budget (Gerrits & Marks, 2014).

### *The awarding process*

Under parliamentary pressure, the Dutch government offered the Dutch railways (NS) repeatedly the chance to get the concession for the HSR-connection. The Dutch government was not satisfied with the offers made by NS and subsequently decides to opt for an open tender. It thereby proliferates market dynamics to the rail sector, something that was not necessarily conventional. This is in itself not so much a surprise as it is part of an overarching leap towards a more market oriented approach that characterizes that particular era. However, the government is according to Gerrits and Marks (2014) still implicitly under a lot of pressure to make sure the concession will end up in the hands of the NS.

The NS, working together in a consortium with Airliner KLM called HSA, is not familiar with the pressure the government is under and eventually wins the tender with an offer that is substantially higher than any other bid and considered too high by many. The NS is also bound by agreement on a high minimum seat capacity and travel times decided by the ministry (Gerrits & Marks, 2014).

### *The procurement of the Rolling Stock*

The stringent conditions and the the high annual price the consortium is due impede the tendering procedure for the trains, although there are initially four bids. The process is complicated further when the ministry decides that the 220 km/h top speed of the trains of two bids is not in compliance with the conditions they set. A third offer is later also pulled, because the company does no longer believe in the financial feasibility of the project (Gerrits & Marks, 2014). The only remaining bid is the offer made by an inexperienced company: AnsaldoBreda.

### *Technical problems with rolling stocks*

Unfortunately, the delivery of the rolling stock is delayed because of technical problems in the assembling of the train and conflicts between AnsaldoBreda and its distributors. 2012 finally sees the trains of AnsaldoBreda leaving the platforms for the first time. But construction mistakes and –even for the winter period- unusual distortions over technical problems eventually force the Dutch railways to terminate the contract (Gerrits & Marks, 2014). Despite the enormous investments the situation forced the Dutch railways to rent old Traxx-locomotives that are used to this day.

The example of the Fyra reflects the complex nature of the railway system in numeral ways.

*Coevolution* is reflected in the interdependent relation between the Dutch government and the NS who are interdependent and adapt to each other's behaviour. By opting for a public tender over directly awarding, the Dutch government hoped to bring NS to offer a more attractive bid. The Dutch railways, unaware that the Dutch government was under pressure to eventually award it to them, and

unjustly afraid of possible competition, adapts to this strategy by offering a bid that is economically not feasible.

The course of the tendering procedure shows the *dynamic* nature of the railway network. For more than half a century the Dutch railway system was stable in the sense that it was completely void of market dynamics. Cargo, local and intercity rail transport were all subject to the monopoly of the Dutch railways. However, the railway system is not isolated from other, more encompassing systems. It is a subsystem of *the Netherlands* which is in its turn a subsystem of the *Western world*.

It is in that respect not surprising that the leap towards a more market oriented approach would 'trickle down' to the railway branch: It merely reflects the changing preference in the Western world in that period of time.

None of the involved actors has the power to create the HSR unilaterally, and as difficult as this sometimes is for the involved actors, it is the sum of their interactions that *emerge* into the railway network. In other words: the railway system cannot be understood by studying the actors in an isolated way because the whole exceeds the sum of the constituent parts.

Finally, it is in this instance quite clear that earlier decisions limited the possibilities for other decisions, even when these decision have ostensibly little to do with each other. The decision for instance of the cabinet to refrain from a direct award, forced the NS to raise its bid. This in effect resulted in the decision of the Dutch railways to opt for a relatively cheap train. The fact that this choice lead to a failure potentially constraints the option for the future development of other high speed lines over a lack of support.

## 2.3 CONDITIONS FOR SUCCESS

This chapter discusses four assumed conditions for success that form the basis for the conceptual framework in chapter three: complexity, oversight, accessibility and unbundled ownership. The decision to select exactly these conditions is informed by reiteration between theory and observations, as is conventional for QCA studies (see chapter 4).

- The choice for complexity as one of the determinants is based on the study by Verweij, Klijn, Edelenbos & van Buuren (2013). They argued that the complex property of networks has a negative effect on the achievements of networks. Based on our assumption that railway networks are complex, we assume that the extent to which they exposit this property has a negative relation to their change for success.
- The selection of oversight as a determinant is the result of reiteration: we found its effect in multiple case studies and grounded that observation in existing literature.
- Accessibility is the result of an exploration of general theories of entering liberalised market plus the observation that capacity has impeded the entrance of new operators in various cases.
- The choice for oversight is also firmly grounded in the reiterative nature of QCA. The observation that the configuration of (the lack of) meaningful and independent oversight played a significant role in some cases (see i.e. the cases Poland, the UK and Italy in chapter 5) and the emphasis some available literature has put on the role of regulators lead to our decision.

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### 2.3.1 THE IMPACT OF COMPLEXITY ON SUCCESS

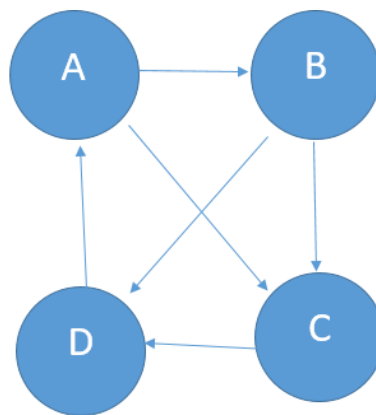
According to the available literature there are three root causes for the impact of the interactional nature of complexity to success in networked systems: the number of actors, the level of interdependency and, characteristic for the railways system; the number of operators.



A higher number of actors results in higher complexity (Verweij, Klijn, Edelenbos & Van Buuren, 2013). Although we full-heartedly agree that the number of actors is very important, we prefer to consider the number of relations in which actors are engaged. A system with a perfect sequential relation in which actor A only has to deal with B, who in turn only has to deal with C, who only has to deal with D, who only has to deal with E produces 4 relations:



More complex becomes a system in which actors have to interact with multiple of their peers. A different configuration of the, in fact, lower number of actors could lead to more relations (and thus complexity). See for example the following figure:



While there are less actors (4) who make up the system, each actor operates in a more complex environment, because it has to take more other actors into consideration (three rather than two). While this system only has four actors, it has as much as 6 possible relations to consider. A sequential system is able to produce complexity as long as the number of actors is high, a system with a lower number of actors can produce equal complexity by a high interrelatedness. The importance of interrelatedness is accorded by Vespignani (2010, p984) who says that interrelatedness causes in problems in one part of the system to trigger “a disruptive avalanche of cascading and escalating failures” in other parts (Vespignani, 2010, p984).

Complexity is not only produced by the extent to which a system is interlinked, but also through the nature of its relations. Interdependency occurs when there is a reciprocal dependency of an important and non-substitutable resource between two actors (Scharpf, 1978, p335). Complexity is the product of interdependency because interdependency requires actors to interact, requiring an extra effort to enhance fitness. It is also important to note that contrary to what one might expect, interdependency does not necessarily enhance the change for success. In Verweij’s words: “complexity makes it more difficult to achieve outcomes, and value disputes can arise even when interactions are based on mutual dependency” (2013, p.1037).

One additional feature of the railway system is that it also has a *physical* dimension in the form of its infrastructure. Of course, the capacity of rails, stations and catenaries are not infinite. In the last section we saw that path dependency explains how decisions in the past on the physical infrastructure, limit the decisions of tomorrow. Limited capacity interplays with the more socially oriented complexity as an external factor that need to be taken into account.

The fact that capacity is limited by definition means that a governance structure is needed to allocate capacity if there is more than one operator active. A higher number of operators produces more wishes (and more strategies) to take into account and leads to higher complexity and also more need for coordination (Van de Velde & Röntgen, 2017; Casullo, 2016). A high number of operators also complicates recovery after disturbances in the network.

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### 2.3.2 OVERSIGHT OF A PRIVATIZED PUBLIC TRANSPORT SYSTEM

The leap towards a market-oriented design is of course far from unique to the railway system. Ever since the 80s, liberalism and privatisation have been creeping forces in many domains. The railway system was, however, relatively late to become affected by this phenomenon. Even Britain only introduced market dynamics as late as 1993, despite its status of the market's most enthusiastic advocate under 'Maggie' Thatcher's reign.

More than two and a half decade have passed since Christopher Hood first coined the term New Public Management (NPM). NPM is firmly rooted in an optimistic view upon the market and its driving forces and is, according to Hood, based upon two ideas: the lessening of the firm delineation between market and public administration and an emphasize on results rather than on process accountability (Hood, 1991). Advocates of NPM claim that the private sector is superior to the public sector in terms of effectiveness and efficiency (Osborne, 2007). Although NPM has since then already been replaced by a new paradigm, mostly over criticism about fragmentation and lack of accountability (Osborn, 2007), it is still relevant for its description of the retreating government.

In the wake of the retreating government, direct control was formally substituted by oversight through (autonomous) regulatory bodies (Christensen & Lægrei, 2009). Regulatory bodies have also been established in the railway domain, and while their competencies are subject to some variation, most are linked to the monitoring of safety and supervision of (indiscriminate) market access. It is important to note that regulators are deemed particularly important for complex systems. Strausch (2017, p127) for instance concludes that "in one form or another, regulators are fixtures of complex system, whether independent overseers of systems or elements of them, regulators provide a degree of oversight of most complex systems".

The importance of regulators to complex systems does by no mean indicates the primacy of politics has disappeared. In fact, Christensen & Lægrei (2009, p13) state that while these regulatory bodies enjoy de facto autonomy and the formal status of an agency, it is also 'a highly uncertain predictor for steering relationships'. The scope of studying oversight would therefore be too limited if solely focussed on the role of the regulatory body and it is imperative to take the intention of the political incumbent into consideration. This assumption is vindicated by the case of Poland where the government unequivocally sided with the operating incumbent in their fierce competition with a competitor (Król, 2017), despite the fact that it had de jure opened up its market and had pooled many of the responsibilities within its regulator.

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### 2.3.3 ACCESSIBILITY OF THE RAILWAY MARKET

Europe's Open Access agenda is informed by the wish for more competition on the European railway market (European Commission, 2016). However, most countries with Open Access arrangements have so far refrained from removing all obstacles to market access. Three obstacles that could hinder new entrants from entering the market are discussed in this section: Entry regulation, costs to enter the network and a lack of capacity.

Klapper, Laeven and Rajan (2006) identify all two barriers to enter the market: regulation and costs. In their cross-national study based on a database of European firms, they found that several modes of

regulation indeed hamper the entry of firms to new markets, especially for relatively small firms. The conditions that are set by regulation for instance regarding quality limit the freedom of operators and requires more effort to comply. One particularly striking example being the economic equilibrium tests (EET) that is used to protect the business case of a concession that already operates a certain line (ORR, 2013) at the cost of new entrants.

The limitation of capacity in infrastructure-oriented markets also poses a barrier to market entry. Open Access operators do not enter new, markets, instead they compete with franchise holders on existing lines. Paradoxically enough, lines where there is available capacity are not always interesting to OAOs because there is not sufficient demand. The Competition and Market Authority for instance concluded in their 2015 report on competition of the British Railways that Open Access operators had difficulty to enter the market for a lack of capacity on commute (and thus profitable) lines (authority, 2015).

One last element that has to be taken into consideration are the costs that entrants face to operate. Considerable costs in the railway industry are the so-called track access charges, a fee that is paid to the infrastructure manager for using their facilities (IRG, 2018). Regardless of the fact that Open access operators often pay less than the incumbent or concessions, it is argued that the level of the TAC in fact play 'a big role in the existence of open access' (Feuerstein, Busacker & Xu, 2018, p.11).

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#### 2.3.4 UNBUNDLED OWNERSHIP

Regulation is not the only constraint for an open market. Study shows that the organisation of ownership of infrastructure and infrastructure influence the structure and accessibility of the railway market. Infrastructure such as rail tracks, bridges, platforms and catenaries are of course of vital importance to operating trains. Infrastructure is possibly a less common known concept. It refers to "a set of advanced services designed to monitor the use of the network" and examples are timetabling, path control and security systems (Pflieger & Csikos, p428-436). Most literature emphasizes the importance of infrastructure ownership. Pflieger and Csikos (2012, p429) explain:

"In order to guarantee fair access of new entrants to the infrastructure and the market, the literature on liberalisation tended to emphasise the necessary independence of two sets of actors: the regulatory agency and the infrastructure owner, either formally or practically."

The separation of the infrastructure manager from the incumbent operator is already formally arranged in Directive 91/440 of the European Union. While Pflieger and Csikos conclude that "the creation of a regulatory agency and the complete separation of service operation from infrastructure ownership are in principle enough to guarantee third party access", it must be said that the directive only refers to a separation in accounting. As we will see in the case studies listed in chapter 6, the German situation proves that infrastructure and services do not necessarily have to be formally separated, tasks linked to infrastructure are still executed by a subordinates of the Deutsche Bahn holding, to which the incumbent operator is also a constituent part (van de Velde & Röntgen, 2017).

Access to train stations also wields an impact on the power balance between service operators. In contrast to for instance the aviation branch, in which it is common practice that an independent company owns and exploits an airport and the airlines offers passenger transport, it is not necessarily conventional for the rail branch to separate ownership and exploitation of train stations from operating rail services.

In addition to the power relation that is derived from the ownership of infrastructure, it is also important to consider the impact of infrastructure ownership for the market position of new entrants on the market. Similar to infrastructure, an imbalance of the ownership of infrastructure and the lack

of meaningful regulation to ensure a level-playing field, poses an obstacle for new entrants to access the market (Pflieger & Csikos, 2012).

## 2.4 MODELS FOR POLICY SUCCESS

There are several models for determining success of which we discuss two: the goal-attainment model and the side-effects model (Vedung, 2013).

### 2.4.1 GOAL-ATTAINMENT MODEL

In an evaluation based on goal-attainment the central question is: are the results in accordance with the goals? It is thereby relatively simple in the sense that it 'just' requires the identification of policy objectives and determining whether and to what extent these goals are realized.

Given this clear benefit, it may be unsurprising that this model was according to Vedung the most popular model in the past. However, critics have argued that this model is flawed over its limited focus on goals that are explicitly defined in the policy document. In reality, they argue, goals are more ambiguous and vague, which should be reflected in the determination of success. Furthermore, it also neglects the fact that public policy goals must be weighed against other, sometimes conflicting, goals.

Finally, this model also disregards collateral side-effects that often characterize policy implementation. Neglecting these side-effects leads to a tunnel vision that results in the loss of meaning for the evaluation. Therefore, critics argue that there is an important 'misfit' between the requirements of this model and the reality of public policy (Vedung, 2013).

### 2.4.2 SIDE-EFFECTS MODEL

The scope of this model is wider than that of the previous model. Where the former solely focusses on results that are relevant to the set target, this model widens its scope by encapsulating side-effects. A feature of public policy is that it often produces unintended effects that in turn necessitate other interventions. An evaluation that encapsulates unforeseen side-effect promotes choosing policies with beneficial side-effects over policies with unfavourable side-effects (Vedung, 2013).

Taking side-effects into consideration is important for the evaluation of a policy, when expected and beneficial side-effects did not occur as the result of the evaluated policy, it ought to be taken into consideration. In contrast, unexpected malicious side-effects that occur in wake of a policy should be weighed against the merit of a policy, even if that policy attained every target for which it was implemented in the first place.

Advocates for this evaluation model agree that side-effect are unintended, but not necessarily unanticipated. In their view, good policies allow positive effects to occur and outbalance negative side-effects (Vedung, 2013).

**Table 1 models for defining success**

	<b>Problems</b>	<b>Goals</b>	<b>Success</b>
<b>Goal-attainment</b>	As outlined in policy document	as determined in policy document	Attainment of goals in policy document
<b>Side effect</b>	As outlined in policy document	As determined in policy document and the enabling positive side-effects.	Attainment of goals in policy document, provided that attainment outweighs negative side-effects.

### 2.4.3 OPEN ACCESS: WHAT IS SUCCESS?

The goal-attainment model requires a review of the policy document that initiated the reform of the European railways. While discussed more in-depth in chapter 5. The Fourth railway package explicitly states:

“Competition in rail passenger service markets will encourage railway operators to become more responsive to customer needs, improve the quality of their services and their cost-effectiveness. The competitive tendering of public service contracts will enable savings of public money. The market pillar is expected to deliver more choice and better quality of rail services for European citizens, these being the overriding objectives.” (European Commission, 2016). Following the rationale of the goal-attainment model, the conclusion would be that Open Access is successful if it makes the rail market “more responsive to customer needs” in terms of

- 1) More choice and a higher frequency
- 2) Lower fares
- 3) Higher quality

The side effect model has the same point of departure as the first model regarding the analysis of the problem. This analysis is explicitly or implicitly derived from the policy document. While not explicitly formulated in this case, the policy makers of the European Commission apparently see the relatively static nature of the railways market as a problem, leading allegedly to higher fares, lower choice and lower standards of service.

What ‘success’ is depends on the overall definition and scope of success that one wishes to employ. With ‘success’ in this thesis, we primarily mean the fulfilment of the goals as formulated in the policy document by the European Commission. That being said, unintended effects will not be overlooked and are discussed in a separate segment (chapter 6).

## 3. CONCEPTUAL FRAMEWORK

Based on the insights gained from the literature study, we defined four different conditions that influence the presence of ‘success’ of open access in long-distance passenger rail transport. These conditions are accessibility, unbundled ownership, complexity and oversight.

The presence of the first condition, accessibility, is determined at the hand of the level of track access charges, the available capacity and ex-ante regulation. High track access charges form a financial barrier for interested parties to enter the market. The entrance of a new operator is also hindered if

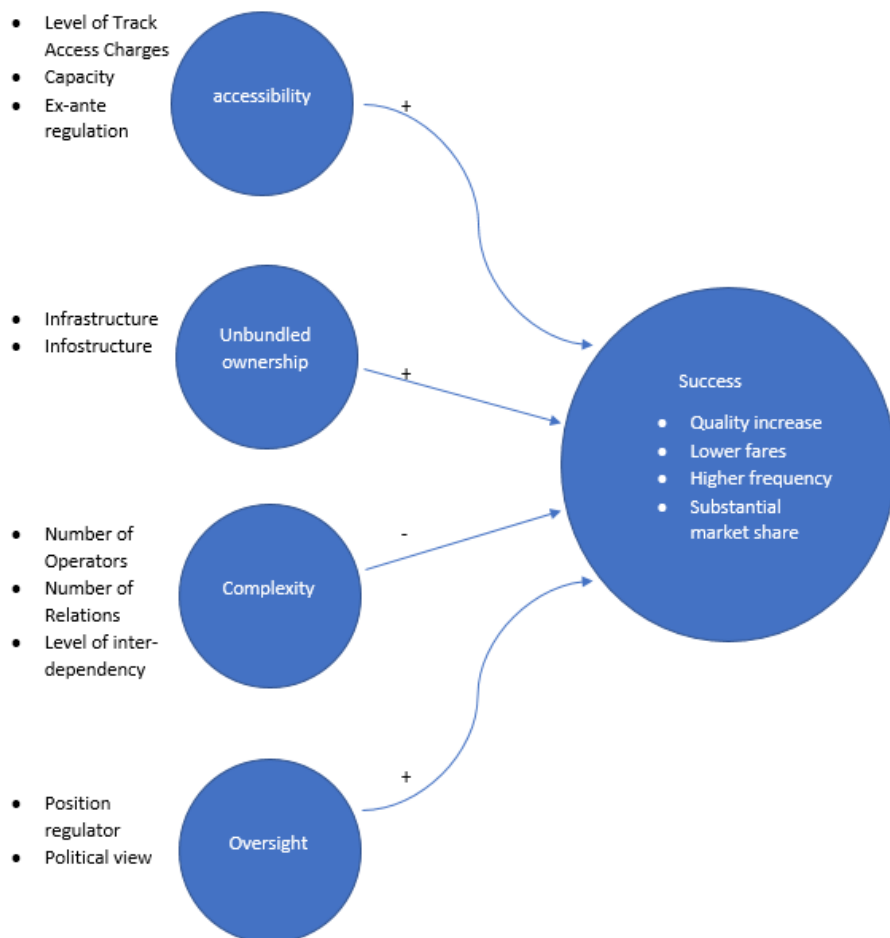
there are no time-slots available for him to operate. High restrictions in the form of economic and non-economic regulatory demands or a demanding entrance process also impedes access of new operators.

The second condition is unbundled ownership. The role of the incumbent in the management of infrastructure or in the allocation of capacity, time-slots and track access (referred to as infostructure) is a powerful asset of the incumbent in fending off competitors. Our assumption is that the more of these responsibilities are separated from the incumbent, the more equal the playing-field is.

The third condition is complexity. It is the only condition for which we assume a negative relation with the presence of success. The higher the complexity is, the more difficult it becomes to govern the railway system. A high number of operators reduces the chance of a rapid recovery after disturbances and a high number of relations and high interdependency result in a complex environment in which it becomes hard for actors to fulfil their own goals.

Finally, the fourth condition is oversight. An independent and robust regulator enhances the level-playing field, reducing the chance of anti-competitive behaviour to push new entrants out of the market. The political incumbent is also an important aspect to take into consideration. A ministry that is devoted to safeguarding the level-playing field could significantly impact the course of the railway system to the benefit of open access operators. A ministry that intervenes on behalf of the incumbent operator hinders chances of success for new entrants.

Outcome is measured in terms of ‘success’ based on goal-alignment and market share on the relevant lines. Advocates for open access expect a higher quality of the product against lower fares, higher frequency and a substantial market share to fuel competition.



Based on these propositions, the following hypothesis are established:

*H1: A high accessibility is a necessary, but not a sufficient condition for success*

Structural obstacles to the entrance of new players impede competition. High track access charges, regulatory obstacles to enter and a lack of capacity are serious discouragements for potential new entrants. A low accessibility of the market increases entrance costs and lowers the attractiveness of the railway market. Therefore, we expect that a low accessibility seriously hinders meaningful open access.

However, high accessibility is also not a guarantee for success. The case of Poland (see chapter 2.5) shows that even after successful entrance, an open access operator could still face strong anti-competitive behaviour. Therefore, it is our assumption that strong oversight, in combination with an accessible market, is expected to be sufficient for success. Our second hypothesis is:

*H2: A high accessibility and strong oversight are sufficient for success.*

A third assumption is that strong regulation is less decisive in those cases where ownership of infrastructure and infrastructure are already fairly unbundled. A separation of infrastructure and infrastructure from the incumbent deprives the latter from a structural beneficial competition vis-à-vis the new entrant. Therefore it is our expectation that:

*H3: A high accessibility and unbundled ownership are sufficient for success.*

Finally, based on the study by Verweij et al (2013) complexity is assumed to form a liability towards the attainment of the goals. A high complexity forms a risk for the coordination of the system (van de Velde & Röntgen) and a lack of coordination in itself could hinder success as formulated in chapter 2.3.3.

*H4. The absence of complexity is part of the sufficient combination or combination of conditions.*

## 4. METHODOLOGY

At the heart of this thesis is the comparison of open access in domestic railway systems in various European countries. The comparison of policies is well described and has a right of its own to be explored. This field, known as comparative public policy research, describes “the use of the comparative approach to investigative policy processes, output and outcomes (Dodds, 2013)”.

Haintrais and Mangen (1996) claim that comparative public policy research must involve data that is (a) collected with a uniform research method and (b) describes phenomena in multiple countries. While understandable from a perspective of scientific robustness, it is in reality not always easy to harvest data in a uniform manner. Some countries are simply more transparent or are more meticulous in keeping track of results than others and different countries may require different strategies for mining relevant data.

One definition that balances the required methodological flexibility and a meaningful conceptualisation of comparative analysis is found in Dodd's work. Dodd (2012, p.13) claims that “any research which either explicitly or implicitly contrasts public policy processes, outputs or outcomes from one or more units counts” can be regarded comparative analysis. It is this definition that is used in this research. We gathered data from literature and reports (4.1.1) and complemented these data with information gathered in a number of interviews (4.1.2). The data is subsequently analysed with the qualitative comparative analysis (QCA) method (4.2). Finally, the operationalization of the conceptual framework is discussed in section 4.3.

## 4.1 DATA COLLECTION

### 4.1.1 LITERATURE AND REPORTS

This thesis is qualitative by nature. According to Johnson (2011) most qualitative research is focused on understanding the world through the experiences of people and the environment they are part of. Johnson's description seems to refer mostly to interviews, gathering field notes and surveys. While interviews are indeed part of this study, it is important to note that the lion's share of this study is so-called desk research. Desk research is defined as the use of secondary data, it involves all sources of data that do not involve a field survey (Robson & McCartan, 2016). The data used in this study are primarily based on reports and official documents such as each case's network statement.

Networks statements are documents in which infrastructure managers (IM) annually publish track access requirements and related costs. Networks statements are also a rich source of formal role descriptions. Another very prominent source in this thesis are the data gathered by the rail department of the European Independent Regulating Group (IRG). Their market monitoring documents offer an excellent source for comparative data due to the methodological uniformity with which these data are gathered. Their reports have been extensively used to compare track access charges, quality monitoring and intensity of rail use.

The data gathered in reports were furthermore complemented by valuable insights from various in-depth case studies currently available. For Austria and the Czech Republic, we made extensive use of the work of Tomes & Kvizda et al (2016; 2013). For Italy we used the case study of Bergantino (2015), the richest source for Poland has been Król (2017), Slovakia is best described in Michniak (2016), Germany is well described in Nikitinas & Dailydka (2016), Sweden in Alexanderson (2015; 2010) and the United Kingdom is very well described in the elaborate report of the Competition and Market Authority (CMA) of 2015.

### 4.1.2 INTERVIEWS

While reports and literature are the primary source for this thesis, we complemented the gathered data with a number of 7 interviews. The goal of interviews is an exploration of views, experiences, beliefs and motivations of respondents (Gill, Stewart, Treasure & Chadwick, 2008, p291).

For the purpose of preparation, we used so called semi-structured interviews when we had the chance to speak directly to our respondents. Semi-structured interviews consist of a number of key questions, but allow to trail interesting leads that were not initially part of the interview set-up (Gill et al, 2008). In those cases where respondents were rather reluctant to do an interview, we proposed to send a written questionnaires with open questions.

Interviews were especially necessary where the lack of methodological uniformity between the in-depth case studies found in the literature resulted in certain blind spots. Moreover, interviews were used to strengthen the comprehension of specific case studies where we deemed a more profound understanding than literature was able to offer necessary.

Respondents were in most cases high ranking officials in either transport ministries or the regulating body. We also interviewed the chairman of AllRail, an organisation that poses itself as the alliance of open access operators to comprehend the importance of entry barriers from the perspective of the transport providers. He was also previously the Head of Sales and Business for HKX, one of the competitors that challenged DB in Germany.



Organisation	Mode
1) Organization for Rail and Road	Telephone interview
2) AllRail	Interview
3) Department for Road and Rail	Telephone interview
4) Austrian Ministry of transport/ ÖBB	Interview
5) German Ministry of Transport	Telephone Interview
6) Slovak Ministry of transport	Written correspondence
7) Czech ministry of transport	Written correspondence/ Telephone Interview

Gaining access to the field was initially quite difficult, at least in the capacity of graduation student as our effort was sometimes met by some reluctance to participate. We ultimately used the network of the Dutch ministry of Infrastructure and Water Management to gain access to the field, but at the cost of some autonomy. In equivalence to the rank of the respondents, the interviews were on our side conducted by both the researcher of this thesis and his superior. That being said, the interviews were prepared, written and processed by the researcher. In some cases the respondents received the questions on forehand and in one case the respondents preferred to answer the questions in writing. An example of a semi-structured interview can be found in appendix 3.

Discussed in the next chapter is the method used for the analysis of the gathered data: Qualitative Comparative Analysis.

#### 4.2 PROCESSING DATA: QUALITATIVE COMPARATIVE ANALYSIS

Complex systems are characterized by unique characteristics, but also share general patterns as the result of interaction with other systems (Verweij, 2015). The relationship between the complexity paradigm and the academic wish to spot generalisations is in that sense rather troubled. One method offers solace: qualitative comparative analysis is a data-analysis method that, in Gerrits words ‘mediates between the understanding of complexity and a knowledge of generality’ (2012, p.175).

Qualitative comparative analysis, better known by its acronym QCA, was first used by Ragin in 1987 when he developed a strategy that aims to gather insights from different cases ‘to capture their complexity, while still attempting to produce some form of generalization’ (Rihoux & Ragin, 2008, p.xviii). It is an example of a so-called set-theoretic model that can be defined as

*“approaches to analysing social reality in which (a) the data consists of set membership scores (b) relations between social phenomena are modelled in terms of set relations and (c) the results point to sufficient and necessary conditions...” (Schneider & Wagemann, 2012, p6).”*

By focussing on sets rather than on the individual impact of variables, QCA allows for complexity. It thereby acknowledges that sets of conditions produce a given outcome in one case, while leading to another in a different context (Gerrits, 2012). QCA is in that sense rather sensitive to the contingent nature of phenomena.

As a research method, QCA is regarded as a mixed inductive and deductive method: Researchers often explore one case to generate explanations from it. Those explanations are then in their turn tested on a relative small number of other cases. QCA is therefore more suitable to arrive at generalization than in-depth case studies (Verweij, 2015), but does not have the same level of detail.

Using a QCA means analysing reality in so called sets. The simplest form is the crisp sets QCA (csQCA) that converts data in binary codes (Schneider & Wagemann, 2016), meaning that a conditions is either present or absent. In this thesis we opted for the more sophisticated ‘fuzzy set’, which allows for the partial presence of a condition and reflects reality better. Suppose that ‘tolerance’ is one of the conditions considered in a QCA. Dividing countries in two camps (tolerant and not tolerant) would not only be overly simplistic, but possible leads to wrong conclusion. An example: Switzerland is much more tolerant than Turkey, but much less tolerant than Canada (OECD, 2011). The decision to designate Switzerland either as a tolerant country or as an intolerant country has far reaching consequences for the conclusion that are drawn from the Truth table.

Fuzzy-sets are either ordinal scales or continuous. We chose a four-value ordinal scale. Which allows for various degrees in which a conditions is present: Absent (0), more out than in (.33), more in than out (.67) and completely in (1) (Ragin, 2009). This designation is based on either scientific knowledge or insights in the case studies themselves (Ragin, 2009). The four value scale is the most suitable for this research because, according to Ragin (2009, p.91),

*“Such a scheme is especially useful in situations where researchers have a substantial amount of information about cases, but the nature of the evidence is not identical across cases.”*

This applies largely to this research due to the said lack of uniformity between case-specific data on several of the identified conditions. The conversion of the empirical data into scores is discussed in chapter 4.4 on operationalization. The converted scores are gathered and put in a so-called *truth table*, which contain the cases in the left column, followed by the score for each indicator and finally also the outcome score. Outcome in this thesis refers to the degree of success.

Fuzzy-sets are compared to crisp-sets relatively harder to interpret. Luckily there has been an expansion of fsQCA software in the last years, of which we use the so called *fsQCA software*, developed by Ragin. This software solves the Boolean functions by applying the Quine-Mclusky algorithm. Solutions produced without taking theoretical assumptions into account are called *complex*. Complex solutions do not have much explanatory power, but rather shows every configuration in which success is also present. More explanatory power has the so called *intermediate* solution, which enables the researcher to include assumptions about the relation of a condition and the occurrence of success. It is this solution that can be used for determining the sufficient conditions (Ragin, 2008). Both solutions are discussed in chapter 6 on results.

FSQCA also shows the consistency score. Consistency expresses the extent to which the assumed set-relations is approximated by the cases. Consistency is rarely 1, since there are always exceptions to the rule, especially in fuzzy-sets analyses (Ragin, 2008). Consistency should be above .75 (Schneider & Wagemann, 2012), especially with the relatively small-N that has been available to us.

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#### 4.2.1 SELECTION OF CASES

The QCA methodology enables the qualitative study of a number of cases that exceeds regular comparative analyses, while also being quite useful for the analysis of a relatively low N (Wagemann & Schneider, 2012). This study encompasses ten case studies. The case studies were selected based on several criteria.

Firstly, In order to come to a meaningful comparison, we chose to exclusively select member states of the European Union, because these cases are all subject to the same technical and safety regulation. Secondly, open access entrants rarely enter the market directly upon the legal liberalisation of the railway market (IRG, 2018). It would be therefore erroneous to include cases directly after the opening

of the railway market. We only include cases where Open Access has been (de jure) introduced no later than 2012. Thirdly, for the sake of a sound comparison, we only included cases where open access has been introduced on long-distance lines. As Taczonowski's (2016) study shows, open access on regional lines know their own distinct dynamics and should be studied on its own.

We initially selected 7 countries. Four European case studies are initially taken from Van de Velde & Röntgen (2017): Great-Britain, Sweden, Austria and Germany. These cases are complemented by three others that were derived from a comprehensive report that Casullo (2016) wrote for the Organisation of Economic Cooperation and Development (OECD) on open access. Two Central-European countries and one South-European country were added for the purpose of balance respectively Poland, the Czech Republic and Italy.

The cases of Bulgaria, Romania and Slovakia were later added to increase variation. These cases proved challenging due to the limited and fragmented information on their specific contexts and outcomes.

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#### 4.2.2 BACK AND FORTH: ITERATION BETWEEN CASE STUDIES AND THE CONCEPTUAL FRAMEWORK.

Above we discussed the mixed inductive and deductive nature of QCA. This is put into practice by moving 'back and forth' theory and case studies. We based our first theoretical conception purely on theory and established the conditions of accessibility, complexity and accountability. We then turned to studying a few, but not all, cases.

Firstly, based on the study by Pflieger & Csikos who studied the impact of infrastructure and infrastructure imbalances on the indiscriminate access of new entrants, we assumed ownership structures to be part of the accessibility condition. However, the impact of this imbalance on later stages of the process in the case of Germany (see 5.6) and Poland (see 5.6), redirected our comprehension of ownership, resulting in the decision to regard ownership on its own.

Secondly, we had considerable difficulty with defining an appropriate measurement of accountability. Accountability was initially included in the conceptual framework based on the belief that it is the necessary condition for success when governments retreat (see i.e. van Dijk & winters-van Beek, 2009). However, a first scanning of the cases of Italy (see 5.6) and Poland (see 5.6) immediately showed that despite the similar levels of accountability, the political sphere wielded its power in very different ways. In Poland, the political incumbent unequivocally sided with the rail incumbent (Król, 2017) while the Italian minister directly intervened to lower the track access charges in order to enhance accessibility (Desmaris, 2016).

Furthermore, we found in the British case that a strongly independent regulating body can play a pivotal role in the outcome of open access, despite the fact that their independence is not necessarily beneficial to accountability (Hood, 1995; Osborne, 2007). This led to our decision to redefine accountability to the more specific 'oversight' as the sum of both the 'direction' of the political weight (in favour of, reluctant to Open Access) and the role of the regulating body.

### 4.3 OPERATIONALIZATION

While the binary crisp-sets are relatively easy to operationalize (a phenomenon is either present or not), fuzzy-set QCAs require a more sophisticated approach. Figure 1 of the conceptual framework shows the various conditions and sub-conditions that were delineated based on the literature study.

The sub-conditions total a number of 10, divided over four main memberships (accessibility, ownership, oversight, and complexity).

First discussed is the operationalization of success, followed by a measurement of complexity for the open access system for each of the ten case studies, after which the operationalization of accessibility is discussed. The final two parts of this section relate to the operationalization of respectively oversight and ownership.

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#### 4.3.1 WHAT IS SUCCESS?

The definition of success in this particular study is based on the literary review discussed in section 2.2. Based on the goal-attainment model, success is measured in:

- Lower fares
- Passenger growth on Open Access lines
- Increased quality
- Average market share of the new entrant on line

The side-effect model encapsulates the goal-attainment model, but pays particular attention to the unintended effects of a policy. In other words: assumed is that Open Access can only be regarded successful if its merits are not outweighed by its side effects. In order to answer this question, we asked every respondent to reflect on the (un)intended effects of the introduction of open access, and complemented these statements by insights gathered in literature.

We decided to separate success as defined in the goal-attainment model from success as defined according to the side-effects model. This decision is informed by a theoretical reasoning: the assumptions that underpin this thesis are all based on their relationship with the attainment of goals, but it is not clear what their relationship is to the production of side-effects. These unintended effects are therefore discussed separately in chapter 8, but are not necessarily regarded in the truth table of the QCA itself.

In terms of truth table scores, it is important to note that we separate lower fares, passenger growth and increased quality from the average market share of new entrants on the relevant lines. Lower fares, passenger growth and increased quality all refer to the attractiveness of the service.

<b>Presence of indicators</b>	<b>Truth table score</b>
<b>3</b>	1
<b>2</b>	.67
<b>1</b>	.33
<b>0</b>	0

The market share of the OAO on the relevant lines is the second parameter for success. The higher the market share, the higher the truth table score. Note that the third membership group only accounts for a five percent difference, whereas the first two groups cover ten percent. This reflects the fact that it becomes increasingly hard for the open access operator to increase its market share due to the fact that every additional train lowers the available capacity on the line.

Marketshare	Truth table scores	Thresholds
Very low	0	0-10%
Low	.33	11-20%
High	.67	21-25%
Very high	1	26% ≤X

Whether a case is deemed successful is determined with the help of a threshold for success. It is important to note that .5 is not the designated tipping point, because it would mean that a full attainment of goals would be sufficient for success, while it is assumed that in order for a case to be successful it must have at least some significance when it comes to scope. The threshold for success is thus  $X \geq .5$ .

#### 4.3.2 HOW IS COMPLEXITY MEASURED?

Complexity has a profound effect on railway systems, both in its physical dimension as in its social form. Cited above is Vespignani (2010) who explains that the introduction of a risk in one part of the system leads to problems in other parts of the system. For the physical property of railways systems, this means that a delayed train on location x results to a delay for train b on location y (e.g. Competition and Market Authority, 2015). In particular interesting for this study is also the risk introduced by more complexity for the railway system as a social system. As shown in figure 1 of the conceptual framework, there are three sub-memberships that determine the truth table score for complexity. For the measurement of success, it is important to note that a high complexity is assumed to have a negative relationship to the chance of success (Verweij, Klijn, Edelenbos & van Buuren, 2013).

What we know for sure is that in open access at least an open access regulator is involved, in whatever form also an infrastructure manager and at least a ministry with the responsibility to oversee infrastructure. Furthermore, it is important to note that by virtue of European law also at least one regulator is added. So, the least complexity is produced in the situation with the minimum number of four actors who theoretically produce the minimum of 3 relations. This is the ideal type of the least complexity possible produced. However, as we will see in the case studies, there is no example of these four actors engaging in less than four relations. Therefore, the lowest category of complexity is up to four relations which translates in a truth table score of **0**. The second category reflects the highest complexity these low number of actors can produce, which is up to six. A system with 5 or six relations is thus converted in a truth table score of **.33**. Now, any more relations indicate that there is at least one more actor to take into account, which makes the system more complex (Verweij et al, 2016). Keeping the size of the third category equal to the second, 7 or 8 relations are then indicated with a truth table score of **.67**, whereas any number of relations that is higher than eight is awarded a truth table score of **1**.

These thresholds are not only informed by the mathematical logic, but also reflect the numbers found in our case studies. Indeed, the most complex systems count 9 relations whereas most fall, as one may expect, in the two middle categories.

Number of relations	Truth table number
>8	1
7-8	.67

5-6	.33
3-4	0

As discussed above, interdependency is also a source for complexity. Interdependency is understood in this thesis as a reciprocal relationship in which actors need each other to achieve their own goals. Interdependent actors may or may not share the same set of goals. Interdependency is determined based on literature and reports on organisational mandates. Where the former component referred to the quality of relations, interdependency tries to measure the quality of the relationship. We determined for each relation that we deemed relevant for open access:

- i. Which resource actor A needs from actor B
- ii. Whether that resource is substitutable and important.

Dependency is *high* if the need resource is both non-substitutable and important and *low* if this dependency is either *important* or *substitutable*. Interdependency means that both actors are highly dependent on each other (Scharpf, 1978), and is denoted with a score of 0. If actor A is highly dependent on actor B, but the latter is less dependent on the former, we regard the interdependency as moderate. A moderate interdependency is scored by a .33. A score of .67 indicates a weak reciprocal dependency. Relations in which the dependency is reciprocal but only high for one actor is scored with a .67. The average results from both parameters are used to determine the overall complexity score.

		Dependency X on Y		
Dependency Y on X		High	Low	None
	High	0	.33	.67
	Low	.33	.67	0
	None	.67	0	0

Finally we also take the number of operators into consideration. Although this may seem straightforward, the operationalization of this aspect poses a bit of a challenge. There are to our knowledge no literary insights on which the thresholds could be based. Ultimately, we chose categories that produce the most variation, in this case with a width of 15 operators (and in which the last is a category of  $X > 45$ ) contain at least one case. What we do observe is that such an operationalization leads to a 'clustering' of most cases in the second (0.33) and third (.67) category (7/10) as you expect in most cases, an effect known as 'limited diversity' (Wagemann & Schneider, 2012).

#### 4.3.3 ACCESSIBILITY OF THE MARKET

Accessibility of the market has been discussed in section 2.8. It is the assumption of this thesis that accessibility of the market is nothing less than the necessary condition for success of Open Access. There are three determinants for open Access: Entry regulation, capacity and track access charges

Entry regulation is qualitatively and nominally measured. The higher the regulatory pressure that functions as a barrier for the introduction of new entrants, the lower the membership score. This thesis pays in particular attention to the presence of Economic equilibrium tests (EET). Entrance can be denied if, based on this test, a new operator on the line disproportionately harms the business case of

the concession that is already operating the line (CMA, 2016). This test is in that sense a defensive measure on the behest of railway undertakings that operate under concession.

Other possible barriers is additional technical regulation, demanding and unclear processes or quality demands. Based on the case studies we found several possible indicators of a high regulatory barrier other than EET, such as a demanding process as the result of the required time and unclarity or demands on quality, safety, reputation or lines that can be operated.

There are thus three ‘groups’ of constraints: EET tests, non-economic requirements or constraints linked to the process itself, such as administrative barriers, lack of transparency or overly lengthy processes. If all present, this is indicated with a 0. The presence of 1 of these constraints is translated in a .67, while 0.33 indicates the presence of two of these constraints and finally; the absence of these constraints is converted into a 1.

Number of present indicators	Truth table score
3	0
2	.33
1	.67
0	1

Low capacity means that there is no space for new entrants on the market. While this is of obvious importance, it is important to note that capacity is in reality very hard to estimate and a comparative study to the level of capacity saturation would easily qualify as a subject for another master thesis in itself. Capacity in this thesis is based on the study by Khadem Sameni & Landex (2014) who compared capacity utilisation for every European member state and provided what they call macro capacity utilization of the system. Macro capacity utilization refers to what we call the ‘saturation of capacity’ meaning that a score of hundred percent would mean that the capacity is fully saturated and that no additional trains can be operated.

It is not possible to determine a sound ‘tipping point’ based on the literature that is currently available, but it is important to note that shares of open access operators in the overall supply seldom exceed a few percent, even in those cases where the available capacity is high (see Finger, Kupfer & Montero-Pascual (2016) for market shares). This means that the availability of a few percent is enough to ‘lure’ open access operators to a certain market. We assume that only on those cases where capacity saturation is close to 100%, the lack of available capacity is problematic. 0% availability is therefore scored with a 1. The balance point between the presence of available capacity is set at 5%, for 5% exceeds in by far most cases the supply that open access operators account for.

Capacity availability	Macro capacity availability	Truth table number
High	$11\% \leq X$	1
Medium-high	$6\% \leq X < 10\%$	.67
Medium-Low	$1\% \leq X < 5\%$	.33
Low	0%	0

Finally, we also have to take cost that entrants face in regard. Empirical evidence from the case of Germany proves that relatively high access charges are able to pose a barrier against open access operators (IRG, 2015). Open Access operators have a relative lack of scale advantage, which results in a higher susceptibility for high track access charges (TAC). In the interest of uniformity we used one

comparative study: the European RMMS (European Commission, 2016). Whether a price or low, is relative to the price of comparable goods of course. Therefore, we used a so called *direct* method to determine the thresholds (Ragin, 2009): first we used the fsQCA software to determine the median and standard deviation ( $\sigma$ ) for track access charges in the those EU-member states that have de jure open access (N=15). Low track access charges are at least one standard deviation lower than the median. High track access charges are at least one standard deviation higher than the median. It is important to note that the higher the track access charges are, the lower is the truth table score.

	Track Access charges in €	Truth table
<b>High</b>	$x > 4.14$	0
<b>Moderately-high</b>	$2.58 < X \leq 4.14$	0.33
<b>Moderately-low</b>	$1 < X \leq 2.57$	0.67
<b>Low</b>	$X \leq 1$	1

Median=2.57;  $\sigma$ =1.57

#### 4.3.4 OPERATIONALIZATION OF OVERSIGHT

Oversight refers in this thesis to the combined effort of the regulator and the political incumbent to steer the railway system towards or away from more open access. It is important to note that the hands of political incumbent are tied insofar that most countries awarded competencies regarding the granting of access and guaranteeing the level-playing field to a regulator, in line with the European first railway package (Scordamaglia & Katsarova, 2016). Although formally separated from the ministry, the dependency of these regulators might differ between countries.

All in all, to assess the membership score of oversight, two things are considered: the view of the government upon open access (contra, neutral or pro) and the role of the regulator (independent/dependent). It is our assumption that a high dependency with a government that is reluctant to allow more open access is the least beneficial for open access operators. While a government with a favourable look upon open access together with an independent regulator produces the most favourable results for the system. A regulator is only regarded independent if it is formally separated from the ministry and on the condition that it has the means and competencies to execute its role.

These positions are hard to quantify, especially because the data from interviews should be treated with caution in this respect. Most respondents seemed to observe reservation to divert from the official view of their government, especially in a conversation with their peers from abroad. The assessment is therefore based on the combination of data from reports, specialized railway magazines and academic literature. Ultimately, the score for oversight is established in the following way:

		Position of the Regulator	
Stance of the political incumbent	View	Independent	Dependent
	Pro	1	.67
	Neutral	.67	.33
	Contra	.33	0



#### 4.3.4 INTEGRATION OF OWNERSHIP

Finally, we also take the structural position of the incumbent vis-à-vis new entrants in regards. There are two parameters that have to be taken into account. The first parameter refers to the ownership of physical means and includes the rail track itself and real estate such as train stations, washing facilities and train yards. We distinguish between either integrated (with service operated) and unbundled.

Infrastructure		Train stations	
		Unbundled	Integrated
Rail tracks	Unbundled	1	.67
	Integrated	0.67	.33

At the other hand, we also take into account the ownership of non-physical ‘assets’ that produce a certain power relation of the incumbent versus the open access operator. We looked at the integration of three tasks with the incumbent operator: timetabling, path allocation and track access granting, in line with the study by Pflieger & Csikos (2012). Integration of every tasks results in a **0**. Integration of two of these tasks with the incumbent results in a **0.33**. Integration of one task results in a **0.67**. If every task is unbundled from the incumbent it results in a **1**.

Infostructure: integration with incumbent	Tasks	Truth table score
High integration	3	0
Limited integration	2	0.33
Low integration	1	0.67
No integration	0	1

The average score for infrastructure and infostructure are used to arrive at the overall ownership score.

#### 4.4 METHODOLOGICAL CONSTRAINTS

For all its merits, QCA has constraints too. First of all, QCA does not contain the same level of detail as in-depth case analysis and does not enable the same extent of generalization as quantitative case analysis. It does, at the other hand, allow for a more systemic analysis than comparative in-depth case research and enables the researcher to process the large amounts of information. While quantitative analysis is surely more suitable for generalization, it does not allow for too many case specific dynamics.

The case-specific nature of the various railway systems dictates the need for allowing enough ‘space’ to complexity. At the same time, QCA also poses a strait jacket in the sense that it requires the prioritization of the most pressing (combination of) conditions on beforehand.

A second criticism on QCA is its ‘blind spot’ for time dynamics, although some have attempted to introduce a more time conscious approach by combining QCAs from various stages in the process

(Verweij, 2013, p.67). The lack of room for manoeuvre with regard to time, meant for this thesis that we had to determine for which period of time we wanted to explore open access. However, our case studies did not introduce open access at the same time, and are all in that sense in a different 'stage' of open access. QCA tolerates little sensitive to the aspect of time.

Two other constraints of our methodological framework are related to the gathering of data. A first constraint is the fact that the availability of data varied a lot between the various cases. Some cases, such as Sweden, the Czech Republic and Great Britain are very well described in academic literature. Information on the cases of Bulgaria, Romania and to a lesser extent Slovakia is not as rich, meaning that in some cases we had resort to less authoritative sources. Data from the World Bank and the OECD proved very helpful in these cases.

Finally, as already briefly discussed in 4.1.2, it is important to note that the way we gained access to the field posed a trade-off. We gained valuable information from both the questionnaires we send around Europe and the interviews we conducted. But the fact that access was gained by the researcher in his capacity as an employee for the ministry means in the first place that there were less means to 'control' the conversation. At the other hand, it must be said that the interviews sometimes erupted into an almost informal conversation between the high ranking official from the Dutch Ministry and her peer from abroad. These informal 'intermezzos' paved in the way for very valuable information that we would probably not have gathered otherwise. However, we found that the respondents were in no way keen to allow full transcripts to be published over fear of voicing a different direction than the official line of their employer. Although we hesitantly accepted this request, we do feel that this is at odds with the scientific preference for transparency.

## 5. OPEN ACCESS IN TEN COUNTRIES

### 5.1 AUSTRIA

In contrast to many other European countries, Austria has a long tradition of a fragmented railway system that spanned various privately-owned operators besides the federal ÖBB (and briefly the Deutsche Reichsbahn). This tradition can be dated back as far as 1880 and some operators are still active service (Taczanowski, 2015).

The Austrian railways found themselves far behind Western-European standards in during the 90s. This inspired change and ultimately to the privatisation of the ÖBB with hundred percent ownership of the Austrian state (Baresch, 2013).

Similar to the German system, infrastructure and operations are not clinically separated but cohabitate within a holding since 2003 (Koroschetz, 2014). The kick-off of for open access competition came after huge investments on the backbone of the Austrian railway system: the Westbahn. This line has now become the stage of fierce competition between ÖBB and the new entrant Westbahn (Steinger, 2016).

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#### 5.1.1 ACTORS

Beside the open access operator itself, there are four actors to take into consideration in order to understand the Austrian open access system.

1. Österreichische Bundesbahn Holding (ÖBB): is the umbrella organization that consists of the former incumbent railway operator ÖBB-personenverkehr, freight transport operator Rail Cargo Austria AG and ÖBB Infrastruktur AG (Koroschetz, 2014).
2. ÖBB Infrastruktur AG is responsible for the maintenance of the infrastructure, time-tabling and train stations. ÖBB infra is also relevant to the open access system as the issuer of infrastructure access contracts (ÖBB, 2018). ÖBB-personenverkehr still serves 88% of the market for domestic passenger transport in Austria (IRG, 2018).
3. Bundesministerium für Verkehr innovation und Technologie is the incumbent authority, and responsible for monitoring material conditions, issuing licenses to traction unit driver and issuer of licenses and safety certificates (Koroschetz, 2014).
4. Schieneninfrastruktur-Dienstleistungsgesellschaft mbH (SCHIG): this organisation is the competent authority for the allocation of infrastructure capacity and responsible for the access charges.
5. Schienen-Control is the regulatory body of the Austrian railways. It mediates conflicts and safeguards the neutrality of the Austrian railway market (Schienen-Control, 2018).

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### 5.1.2 COMPLEXITY

#### **Numbers of Railway undertakings**

There is a total number of 40 operators active in Austria (IRG, 2018), which is converted in a truth table score of **.67**

#### **Number of relations**

There are 8 relations identified as relevant to the open access system, this translates into a truth table score of **.67**.

**Interdependency: .67** (See appendix 1 for the elaboration of relations.)

**Truth table score for complexity is .67**

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### 5.1.3 ACCESSIBILITY

#### **Entry regulatory barriers**

In principle, open access is legally possible on every connection (BMIT, personal communication, 11/07/2018; Finger, 2016). Austria does not perform an EET to measure the (harmful) impact of a new entrant to the concession holder on that line (IRG, 2017).

We could not find any extra regulatory barriers to entering the Austrian market, although it must be said that the BMVIT is currently looking into its options to steer the volume of open access in the future (BMVIT, personal correspondence, 11/07/2018).

We found no evidence of significant administrative constraints.

**Truth table score: 1**

#### **Available capacity**

The elaborate utilisation of capacity study by Khadem Sameni & landex (2013) shows that Austria has a relatively low percentage of double track lines, which negatively impact capacity. Despite this constraint, data from IRG (2018) proves that the intensity of the use of the Austrian railways is with 73 trains per route kilometer higher than the European average (see appendix 1). Khadem Sameni &

Landex's (2014) model for macro capacity ("how well the potential for producing railway services in a country is actualized") shows that the Austrian potential is nearly saturated, meaning that there is very little space for new entrance.

**Truth table score for capacity: 0.**

Track access costs

Austrian track access costs (in euro per train.km) for passenger rail transport is 2.36 euro (IRG, 2018), which is translated into a **membership score of .67**.

Track access charges membership score is **.67**.

**Overall accessibility score: 0.67**

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#### 5.1.4 OWNERSHIP

Infrastructure and most train stations are owned by subsidiaries of the ÖBB. There have been complaints against ÖBB Infrastruktur for the high raises of the entrance charges for train stations (Tomes et al, 2016; Wärnecke & Götz, 2012).

Although Austria is characterized by an integrated model between IM and incumbent, it is also characterized by a separation of tasks linked to infrastructure. Path allocation and track access granting are not primarily the responsibility of the infrastructure manager (Schienen-control, 2018) but of an independent body (SCHIG). The exception being timetabling which is primarily the responsibility of ÖBB Infrastruktur.

The prominent position of ÖBB with regards to the infrastructure and its less prominent role in infrastructure (one out of three tasks) results in a **truth table score of .33**.

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#### 5.1.5 OVERSIGHT

While, according to AllRail (personal communication, 2018), more prone to open access than the German authorities, it would also go too far to portrait the Austrian authorities as overly enthusiastic towards open access. Historically, the ÖBB has had strong ties to the SPD and the former president of the ÖBB, Christian Kern, left the ÖBB to become the Austrian chancellor. At the other side of the aisle, the significant center-right and far-right parties ÖVP and FPÖ favor the 'national champion' idea (AllRail, personal communication, 2018). The stance of the Austrian government has in that sense been ambivalent. The Austrian market regulator, Schienen-Control is formally independent.

The ambivalent stance of the government and the independent role of the regulator results in the **score of .67**.

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#### 5.1.6 OUTCOME

##### **Marketshare**

- Open access operator's account currently for 50% on the relevant lines (Austrian Ministry, personal correspondence, 2018), which results in a partial truth table score of **1**.

##### **Goal attainment**

- Prices have declined on the line where open access has been introduced (BMVIT, personal communication, 11/07/2018; Fitzova, 2017).

- The frequency of service delivered on the line where Westbahn and ÖBB compete has increased (Fitzova, 2017; Finger, Kupfer & Montero-Pascual, 2016)
- After initial price competition, quality of service has over time improved (Ministry, personal correspondence, 11/07/2018).

The presence of all three indicators results and the market share of 50% result in a truth table score of **1**.

## 5.2 BULGARIA

After the Second World War the Bulgarian railway system was subjected to the economic interest of the relations within the framework of the East bloc. In the build-up to the Bulgarian accession to the European Union, development of the Bulgarian railway became one of the priorities of the authorities in order to comply with the European acquis (Dzhaleva-Chonkova, 2007).

In 2002, the Bulgarian Railway Transport Act split the incumbent *Bългарски Държавни Железници* (BDZ) from the infrastructure manager that goes by the name of *Natsionalna kompaniya Zhelezopatna infrastruktura* (abbreviated by NRIC) (IBM, 2011). Bulgaria opened up its system relatively early for open access, but so far, no open access operator has been active on the Bulgarian railway market (IRG, 2018; Perennes, 2017).

### 5.2.1 ACTORS

#### Involved actors

Many responsibilities are clustered in the Railway Administration Executive Agency, seriously bringing down the number of actors that are relevant to the Bulgarian open access system.

1. NRIC: Is the Infrastructure manager and also responsible for train stations. It has no role in the issuing of licenses or safety certificates. While a contract with the NRIC is necessary to enter the Bulgarian market, the negotiations are tripartite and it is ultimately the Railway Administration Executive Agency that has the most decision power.
2. The Railway administration executive agency (RAEC): Compared to other regulators in this study, the role of the RAEC is one of the most prominent. It reviews license application, takes part in the accession negotiations between the OAO and the infrastructure manager (NRIC, 2018), regulates the market (IBM, 2011) and also collects fees (European parliament, 2011)
3. Ministry of Transport, Information, Technology and Communication: Issues licenses for rail passenger transport (NRIC, 2018).
4. OAO: There are currently no OAOs active on the Bulgarian market.

### 5.2.2 COMPLEXITY

#### Number of railway undertakings

The number of active Railway undertakings active in Bulgaria is 14. This results in a truth table score of **.33**

#### Number of relations

There are six relations to be taken into account when an open access operator enters the Bulgarian market. This translated into a **truth table score of .33**.

**Interdependency: .33** (Relations correspondent with elaboration in appendix).

## Overall score for complexity: .33

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### 5.2.3 ACCESSIBILITY

#### Entry regulation

Bulgaria is one of five countries in Europe where the regulator has the authority to perform an EET to assess the impact of the open access operator on the concession, according to article 41 of its railway act (IBM, 2011).

On the non-economic side of the entry process, IBM (2011) concludes that there are a few constraints with respect to entering the Bulgarian rail market. One regulatory constraint is the fact that the detail in the safety requirements are higher than conventional and place in that respect a barrier for entrants.

Finally, it has been noted that there are also administrative constraints to entering. The process of obtaining licenses is very lengthy and lacks at time transparency.

Regulation truth table score: 0.

#### Track Access Charges

The TAC for passenger services is with 0.68 (European Commission, 2016, p.6) euro relatively low in Bulgaria and is designated the truth table score of **1**

#### Capacity utilization

The Bulgarian capacity availability is constrained by the country's railway system. This accounts for the fact that while the average train per kilometer is amongst the lower ranks of the EU (IRG, 2018), capacity utilization in Bulgaria is according to Khadem Sameni & Landex (2016) almost full, which results in available capacity score of **0**.

Overall truth table score for access: **.33**

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### 5.2.4 OWNERSHIP

#### Infrastructure

The tracks and stations are in the hands of the infrastructure manager, NRIC, who has been the subject of many complaints in the past over discriminate access to some facilities in the freight sector (IBM, 2011).

#### Infostructure

Timetabling, path allocation and track access are all unbundled from operatives (NRIC, 2018).

**Score for unbundled ownership: 1.**

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### 5.2.5 OVERSIGHT

The Bulgarian government has incrementally introduced measures to strengthen the attraction of its market. However, they are no fervent advocates of open access for a 'clear lack of business orientation' when it comes to the rail market, according to the World Bank (2011).

The Bulgarian rail regulator is formally independent from the ministry (United Nations, 2017).

Governmental position is ambivalent and the regulator is independent, resulting in a truth table score of **.67**.

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### 5.2.6 OUTCOME

Success score for Bulgaria is 0, since no open access operator has successfully accessed the market.

## 5.3 CZECH REPUBLIC

The first steps in the liberalisation of the Czech railways came into being in the year 1994. From the middle of the nineties on, it was common practice to tender non-profitable lines or connections that necessitated investments over negligence (Taczanowski, 2015). The foundations of the Czech railway system were shocked when a 2003 overhaul split the incumbent into a service operator and an (formally) independent infrastructure manager: the Sprava Zeleznicni Dopravni Česty, known by its acronym SZDC (Tomes, Kvizda, Nigrin & Seidenglanz, 2014).

Despite the formal independence of SZDC from the incumbent, ČD still owned train stations, depots and responsibilities related to the infrastructure. This situation changed in 2008, although train stations are still managed by ČD (Tomes, Kvizda et al, 2014).

Open access was introduced in 2012, when the ministry of transport decided to allow open access on the most important line in the country (Tomes, Kvizda et al, 2014). Prague-Ostrava connects two of the four most prominent urban areas of the Czech Republic, and also has a sound business case considering that the other two (Brno and Plzen) are connected with the capital by a good quality highway (Tomes, Kvizda et al, 2014).

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### 5.3.1 ACTORS

1. Český Dráhy is the incumbent operator and to this day the most dominant operator on the Czech railway market with a market share of more than 90% (European Commission, 2016).
2. Sprava zeleznici dopravni Cesty (SZDC) is the infrastructure manager that is also responsible for train stations, timetabling and track access (Tomas, Kvizda et al, 2014) and path allocation (SDCZ, 2017)
3. Safety regulation is enforced by Drážní Inspekce.
4. Access to infrastructure is monitored by a different organ that goes by the name of Úřad pro přístup k dopravní infrastruktuře (UPDI). It is also this organ that is responsible for performing the EET-test. However, this office has only been installed last year and European regulatory bodies are momentarily negotiating rules for the EET. It is therefore highly unlikely that this office has had a significant impact already.
5. Drazni urad is yet another organisation that is responsible for issuing competency licenses, regulating material, professional competence etc (SZDC, 2017).
6. Responsible ministry is the ministry of Transport, going by the name of Ministerstvo dopravy.

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### 5.3.2 COMPLEXITY

#### **Number of operators**

As shown in appendix 2, there are 19 operators active in the Czech Republic (truth table score of **.33**)

#### **Number of relations**

There are 7 relations to take into account, which translates into a **truth table score of .67**.

**Interdependency: .67** (see appendix one of an elaboration of the relations)

**Overall complexity score is .67**

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### 5.3.3 ACCESSIBILITY

#### **Entry regulation**

Economic regulation in the form of for instance an EET is relatively relax in the Czech Republic. While it recently established a new body to perform an EET<sup>2</sup>, it has not done so in the past, allowing the revenue of the incumbent to sink (Tomas, Kvizda et al, 2014)<sup>3</sup>. According to the ministry, there are currently no other formal barriers for entrance (personal communication, 11/07/2018), nor have we found evidence in the literature study.

What has been registered, are problems with the entry process. Operators have complained about the transparency of the process and the process for safety licenses are overly lengthy (IBM, 2011). The absence of the EET, the absence of non-economic regulations and presence of process barriers. These outcomes accumulate into a **truth table score of .67**.

#### **Track Access charges**

Tomas, Kvizda, Jandová and Rederer (2016) state that the relatively high entrance costs further hindered entrance to the Czech market. However, track access charges are considerably below European average with an access fee of 1 euro per kilometer (European Commission, 2016, p.6), we convert the cost into a truth table score of **1**.

#### **Capacity availability**

As said above, the Czech Republic did not have a regulatory body until very recently. An unpleasant side-effect is that it has not participated in the Independent regulators group that gathers a lot of information used for this thesis. However, research by Tomas, Kvizda, Jandová and Rederer (2016) has indicated that capacity constraints are also considered entrance barriers for entrance to the Czech rail market.

Whether this is in fact true, can be found in the work of Khadem Sameni & Landex (2013). One serious constraint that could impede new entrance to the Czech railway market is the fact that only 20% of the Czech railway has a double track. This is significantly below the European average of 35.61% (based on IRG, 2018). The capacity of the Czech network is almost fully saturated (Khadem Sameni & landex (2013), meaning that the entrance of new operators is severely constrained.

Capacity availability score: 0.00

**Overall truth table score: 0.67**

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<sup>2</sup> It has so far only participated in European negotiations on the European EET standard, rather than completing the conducting of an EET in the past (Czech Ministry of Transport, personal correspondence, 13/07/2018).

<sup>3</sup> European EET negotiations are currently taking place, it is therefore very unlikely that the Czech Republic has already conducted such a test, a believe that is strengthened by the fact that we have not found any declines so far based on EET tests. All in all, we have decided to not take the EET test in consideration in the scoring of the Czech accessibility score.



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#### 5.3.4 OWNERSHIP

Despite the gradual shift of power from ČD towards SDZC, ČD still holds considerable power. It owns washing facilities and is the owner of train stations. According to Tomes et al, the ČD continuously makes it hard for new entrants to enter these facilities which ‘is a fact that does not make the situation of open access any easier’ and is in fact one the most important barriers to entering the Czech rail market (2016, p.210).

This in stark contrast to the responsibilities linked to the infrastructure. Timetabling, path allocation and track access granting are unbundled from the incumbent (SCDZ, 2017; Tomas, Kvizda et al, 2014).

The partial integration of elements linked to infrastructure, but the full unbundling of infrastructure leads to score of **.67**.

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#### 5.3.5 OVERSIGHT

Market and performance regulation have both been relatively weak for the Czech Republic. The predecessor of UPDI had little means to monitor the Czech market (Tomes, Kvizda et al, 2016; UPDI, 2017), and the Czech Republic was one of the few countries that did not have a representative in the IRG (IRG, 2018).

Various overhauls of the Czech railway system resulted in an increased separation between the incumbent and the infrastructure manager, and a weakening of the structural power of the former, and it could well be that this will soon include train stations (Tomes, Kvizda et al. 2016). The Czech Republic has given way for open access operators to engage in head-on competition with its incumbent. At the other hand, the Czech authorities are one of the few governments that reserve the power to specifically designate a line open for open access. This has only happened in the case of one long-distance line so far (Tomes, Kvizda et al, 2016). The position of the Czech authorities vis-à-vis open access is therefore regarded as ‘ambivalent’.

The lack of an independent regulator with clear authorities, and the ambivalent stance of the government regarding open access leads to a **truth table score of .33**

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#### 5.3.6 OUTCOME

##### **Market share**

The market share of new entrants on the relevant long-distance line is between 55% (Tomes, Kvizda et al, 2016) and 65% (Finger, Kupfer & Montero-Pascual (2016), which is the highest market share of any open access operators in Europe, **and results in a truth table score of 1.**

##### **Goal-attainment**

The fierce competition has resulted in a diversification of fares resulting in a lower average fare, more capacity, quality improvements and a higher (albeit concentrated) frequency (Ministry of Transport, personal correspondence, 11/07/2018; Tomes, Kvizda et al, 2016). On a first glance, one could say that the introduction of open access has been quite successful, at least from the perspective of the passenger. The truth table score for goal-attainment is 1.

The overall score for success is **1**.

## 5.4 GERMANY

Reform of the German railway system commenced in 1994 with the integration of the Deutsche Bundesbahn and Deutsche Reichsbahn into one company: the Deutsche Bahn (DB) of which 100 percent of the shares are owned by the German government. This incumbent was reformed five years later, when some of its tasks were divided over newly established subordinates: DB netz and DB Stations&Service. Legal provisions to enable open access were also introduced in 1994. The complete privatization of DB has been on the table since 2008 but was hindered by the economic crisis that affected the European stock markets. A new step that has been taken is the separation of DB Mobility logistics that is responsible for, amongst other things, infostructure (Nikitinas & Dailydka, 2016).

The relatively prominent position of the incumbent has prompted some to criticize the German railway system for a lack of neutrality, and most notably also the so called monopoly commission of the German government (Monopolkommission, 2015).

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### 5.4.1 ACTORS

1. Deutsche Bahn (DB) is the incumbent and the most prominent operator on the German railways. It is also involved in the open access system through its subsidiaries DB Netz (infrastructure management), DB mobility (infostructure) and DB Stations & Services (Nikitinas & Dailydka, 2016).
2. Responsible ministry is Bundesministerium für Verkehr and digitale Infrastruktur (BMVI). It develops the long-term rail policy, governs the Eisenbahn-Bundesamt, and establishes agreements with the incumbent operator DB (Van der Velde & Röntgen, 2017), although governance is not strong (Nikitinas & Dailydka, 2016).

Regulation of the market is performed mainly by two organisations:

3. The Bundesnetzagentur is responsible for fair access to infrastructure, capacity and charges.
4. The Eisenbahn-bundesamt (EBA) is an autonomous governmental organisation that is part of the ministry.
5. Considering that most Open Access operators operate in the region, it is also important to take the regional authorities into consideration that all have a regional ministry of transport. They have the freedom to design and implement their own transport strategy. Regional transport is mostly organised through direct awarding and tendering. Open access has increased in importance lately however (Van de Velde & Röntgen, 2017).

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### 5.4.2 COMPLEXITY

**Total number of active operators:** 340. This number is converted into a truth table score of **1**.

#### **Number of relations**

We identified eight relevant relations that can be found in appendix 1. This translates into a **truth table score of .67**

**Interdependency: .67 (see appendix one for an elaboration of the relations)**

**Total score for complexity: .67.**

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### 5.4.3 ACCESSIBILITY

#### Entry Regulation

German access regulation is famously strict. Although Germany does not have an EET (German ministry, personal correspondence, 14/07/2018), other conditions are considered very stringent. Nikitias and Dailydka (2016, p11) say:

*“The German case showed that some access conditions may be too strict and thus discriminatory, in particular those concerning technological and staff requirements” So despite the fact that the regulatory body BNA has no formal power to limit open access (BMVI, personal communication, 13/07/2018; IRG, 2015)*

It is important to note that there are structural regulatory boundaries for entering the German market. IBM (2011, p.101) indicates that there are no administrative barriers and that the path allocation process is indicated by operators as non-discriminatory and “predictable and reliable”.

The absence of an EET test, the high regulatory boundaries and the absence of constraints related to the process result in a **membership score of .67**.

#### Capacity availability

The intensity of the German railway system use as measured in train kilometres/route kilometres ranks Germany in the European sub-top (See annex 1), decidedly lower than countries such as Great-Britain, Austria and especially the Netherlands. Compared to the cases of the Netherlands and Great-Britain, this could be possible partly attributed to the fact that the less lines are double tracks in Germany than in the former two. German capacity is almost completely saturated by the Deutsche Bahn (German ministry, personal correspondence, 13/07/2018). According to Khadem & Landex, there is a very low availability of capacity (Khadem & Landex, 2013).

**Capacity availability: 0.**

#### Track Access Charges

The High German TAC are often cited as a barrier for entering the Germany market, for instance by AllRail (personal correspondence, 2018). The track access charges of €5.11 is translated into a truth table score of 0.

The German membership score for accessibility is **.33**.

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### 5.4.4 OWNERSHIP

Ownership of infrastructure and train stations is all in the hands of the former incumbent DB AG. The tasks related to the infrastructure, timetabling, path allocation and track access granting are managed by DB Netz (DB Netz, 2017) and in the past a court order was needed to force DB to share all the relevant information (Deville & Verduyn, 2012).

The internal unbundling of the DB is legally in compliance with European law. However, it is subject to criticism by –amongst others- the German Monopoly Commission, for its negative effects on the neutrality of the market (see for example European Commission, 2012; Monopol Kommission 2015).

Both infrastructure and infostructure are completely integrated, **resulting in a truth table score of 0**.

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### 5.4.5 OVERSIGHT

The political-directive in Germany is crystallized into an agreement with the ministry, known as the Leistungs-und Finanzierungsvereinbarung, but the formal governance is according to Van de Velde & Röntgen (2017) fairly limited and the DB enjoys a lot of scrutiny in the drafting of timetables and setting investment goals.

Furthermore, the German government has not exactly positioned itself as fanatic advocate for open access in the last years, despite the fact that the Germany ministry indicated that it was not satisfied with the current quasi-monopoly of the DB (Minsitry, personal communication, 13/07/2018). It has ignored warnings from its 'monopoly commission' (Monopolkommission) on the questionable state of the level-playing field in Germany (see: Monopol Kommission, 2015) and the government has had seemingly no intention to undermine the structural powerplay of the Deutsch Bahn, although it has strongly advocated the European fourth railway package (ministry, personal communication, 13/07/2018). We deem its position ambivalent.

Finally, both market authorities, the Bundesnetzagentur and Bundeskartellamt are bodies of the ministry, so independence is low (the Ministry of Economic business and Energy).

**Truth table score: .0**

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#### 5.4.5 OUTCOME

##### Market Share

Market share of the new entrant on the relevant line was around 7,5% (Finger, Kupfer & Montero-Pascual, 2016), but is now 'negligible' (Casullo, 2016), which results in a partial membership score of **0**.

##### Goal-attainment

Based on the experiences of the former head of Sales and Business of HKX, one can established that competitors tried to conquer their market share through price competition.

Secondly, quality has most probably not gone up. The competition in the German case had significant problems with procuring rolling stock and operated refurbished trains acquired in Belgium and Austria, and even used trains that belonged to the East German Deutsche Reichsbahn. These trains were, according to AllRail 'a bit clunky' and offered no extra services like Wi-fi (Personal communication, July 2018)

Thirdly, frequency had gone up as the result of Open Access, as the DB seemingly continued its service.

For goal-attainment, **the score is .67**

**Overall success score is .33**

#### 5.5 GREAT-BRITAIN

The railway system of Great-Britain is probably the most studied case. Great-Britain was one of the first to privatize its railways under the Prime Minister John Major as early as 1993. The leap towards privatization did not immediately open the British railways for competition *on* the rail, but enabled franchises to enter the market. Open Access on the domestic railway market was introduced in 1998, far before other countries (IRG, 2015).

However, despite the country's experience with liberalisation, open access operators only account for approximately 1 percent of the market, divided over two OAOs: Hull trains and Grand Central, both active on the East Coast mainline (CMA, 2015). This is the result of the dialectics of lead: the preservation of the British franchise system and its reliance on revenue rather than tax payer's money, now lowers the attractiveness of allowing more open access over fear of diminishing returns (DfT, personal communication, July 2018).

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### 5.5.1 ACTORS

Six actors are identified besides the potential Open Access Operator: the Department for transport (DfT), Network Rail (NR), the Office of Rail and Road (ORR), Franchises, Rolling Stock companies (ROSCOs). Not directly involved in the process but taken into consideration is the Rail delivery Group (RDG).

1. The Department of Transport is the responsible governmental office for transport in Great-Britain. It plays a rather modest role in the allocation of access to the railway market and oversight of open access (ORR, 2013). The DfT pays grants to Network Rail in exchange for fulfilment of requirements it sets. It is also responsible for devising the strategy of the railways, based on advice from the ORR (Van de Velde & Röntgen, 2017).
2. Network Rail (NR) is responsible for the management of the infrastructure. It is the owner of the lion's share of the British tracks and most train stations (Van der Velde & Röntgen, 2017). It plays a major role in the initial phase of acquiring access to the British rail market as the distributor of capacity and timeslots (ORR, 2013).
3. The Office of Rail and Road is an independent organisation that is responsible for the regulation of the British railways. Its permission is in that capacity necessary to enter the British railways. Furthermore, it also issues safety and technical licenses and mediates whenever conflicts arises between operators and Network Rail (ORR, 2013; Van de Velde & Röntgen, 2017).
4. The franchise holders that operate the line the OAO wishes to operate also needs to be taken into consideration. It has two occasions to weigh in on the whole access process: an open consultation during the negotiations with NR and during the drafting of the timetable (NR, year unknown)
5. Finally, the Rail Delivery Group has been established in the aftermath of the critical McNulty report. McNulty criticized the railway system for its supposed lack of coordination and called upon the industry to do more. Although it has not offered solace to the problem, it does foster cooperation in order to establish an integrated payment (van de Velde & Röntgen, 2017). Their role in the whole Open Access system is currently rather limited.

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### 5.5.2 COMPLEXITY

**Total number of operators** is 35 (IRG, 2018). Truth table score is **.67**.

**Number of relations** is 8, which translates into a **truth table score of .67**.

**Interdependency: .33** (Scores correspond with elaboration in appendix 1.)

**Overall complexity score: 0.67**

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### 5.5.3 ACCESSIBILITY

#### Entry regulation

British market entry regulation is infamous for its Non-Primarily Abstractive Test, which is the British equivalent of an EET. The NPA test is designed to determine the original revenue an Open Access

operator generates besides the already existing revenue of that line. OAOs need to generate 30 pence extra to every pound extracted from the concession (ORR, 2018; ORR, 2013). Many cite this barrier as a fierce constraint for market entry (Van de Velde & Röntgen, 2017). The NPA test is a particular form of the EET, but both the DfT and the ORR expect it to be complimentary to the upcoming European standardized EET (DfT, personal correspondence, July 2018; ORR, personal correspondence, July 2018).

Furthermore, the ORR is famously strict on demanding high standards in almost every other field. According to the ORR, the non-economic demands are at least as important as the economic demands for passing the entrance test. Innovation, quality and reputation are all part of the access test (ORR, personal correspondence, 2018). Furthermore is it for OAOs in the UK necessary to obtain an extra license above the European standards (Network Rail, 2017).

The entry process is unrivalled in terms of its transparency, there are guides for each step of the entry process and clear time indications.

**Regulation score is 0.33.**

### **Capacity**

Capacity is distributed by Network Rail. In terms of usage intensity of the infrastructure, Great-Britain is only third to Switzerland and the Netherlands (European Commission) and many open access candidacies are allegedly rejected over a lack of capacity (i.e the application of Great North Eastern Railway Company limited (ORR, 2016). Khadeem Sameni's and Landex's model (2014) show indeed that the use of capacity is almost fully occupied. This is converted into a **membership score of 0**.

### **Track access charge**

TAC in Great-Britain is 1.20 in euro's (EC, 2016), this is converted into a truth table score of **.67**.

**Accessibility score is 0.33.**

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#### 5.5.4 OWNERSHIP

Great-Britain is the only country in this study that has no incumbent railway operator. Infrastructure/infrastructure is maintained and managed by Network Rail, an independent governmental organisation (van de Velde & Röntgen, 2017; CMA, 2016). In most cases, train stations are also owned by NR, but leased by concession owners, with whom an OAO has to establish an agreement (ORR, 2013).

Timetabling, path allocation and track access are the responsibility of either the NR or ORR, and therefor separated from operators.

The full separation of tasks linked to both infrastructure and infostructure is converted **into a score of 1**.

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#### 5.5.5 OVERSIGHT

The British government acknowledges the promise of open access for the future of the country, but is currently fairly reluctant to introduce more open access over fear for decreasing revenues from franchises (DfT, personal correspondence, 2018). The British regulator, the independent ORR, has considerable powers regarding open access. The ministry does not have the authority to directly stop an open access application for instance, although they are consulted during the access process (DfT, personal correspondence 2018; ORR, personal correspondence, 2018).

Considering the firm and independent position of the ORR and the currently reluctant stance of the British government to support more open access, the oversight score for Great-Britain is **.33**.

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#### 5.5.6 OUTCOME

Cumulative market share of both new entrants on the relevant line is around 5% (Finger, Kupfer & Montero-Pascal (2016), which results in a score of **0**.

#### Goal-attainment

- Frequency has increased (CMA, 2015)
- Lower fares: reports show that fares did indeed decrease after the introduction of open access. This goal is achieved (CMA, 2015).
- Quality has increased on the lines (ORR, personal communication, 2018).

**Which results in a score of 1.**

**Goal attainment score: .33**

### 5.6 ITALY

Italy opened up its market in 2011, provided that the home country of the new entrant also allowed Italian operators (European Commission, 2012). Its incumbent, Trenitalia, is a hundred percent state owned and tied together with infrastructure manager Rete Ferrovie Italiana in the national Ferrovie dello Stato holding (European Commission, 2012).

Italy is particularly interesting as the only country that has so far allowed open access on its domestic High speed rail (HSR) network, putting rail transport in direct competition with airliners (Bergantino, Capozza & Capurso, 2015). Open access operator Nuovo Trasporto Viaggiatori (NTV) has shown an impressive track record with a rise of 2 million to 7 million passengers between 2012 and 2013, but not necessarily at the cost of the incumbent Trenitalia that also has increased its revenue (Bergantino, Capozza & Capurso, 2015).

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#### 5.6.1 ACTORS

1. Ferrovie dello Stato is a public body that is owner of both incumbent Trenitalia and infrastructure manager Rete Ferrovie Italiana. Trenitalia owns 89% percent of the passenger railway undertakings (IRG, 2018).

There is a whole scope of regulators that are involved in Italian railways. The Autorità di Regolazione dei Trasporti (ART), the Direzione Generale per le investigazione Ferroviarie, the Agenzia Nazionale per la Sicurezza delle Ferrovie (ANSF) and the Direzione Generale del Trasporto Ferroviario e le Infrastrutture ferroviarie (DGTIF) are all partly responsible for monitoring the the Italian railway system (RFI, 2017).

2. The Autorità di Regolazione dei Trasporti (ART) is the market regulator, responsible for monitoring indiscriminate market access for open access operators.
3. Safety regulator on the railway market is the Direzione Generale per le Investigazione Ferroviarie (DGIF), part of the ministry of transport.
4. Agenzia Nazionale per la Sicurezza delle Ferrovie (ANSF) is in the open access system in its capacity of issuer of safety certificates.
5. Finally, the Direzione Generale Del Trasporto Ferroviario e le Infrastrutture ferroviarie (DGTFI) issues the mandatory licenses for entering the Italian railway infrastructure.

6. Ministero delle Infrastrutture e dei Trasporti (MIT) is the responsible ministry.

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### 5.6.2 COMPLEXITY

#### Number of operators

Total number of operators is 32 (IRG, 2018), which translates into a truth table score of **.67**

#### Number of relations

We identified a number of 9 relevant relations which is converted into a truth table score of **1**.

**Interdependency: .67 (See appendix one for an elaboration of the relations)**

**Total truth table score for complexity is 0.67.**

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### 5.6.3 ACCESSIBILITY

#### Entry regulation

Italy performs an EET (IRG, 2017; IRG, 2011). Entrants to the Italian market are not necessarily faced by extraordinary strict rules. Nor have we found any non-economic conditions.

However, it is important to note that the entry process has been noted as a constraint on entrance for its length and unclarity. A situation that previously forced the the new entrant Italo-NTV to appeal to the Antri-Trust authority (Desmaris, 2016). The situation has seemingly improved over time. However, we do take this feature of the Italian regulatory access into account.

The newly established regulator ART is planning to conduct EET tests in the future, but Italy has not put such a barrier in place in the past (IRG,2018). Therefore we regard economic entry regulation as non-existent, the non-economic conditions as absent, but constraints related to the process present, which accumulates into a membership score of **.67**.

#### Capacity

Intensity of Italian network use is less than European average (IRG, 2018). It is also significantly less than other case studies Austria, Germany and Great-Britain. While not amongst the highest in Europe, Italy has a higher-than-average degree of double track lines. Furthermore, it must be noted that Italy relatively recently invested enormous capital into the establishment of a high speed network (Bergantino, 2016). Capacity saturation is relatively modest with a 63% (Khadem Sameni and Landex, 2014), meaning that the overall capacity is yet to be fulfilled. However, Trenitalia is said to employ competitive strategies that seek to saturate timeslots, in order to force competition out of the market (Bergantino, 2016). This could result in an upward development of the capacity saturation in the years to come.

**Truth table score: 0.67**

#### Track access charges

Italian track access charges are on average below the European average for passenger transport TAC. The Italian TAC of 3.09 is awarded **the truth table score of .33**.

**Total accessibility score is 0.33**

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### 5.6.4 OWNERSHIP



## Infrastructure & Infrastructure

Infrastructure is not separated from the incumbent. Stations and rail tracks are managed by Rete Ferrovie Italiana, the infrastructure manager (RFI, 2017). An organisation that is bound with RFI within umbrella organisation Ferrovie dello Stato. In the past, RFI and Trenitalia have actively sought to push competition out of the market by working together, resulting in a 300000 fine in 2012 (Railjournal, 2012). Although RFI manages train stations, open access competitors are allowed to sell their own tickets, but at high cost (AllRail, personal correspondence, 2018). RFI is also responsible for time-tabling, path allocation and capacity allocation (RFI, 2017)

This results in a **truth table score of 0**.

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### 5.6.5. OVERSIGHT

#### Role of the political incumbent

There have been significant issues with the level playing field in Italy, which was amplified by the lack of a competent market regulator until quite recently (Desmaris, 2016). The Italian government unilaterally decided to lower the track access charges and has intervened directly when RFI denied OAOs access to washing facilities (Desmaris, 2016). With the establishment of the ART, the Italian government has sought to strengthen guarantees for an indiscriminate access to the market, although AllRail is rather sceptical on the impact of this new regulator (personal communication, 2018).

In order to reflect the structural weakness of regulatory overview in the past, it is assumed that the *independent* regulator has not been able to perform its task. Based on the involvement of the Italian government in the last years regarding open access and the optimistic view upon the Italian authorities expressed by the chairman of AllRail, the Italian government is regarded as *pro* open access.

Therefore, oversight in the Italian context is designated **the score of .67**

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### 5.6.6 OUTCOME

#### Market share

Market share is relatively high with 23% on the relevant line in Italy (Finger, Kupfer & Montero-Pascal, 2016). According to the thresholds we set, this market share is converted into a **.67 partial membership score**

#### Goal-attainment

Desmaris, Croccolo and Patuelli (2017) sum up various benefits as the result of the introduction of open access in the Italian case: more transport capacity, higher frequency of trains and more connections, a downward pressured price development and higher quality on trains. The main competitors, Italo-NTV and Trenitalia, both invest large amounts of money to continuously update their rolling stock (AllRail, personal communication, 2018), so it might be that the rising quality is a trend that is set for the years to come (**leading to a score of 1**)

The uncorrected success score is .84, which leads to a **success score of 1**.

## 5.7 POLAND

Liberalisation of the Polish railway market started in 1991, only two years after the transformation set in motion by Lech Walesa. Competition became possible in 1997 (Król, 2017). Warsaw took it a step further in 2000 with the division of the incumbent in different companies, but within the PKP group (Taczanowski, 2015).

It is one of these companies, the regionally operating PKP Przewozy Regionalne (PKP PR) that would become the centre of a dispute between the national authorities and the regions. PKP PR's desperate financial situation prompted the Polish authorities to offer it for sale, an offer that was soon accepted by various regions that all took partial ownership of the company. In a peculiar twist, this company would grow out to be the main competitor of the PKP under the acronym PR. This competition was far from reserved to regional, marginal lines but escalated into a full front competition for the most essential connections of the country (Taczanowski, 2015). However, internal strife amongst the 16 (!) owners of PR and anti-competitive behaviour of the PKP with support from Polish ministry of Transport (Król, 2017) ultimately lead to the marginalization of PR.

While all the legal provisions are ever still in place, there are currently no open access operators active on the Polish market. However, Arriva has obtained three new routes from the end of this year on (Railway Gazette, 2017), so open access might be reintroduced in the Polish case again very soon.

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### 5.7.1 ACTORS

In order to understand the Polish Open Access system, there are several actors that need to be taken into consideration: the PKP Group, consisting of three entities we will treat separately (PKP PLK, PKP Energyka and PKP IC). The full spectrum of regulation is executed by Urząd Transportu Kolejowego (UTK). The Polish Ministry of Transport, the Ministerstwo Infrastruktury Rzeczypospolitej Polskiej, also plays an active role.

1. PLK: This organisation is responsible for the maintenance of the infrastructure, stations and the allocation of capacity (PLK, 2018) and is part of the PKP group.
2. Polskie krajowe koleje (PKP) is the incumbent railway operator, one of the constituent parts of PKP group, together with amongst others PLK.
3. Urząd Transportu Kolejowego (UTK) is a regulator with a wide scope of responsibilities. It is the competent authority to issue safety licenses and 'entrepreneur' licenses (PLK, 2018). It is also responsible for the market regulation of the Polish rail network. In that capacity, it aims to guarantee market neutrality and indiscriminate access to the Polish market (UTK, 2018). It is dependent on the Ministry of infrastructure (Król, 2017).
4. Ministerstwo Infrastruktury Rzeczypospolitej Polskiej plays an indirect, but not unimportant role in the Open Access system in Poland. In the past, it acted on behalf of the PKP. For instance, the Minister of Infrastructure wrote a letter to PR to complain about the threat posed to PKP IC by the interregional service offered by PR. Furthermore, Król (2017, p161) claims that it used its discretionary right to stop PR trains for overdue train track charges. While this is in itself not surprising, it is worth nothing that PKP also had overdue its track access charges.

---

### 5.7.2 COMPLEXITY

**Total number of operators:** 82 (IRG, 2018), which is converted into a truth table score of 1.

### Number of relations

The Polish Open access system has relatively few actors, partly because many responsibilities are bundled within the tasks of the UTK. There are 5 relations to consider, which translates into a truth table score of **0.33**.

### Interdependency

The relations are elaborated in appendix 1.

Total score for complexity is **.67**

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### 5.7.3 ACCESSIBILITY

#### Entry regulation

Formal entry demands do not seem necessarily high. Poland does test the impact of the entrance of a new operator on the economic equilibrium (IRG, 2017), but there are to our knowledge no extra formal barriers to entering the Polish market. However, it seems far from the case that entry regulation allows for an easy entrance to the Polish market. Unclear allocation rules for infrastructure render the Polish railway system 'heavily restricted' according to operators who have attempted to access the Polish market in the past (ZPNK, 2010), and the case of RegioJet seems to indicate that the incumbent and the authorities are willing to use regulatory barriers to repel entry on certain lines (Król, 2017).

All in all, economic demands are present, non-economic conditions are absent and constraints related to the process are also present. **The entry score is thus .33.**

#### Capacity

Capacity on the Polish railway network is relatively high due to the low intensity of rail track use in Poland which is, according to appendix A, with 33 trains per track kilometres far below the European average of 53 (IRG, 2018). On first sight, it seems that Poland's potential is considerably higher, the percentage of double tracks is for instance with 44% higher than average. Khadem & Landex (2013) indicate that there is an availability of 16%, **which results in a score of 1.**

**Truth table score: 0**

#### Track Access Charges

The Polish track access charges for passenger transport are with a 1.55 euro per train kilometre amongst the lowest in Europe. **Truth table score is 0.67.**

**Total membership score is 0.67.**

---

### 5.7.4 OWNERSHIP

Ownership of assets in the Polish Open Access system are far from separated from services. Formally, both train stations and infrastructure/infrastructure are all integrated within the PKP Group (IRG, 2018; Król, 2017; Taczanowski 2015). While internally separated and governed by their own management, it is said that the transport branches have considerable power of the infrastructural parts of the companies (Król, 2017).

Furthermore, timetabling, path allocation and track access granting are all the responsibility of the PLK (and thus integrated with PKP) (PLK, 2018).

**The truth table score for ownership is 0.**

---

#### 5.7.5 OVERSIGHT

Bearing in mind the direct intervention of the ministry in the competition between PR and PKP IC, as explored in the introduction of this chapter, the Polish government has in the past not always acted in the best interest of open access operators.

The relation between the PKP and IC seems quite unique for Poland in the sense that the PKP seems to hold considerable power over the course of the transport ministry which can be drawn from the extensive analysis of Król (2017). Król (2017, p.165) writes that with the help of the government, the PKP group's strategy can be described as "a successful applying of the raising rivals' costs strategy". He concludes that this evidence suggests that incumbent can use its relation with the political field to its benefit.

Furthermore, the UTK lacked the independence to guarantee the level-playing field. Król concludes that the regulator is "dependent on the Minister of Infrastructure and led by ex-PKP executives" (Król, 2017, p.161).

The position of the Polish government and the lack of any meaningful regulation results in a truth table score of **0**.

---

#### 5.7.6 OUTCOME

The few years that full open access was not only a de jure fantasy but also de facto reality saw a decrease in fares, diversification in quality and on those lines where both operators were active also an increase in passengers (Król, 2017). However, the eradication of the only serious competitor to PKP renders it impossible to regard Poland as a successful case, simply because there are no active competing operators. The market share is thus currently **0**.

### 5.8 ROMANIA

Romania was relatively late to establish a railway system, after which the development of the railways was affected by the outbreak of both World Wars. It is due to these circumstances that the Romanian railways have, according to Mathé, Tamási and Schubert (2013, p.81), "not reached an optimal development level" nowadays.

Similar to for example the Bulgarian case, the Romanian pivot towards Europe encouraged the authorities to reform the Romanian railways. The monolithic SNCFR was reformed in 1998 into a holding. This organisation, known as the Compania Nationale de Cai Ferate, counts amongst its five constituent parts CFR Infrastructura and CFR Calatori. In order to stimulate the liberalization of the market, the Romanian authorities also unsuccessfully attempted to privatize the freight parts of the CFR group. The freight market has nevertheless been described as 'dynamic', (Buşu & Buşu, 2015), whereas meaningful open access competition has yet to develop.

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#### 5.8.1 ACTORS

1. CFR: The Romanian railways holding that consists of the (autonomous) infrastructure manager CFR Infrastructura and the passenger transport operator CFR Calatori. CFR also owns the 936 train stations that Romania counts (CFR, 2017).
2. OLFR: This is an independent body responsible for the issuing of granting licenses. OLFR is an independent body within AFER (CFR, 2017).
3. ASFR: responsible for the issuing of safety licenses (CFR, 2017).

4. OAO: the open access operator, there is currently no open access operator active on the Romanian market.
5. Railway Supervisory Council (RSC): is the independent market regulator of the Romanian Railway system.
6. Ministry of Transport (MT): the ministry is not directly involved in the open access systems through the granting of licenses, in contrast to for instance the Bulgarian case.

---

## 5.8.2 COMPLEXITY

### Number of active railway undertakings

There are currently 26 active railway undertakings in Romania. This translates into a truth table score of **.33**.

### Number of relations

There are 9 relations to take into consideration, which results in a **truth table score of 1**.

**Interdependency:** .67 (see appendix 1 for an elaboration of the relations).

**Truth table score for complexity: .67**

---

## 5.8.3 ACCESSIBILITY

### Entry regulation

Romania does not currently perform an EET, there are no other economic provisions besides track access charges (IRG, 2018).

Non-economic regulation forms a barrier in the sense that there are two different regimes to be taken into consideration. European regulation applies for the central lines of the Romanian network, but specific Romanian regulation applies to other parts of the Romanian infrastructure (Railweb Consultancy, 2017). The benefit of equated legislation for interest parties thus disappears for part of the Romanian rail system. Furthermore, similar to Germany, the Romanian law stipulates the need for a new entrant to establish a Romanian legal personality, which harms competition according to the OECD (2016).

Furthermore, the OECD (2016) also dispraises the lack of transparency of the access process. The conditions for obtaining a safety license are unclear and so are the conditions for obtaining capacity.

The absence of an EET, the presence of non-economic conditions and the constraints linked to the entry process **lead to a score of .33**

### Track Access Charges

The charges for passenger railway undertakings on the Romanian tracks is 2.55. Which translates into a **truth table score of .67**.

### Capacity

Romania has had considerable problem in developing their infrastructure due to a lack of funds (World Bank, 2011). This could be the reason for the underutilisation of the capacity by the incumbent, which is currently only 66% (Khadem Sameni & Landex, 2013). The availability capacity of 34% results in **the truth table score of 1**.

**The overall truth table score for accessibility is .67.**

---

#### 5.8.4 OWNERSHIP

##### Infrastructure

Train stations and infrastructure are all owned by CFR. A small minority of the train stations is owned by CFR but leased by marginal independent infrastructure managers (CFR, 2017). Access to infrastructure is also strained by the unclear conditions for entry access (OECD, 2016).

##### Infostructure

While it is not quite transparent who is responsible for the time tabling, path allocation and track access, it seems that the CFR Infrastructura part of CFR is competent for these tasks, although Railweb (2017), a counseling firm specialized in rail transport, claims that private operators have to “*coordinate their timetables with CFR Călători’s*” indicating the prominent position of CFR. Evidence from freight transport seems to indicate a sometimes discriminate treatment of new entrants in favour of the incumbent (OECD, 2016)

**Truth table score for ownership is 0**, because it is fully integrated. Furthermore it seems that the ‘Chinese walls’ installed to prevent anti-competitive behaviour are not ‘fail prove’.

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#### 5.8.5 OVERSIGHT

The Romanian regulator is independent and does not omit its responsibility, for instance through fining the incumbent for anti-competitive behaviour in the freight market (OECD, 2016). The Romanian government on the other hand has not committed to promoting open access and the fact that CFR is state owned has not hindered the incumbent to perpetrate anti-competitive behaviour, with seemingly little response from the Romanian political incumbent. While we assess the behaviour of the Romanian authorities to be *contra* open access, this behaviour is partly mediated by the independence of their regulator, resulting in a **truth table score of .33**.

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#### 5.8.6 OUTCOME

While the legal opening for open access of Romania dates back to 1998 (IRG, 2018), it is not very clear how many operators offered their services as OAOs (Perennes, 2017), although OAOs are often not mentioned in connection to Romania. One noticeable is the ASTRA who operates open access night trains, but on a very limited scale (Railway Gazette, 2017). Their services are believed to be:

1. Quality wise superior to those of CFR
2. Cheaper in terms of fares for passengers
3. No considerable contribution to frequency of choice, they operated one a less-than-daily basis (railway gazette, 2017).

The very limited scale and the fulfilment of two out of three goals translate in a **score of .33**

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### 5.9 SLOVAKIA

The Slovak railways are greatly influenced by the changing economic and political conditions that were imposed by the various regimes that exerted sovereignty on Slovakian soil. The main defining factor today is the membership of the EU, which not only lead to the modernisation of its rail tracks but also inspired an overhaul of the service quality in order to catch up with the rest of the continent (Michniak, 2016).

The current configuration of the Slovak railway system is the result of various reforms. The current Infrastructure manager, Železnice Slovenskej republiky (ZSR), was established after the peaceful secession from the Czech Republic. The incumbent passenger operator is the Železničná spoločnosť Slovensko (ZSSK), which is hundred percent owned by the Slovakian government.

Open access was introduced in 2011 and the first operator to challenge the ZSSK has been Regiojet. Regiojet's Czech background is no coincidence, as authors note that the introduction of open access in Slovakia is closely linked to that of the neighbouring Czech Republic (Tomeš et al, 2016).

The Slovakian case is interesting in the respect that while most open access competition is regarded competition *on rail*, meaning that multiple companies serve one route, open access in the Slovakian context mainly took off in those areas where the incumbent wished to retreat, although this started to chance recently with competition on several prominent lines (Taczanowski, 2015).

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### 5.9.1 ACTORS

Four actors are deemed relevant to the Open Access system, besides the Open Access Operator. ZSSK and ZSR are directly linked to the day-to-day rail operations as respectively the incumbent and the infrastructure manager, the last two have responsibilities regarding the regulation of the railway system.

1. ZSSK: Is the incumbent operator of Slovakia with a market share of 94%. It is however, exclusively active in the passenger transport branche as the result of a separation from the freight part of the railways (Michniak, 2016).
2. ZSR is the state owned infrastructure manager, and in that capacity also responsible for granting access to the Slovak tracks. Furthermore, ZSR also manages stations, maintenance facilities, marshalling yards and washing facilities (ZSR, 2016).
3. Dopravny Urad was established in 2014 as part of the Ministry of Transport, Construction and Regional development of the Slovak Republic and is responsible for regulation, licensing, safety and supervision (Dopravny Urad, n.d.)
4. Urad pre Regulacia Zelenicnej Dopravy (URZD) is the market regulator. It supervises non-discriminatory access, regulates payments, fare regulation and is the safety authority for infrastructure (URZD, n.d.)

---

### 5.9.2 COMPLEXITY

**Total number of operators:** 37 (IRG, 2018). Truth table score is **.67**.

#### **Number of relations**

We found 5 relevant relations to the open access system of Slovakia, truth table score of **.33**.

**Interdependency: .67 (see appendix one for an elaboration of the relations)**

Relations correspondent with elaboration in appendix 1.

**Total score for complexity is .67.**

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### 5.8.3 ACCESSIBILITY

#### **Regulation**

Slovakia does measure the impact of an open access operator through the means of an EET. The EET is performed on the request of stakeholders after candidacies are published on the website of the transport authority (Ministry of Transport and Construction, personal correspondence, 2018). The ministry furthermore states that non-economic regulation is 'not applicable'. However, similar to the case of Great-Britain, operators have to demonstrate that they have a good reputation and need to register as an 'entrepreneur' in Slovakia, effectively preventing cabotage. Furthermore, entrants need to comply with Slovakian fare conditions, which can be considered a barrier because it exempts certain groups from paying for transport (such as students and pensioners) (Masek, Kendra, Camaj & Dolinayova, 2016), we therefore regard non-economic conditions as present.

Finally, we have not found indications of constraints related to the entry process.

The presence of an EET, non-economic conditions and the absence of procedural constraints results in a **truth table score is .33**.

### **Capacity**

With 35 trains per track kilometre, the intensity of the use of the Slovakian tracks are far below the European average (IRG, 2018; Annex A), while the percentage of double-track lines is higher than European average. This could indicate that the Slovakian capacity is not (yet) saturated. Indeed, Sameni's and Landex's model indicate a saturation of .22, which means that there is an availability of 78% results in a **truth table score of 1**.

### **Track Access Charges**

The Slovakian track access charges for rail passenger transport is significantly lower than the European average with a rate of 1.52 in euro per kilometres (IRG, 2018, p.16). **Truth table score is 0.67**.

**Accessibility score is .67**

---

## 5.9.4 OWNERSHIP

### **Infrastructure**

Ownership of the Slovakian infrastructure/infrastructure and train stations are all separated from operators and the incumbent operator. It is the infrastructure manager ZSK who is responsible for the rail tracks and who is also the competent authority for the management of train stations, according to their network statement (ZSR, 2016).

### **Infostructure**

Train operators submit requests for train paths to the Infrastructure manager each year. It is the duty of the (independent) infrastructure manager to allocate train paths, time slots and grant track access (personal correspondence with the Ministry of Transport and construction, July 2018).

**Truth table score is 1.**

---

## 5.9.5 OVERSIGHT

The Slovakian government has actively sought to introduce Open Access on its network in order to reverse the trend of the sometimes dilapidated railway infrastructure (Michniak, 2016). There have been some problems in the past with regards to the guaranteeing of the level-playing field, ultimately leading to a complaint at the European Commission (AllRail, personal communication, 2018), although Slovakia was fairly quick to comply afterwards. While it is fairly hard to designate a membership to the



political incumbent, we do regard the position of the Slovakian government in general as favourable towards open access.

### Regulator

The budget of the Slovak regulator is managed by the ministry (NSAT, 2018), therefore we do not view the regulator as entirely independent.

**Overall truth table score is .67**

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## 5.9.6 OUTCOME

### Marketshare

There is to our knowledge no data available on the marketshare of the OAO on the relevant lines specifically. However, the overall marketshare of open access operators in Slovakia is with an impressive eight percent one of the highest in Europe. This market share is the accumulation of operations on only four lines and Slovakia is therefore designated a **.67 membership score** for market share. The market share might furthermore increase over the next years as the number of open access operators has grown from two to 4 (Ministry of Transport and Construction, personal correspondence, 2018).

### Goal-attainment

According to our respondent at the Slovakian ministry (personal correspondence, July 2018) a fare decrease has been observed and through 'adding new and upgrading services' open access also resulted in a higher overall quality and more passengers. In many cases open access operators operate where the incumbent is not active any more (see introduction) The attainment of two out of three goals is converted into a partial membership score of **.67**

**Total truth table score for success is .67**

---

## 5.10 SWEDEN

The Swedes were one of the frontrunners of liberalisation, after budget problems hit their incumbent Statens Järnvagar (SJ). Sweden was in 1990 the very first country to allow other players on its regional infrastructure network. Long-distance distance rail paths were the next to be liberalized in 1993 through tendering and Open Access was introduced in 2009. Open Access was initially restricted to timeslots during the weekend (Alexandersson, 2015), but came into full effect in 2010 (IRG, 2015)

SJ remains by far the most dominant player on the market with OAOs mostly limiting their activities to regional lines. However, the Hong Kongese subway operator MTR has commenced operations on the Göteborg-Stockholm line and accounts for 28% of the market (Finger, Kupfer & Montero-Pascual, 2016).

---

### 5.10.1 ACTORS

We identified seven actors that are relevant to the Open Access System: Näringsdepartementet (ND), Trafikverket, Transportstyrelsen, Jernhusen, Konkurrensverket, Län, and the Järnsvägsbranchens Samverkanforum (JSF).

1. Näringsdepartementet is the ministry responsible for, amongst others, infrastructure. It also grants budgets to Trafikverket and Transportstyrelsen and governs these independent bodies by means of a regulatory letter (Van de Velde & Röntgen, 2017)

2. Trafikverket is the Infrastructure manager. It is in that capacity also responsible for the allocation of capacity and manages a part of the Swedish train station (Trafikverket, 2016).
3. Jernhusen is a governmental body that manages real estate in the proximity of the rails and also the main train stations (Van de Velde & Röntgen, 2017).
4. Transportstyrelsen is the regulator. It is part of the Näringsdepartementet, but maintains an independent status. It is responsible for safety, investigation of incidents and granting licenses. It is also partly responsible for guaranteeing a level-playing field in the market (IRG, 2018).
5. Konkurrensverket is not directly part of the open access system but is worth mentioning in its capacity of general market authority (van de Velde & Röntgen).
6. Län are the regional governments who also weigh considerably on the rail market through their local public transport offices. These are responsible for timetabling in their own region, fare regulation and tendering public transport (Van de Velde & Röntgen, 2017).
7. Järnsvägsbranchens Samverkanforum (JSF) is a branche-organisation established in response to a critical report (Alexandersson, 2010) in which it was argued that the lack of coordination in the Swedish railways lead to insufficient financing and problems with punctuality recovery (Van de Velde & Röntgen, 2017).

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### 5.10.2 COMPLEXITY

**Total number of operators:** 21 (IRG, 2018). The number of 21 operators translates into a truth table score of **.33**.

#### **Number of relations**

There are 6 relations identified, which is converted into a truth table score of **.33**.

**Interdependency:** **.33** (scores correspond with elaboration in appendix 1).

Total truth table score for complexity is **.33**.

---

### 5.10.3 ACCESSIBILITY

#### **Entry Regulation**

Entrance to the Swedish market is relatively easy to obtain. There is no EET in place (IRG, 2011), technical and safety standards follow European standards and there are no extra regulatory barriers for new entrants. Furthermore, we found no evidence of any problems with the access process. **Score is 1.**

#### **Capacity**

The intensity of the use of the Swedish rail is relatively low (IenM, 2017). Research into capacity constraints per line by Alexandersson (2015) indicate that there is only a low number capacity constraints in the Swedish rail system. His research is vindicated by the work of Khadem Sameni and Landex, 2014) who show that, despite the remarkably low percentage of double track lines, Swedish capacity saturation can be considered low with 37% (based on table 6 in Khadem Sameni & Landex, 2014, p17)

**The availability of 63% results in a truth table score: 1**

#### **Track access charges**

Swedish track access charges are low with €1 per kilometre (European Commission, 2016), it is converted into a **truth table score of 1.**

**Overall accessibility score: 1.**

---

#### 5.10.4 OWNERSHIP

##### **Infrastructure**

The incumbent plays no role in the management of infostructure, infrastructure or train stations. Ownership of these commodities are in hands of government agencies. Trafikverket owns and maintains info and infrastructure, whereas government agency Jernhusen is responsible for other real estate (depots) and large train stations (van de Velde & Röntgen, 2017; Trafikverket, 2018) and communities manage some smaller trainstations (Trafikverket 2018).

##### **Infostructure**

Timetabling, path allocation and track access are all managed by Trafikverket and not integrated with the incumbent (Trafikverket, 2016).

**Truth table score for ownership is 1.**

---

#### 5.10.5 OVERSIGHT

As one of the pioneers of rail market liberalization, one expects that the Swedish view upon open access is generally favourable. The country does not have a clearly defined national policy according to Van de Velde & Röntgen (2017), however, the Swedish government actively pursues a level-playing field, even going so far to set-up a neutral ticketing system recently (AllRail/AllRail, personal communication, 2018). The Swedish regulator, Transportstyrelsen, is functionally, but not formally independent from the ministry. And while it enjoys discretion in its day-to-day operations van de Velde & Röntgen (2017) do conclude that "it executes [the] government's policy" (2017, p. 17).

The preferable position vis-à-vis open access of the government and the formally dependent role of the regulator accumulate into a **truth table score of .67**.

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#### 5.10.6 OUTCOME

**Marketshare** of the new entrants on the long-distance line between Stockholm and Goteborg is 28% (Finger, Kupfer & Montero-Pascal, 2016), which leads to a **partial membership score of 1**.

##### **Goal-attainment**

Vigren (2017) claims that frequency has increased and that the fares of the new entrant are in fact lower. Quality has not improved due to the high standard of trains SJ already operates (Vigren, 2017).

This leads to a membership score of **.67**

Ultimately, the truth table score for success is **1**.

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## 6. RESULTS

The gathered data offers a rich opportunity to compare the various railway systems of Europe. We found a very large variation and interestingly none of the successful cases scored completely equal on every of the four conditions. Purely based on the above, a few interesting insights can be offered;

A first insight is that the variation is bigger for some conditions than others. With regards to complexity for instance, we see that countries are members of the two middle memberships, while ownership covers each of the four options (0, 0.33, 0.67, 1).

Secondly, it seems that open access has indeed produced a combination of lower fares, higher quality and a higher frequency in some cases. Thirdly, the scope of open access in terms of market share on the relevant line is relatively modest and exceeds the 30% only in the cases of the Czech Republic and Austria.

An overview of the gathered truth table scores can be found in appendix 2. The aggregated data that is ultimately used as the basis for the fsQCA software's minimization is shown in the figure below. The numbers in the left bound refer to the alphabetical order (1= Austria; 2=Bulgaria; 3=the Czech Republic; 4=Germany; 5=Great-Britain; 6=Italy; 7=Poland; 8= Romania; 9=Slovakia and 10=Sweden).

## 76 FS/QCA Data Sheet

File	Variables	Cases	Analyze	Graphs	
Case	accessibility	ownership	oversight	complexity	success
1	0.67	0.33	0.67	0.67	1
2	0.33	1	0.67	0.33	0
3	0.67	0.67	0.33	0.67	1
4	0.33	0	0	0.67	0.33
5	0.33	1	0.33	0.67	0.33
6	0.67	0	0.67	0.67	1
7	0.67	0	0	0.67	0.33
8	0.67	0	0.33	0.67	0.33
9	0.67	1	0.67	0.67	0.67
10	1	1	0.67	0.33	1

### 6.1 THE COMPLEX SOLUTION AND COMPLEXITY

Based on the table above, we first use the fsQCA software to generate the complex solution. As discussed above, complex solutions have very limited explanatory value, because they do not take theoretical assumption into account (Ragin, 2008). Rather, this complex solution merely shows configurations that include success and is not suitable for the extrapolation of the sufficient or necessary condition(s). The fsQCA gives the following result:

Algorithm: Quine-McCluskey  
True: 1

--- COMPLEX SOLUTION ---  
frequency cutoff: 1.000000  
consistency cutoff: 0.857759

	raw coverage	unique coverage	consistency
accessibility*ownership*oversight	0.388982	0.056761	0.875940
accessibility*ownership*complexity	0.388982	0.056761	0.875940
accessibility*oversight*complexity	0.555927	0.223706	0.909836
solution coverage: 0.669449			
solution consistency: 0.923963			

\*\*\*\*\*  
\*TRUTH TABLE ANALYSIS\*  
\*\*\*\*\*

The outcome shows that there are three combinations that have led to success.

1. The presence of accessibility, the presence of unbundled ownership and the presence of oversight with either present or absent complexity.
2. The presence of accessibility, either unbundled or integrated ownership or the presence of complexity with either the presence or absence of oversight.
3. The presence of accessibility, the presence of oversight, the presence of complexity with either unbundled or integrated ownership.

What the complex solution shows, is that complexity as a feature of the system has limited explanatory power for the failure of cases. In none of the three 'paths to success' is the absence of complexity an absolute prerequisite. The hypothesis (h4) that the absence of complexity is part of the sufficient condition for success is thus disproved.

That does not mean that complexity is harmless. Remember that QCA does not show the individual impact of a condition on the outcome. It merely indicates that success can be achieved when complexity is high, in every sufficient configuration.

## 6.2 THE INTERMEDIATE SOLUTION AND SUFFICIENCY

More explanatory power is invested in the so called *intermediate* solution. The intermediate solution allows the researcher to include its assumptions. In our case, we assume that accessibility, unbundled ownership and oversight are positively linked to success, while complexity should be absent (see conceptual framework, chapter 3). The paths to success that are shown by the intermediate solution are the *sufficient* paths to success. The software generates the following outcome:

```

Algorithm: Quine-McCluskey
  True: 1
  0 Matrix: 0L
Don't Care: -

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1.000000
consistency cutoff: 0.857759
Assumptions:
~complexity (absent)
oversight (present)
ownership (present)
accessibility (present)

              raw      unique
              coverage  coverage  consistency
              -----  -
oversight*accessibility  0.612688  0.223706  0.917500
ownership*accessibility  0.500835  0.111853  0.900901
solution coverage: 0.724541
solution consistency: 0.929336

```

There are two sufficient paths to 'success', both with a consistency well above the minimum .75 consistency score that is minimally required (see 4.2).

There are two sufficient conditions for success:

1. The first sufficient set is (high) accessibility with (high) oversight. In this sufficiency, ownership can be unbundled or integrated. Complexity may also be low or high.
2. The second sufficiency is a combination of the presence of accessibility and unbundled ownership. Oversight can either be present or absent and complexity can either be low or high.

The first path shows that the accessibility to the market and guarantees to a level-playing field by virtue of the regulator is beneficial for the attainment of goals and higher market shares for OAOs. What this path also indicates, is that if oversight is high, ownership may be unbundled or integrated. This could be attributed to the fact that if ownership is unbundled, the incumbent has less incentive and, more importantly, less means to wield its position to its own benefit. With an oversight regime that is bound in favour of open access, complexity may be either high or low. The hypothesis that *the presence of accessibility and strong oversight are sufficient for success* (h2) is thereby confirmed.

The second sufficient combination combines the presence of high accessibility with unbundled ownership. In this combination, oversight can either be present or absent and complexity can either be high or low. That oversight can be low when ownership is unbundled, is maybe not such a surprise. An unbundled system presents in itself less opportunities to hinder new entrants from entering the market. This result confirms the hypothesis (h3) that *A high accessibility and unbundled ownership are sufficient for success*.

## 6.2 ACCESSIBILITY AS THE NECESSARY CONDITION

One of the assumptions of this thesis is that accessibility is the *necessary* condition for open access to succeed. Based on both outcomes generated by the fsQCA software above, we can already assert that an unbundled ownership and the presence of oversight are not part of the necessary condition, because they are present in the one sufficient combination, but absent in the other. The observation that accessibility is part of both sufficient paths strengthens our assumption, but the fsQCA software's necessary condition feature is used to determine whether the consistency level of accessibility exceeds the .75 threshold. It produces the following outcome:

```
Analysis of Necessary Conditions
Outcome variable: success
Conditions tested:
accessibility          Consistency    Coverage
                      0.834725      0.831947
```

The assumption that accessibility is the necessary condition has a .83 consistency. The hypothesis (h1) that *high accessibility is a necessary, but not a sufficient condition for success* is thereby confirmed.

The relatively modest consistency can be attributed to the fact that there is just one case where accessibility is scored a convincing **1** (Sweden). In every other instant accessibility scored .67, which weakens the consistency.

## 6.3 UNINTENDED EFFECTS

Initially, we attempted to make a structured oversight of the side-effects of open access in every case study as an additional insight. However, the considerable imbalances in available information between cases, proved too significant to approach this in a systematic way. The unanticipated nature of side-effects is possibly one of the causes for the little monitoring it is subject to. The little data we have gathered on side-effects is however too valuable to ignore all together. Based on the conducted interviews, four unintended effects can be distilled.

One first negative effect of open access is its impact on the profitability of the concessions. OAOs do not have the obligation to transfer returns to the treasury. Take the example of Britain: Bearing in mind that the British view on railway expenses is that the lion's share should be paid by the passenger and not by the taxpayer (AllRail, personal correspondence, July 2018) it is quite easy to see why this effect distorts the system. In order to balance this effect, the DfT has held a consultation on a possible levy on open access operators, and it seems that it is the intention of the DfT to impose such a levy in the future (ORR, personal correspondence, 2018). Similar discussions are currently taking place in the Czech Republic and Slovakia (Czech Ministry, personal correspondence, 11/07/2018; Slovak Ministry, personal correspondence, 2018). The current applicable railway package does provide an option for countries to impose a levy (article 12 of directive 2012/34/EU).

Secondly, open access possibly threatens the robustness of the whole railway system. One example is an open access operator who "essentially overnight" (DfT, personal correspondence, July 2018), decided to quit operating which is of course a major liability for any railway system. This is also a

potential risk for the Czech market where operators are yet to make profits and the risk of retreat is looming (Ministry of transport, personal correspondence, 2018; Tomes et al, 2016).

Thirdly, the Slovak ministry, the Austrian ministry and their Czech counterparts indicate in personal correspondence (11/07/2018) problems with the allocation of capacity, which could possibly lead to congestion. The Prague-Ostrava line for instance, changed from an underserved knot to a congested line. The coordination in itself of course demands attentions from ministries. One example is the case of Austria where numbers of court suits has demanded a lot attention from the department. One Austrian respondent (11/07/2018) notes that “*the whole experience with open access prove one thing, open access costs a lot of money*”, also because ministries have to face “*huge businesses, lawyers and consultants*” who sometimes outbalance ministries in terms of legal knowledge (Van de Velde & Röntgen, 2017).

Fourthly, while a higher number of trains always form an increased risk for the line’s punctuality, it is important to note that this risk is proliferated in the case of open access, because of the material variety of rolling stock (DfT, personal correspondence, 2018). And, lines are not isolated; Punctuality risks introduced on one particular line spread to other parts of the system, causing fall-outs and delays in otherwise robust rail lines.

Finally, the case of Italy has shown that open access can also produce positive unanticipated effects. The fierce competition on the HSR-lines that resulted in lower fares, a quality increase and a higher supply (read: frequency), has resulted in an enormous modal shift from domestic flights to the train. The fierce inter-modal price competition between rail and aviation ultimately pushed Ryanair out of the market (AllRail, personal correspondence, 06/2018; Bergantino, 2017). This modal shift resulted in a more environment conscious transport network for Italy (AllRail, personal communication, 06/2018).

## 7. CONCLUSION, DISCUSSION & RECOMMENDATIONS

A dynamic, competitive and, last but not least, *European* rail market. That is the ambition of the European Commissions that forms the very foundation of their ambitious Fourth Railway Package. Advocates for open access have heralded it as a chance to lower fares, boost quality and increase choice by promoting more competition. Unfortunately this thesis shows that open access operators have not always succeeded.

We commenced this thesis with an exploration of the complex nature of railway systems. In this study we compared ten vastly different railway systems all with their respective unique heritage. Decisions in the past have led to a certain ‘freedom of choice’ for open access in some countries. The infrastructural investments in Italy and Austria for instance, allowed these countries to opt for the introduction of open access ahead of other countries. In contrast, the case of Great-Britain proves that initially positive feedback incentivized a more dynamic market, but now limits the leap towards a truly dynamic open access market. This is an example of path dependency.

Complexity theory’s focus on interaction has proved to be a very useful point of view in this context. Interaction between actors such as regulators spurred the establishment of dynamic markets in some cases while different configurations lead to the opposite in Poland and Germany.

We found that accessibility is imperative for the extent to which a dynamic market develops. To promote access to their markets, governments can choose to lower the track access charges, refrain from high regulation and demanding entry processes and invest in more infrastructure capacity.

However, an accessible market is not enough to make open access ‘work’. The position of the incumbent is also important to take into consideration. Anti-competitive behaviour in Poland and to a



lesser extent in Germany show that incumbents do not always hesitate to use their strong position to their benefit. This can be balanced by a government that is determined to promote open access and a strong regulator. The presence of complexity is not intrinsically linked to system failure and highly complex systems can be successful.

Surprisingly, the unintended effects of open access are clearly underdescribed. Most articles seem to focus on the merits of open access and even in the qualitatively gathered data out of first hand, it was frankly quite difficult to come to a systemic analysis of the exact cost of open access. The limited data on the risks of open access points to an increased risk for punctuality, lower returning revenues from franchises a lower reliability over the risk that open access operators may cancel their service and a higher need for coordination.

What should be clear is that the choice for open access should be a conscious one. While the European fourth railway package seemingly makes that decision for the constituent members of the European Union, this research shows countries do have means to influence the extent to which open access operators will participate in their country.

## 7.1 DISCUSSION

*“journeying on without any visible cause of progress”* is part of the citation with which we commenced this thesis. Indeed, market orientation has journeyed on ever since its (re-)introduction in the nineties. Question is whether the motion of open access has a visible cause.

Governments can be function as a *cause*, but can hinder more open access likewise. The entrants themselves, then? Are they the cause for more open access? In some cases they are, but only if they are able to access a market and are protected from more powerful competitors by the design of the system or a diligent regulator. Finally, can open access truly be considered *progress*? It seems it depends who you ask. In many cases passengers stand to win in the form of lower fares, higher quality and more choice through a higher frequency of trains. Some governments initially heralded open access over this promise, but now seem wary to expand its role.

What is worrisome, is the limited knowledge on the negative effects of open access. This thesis has very limitedly served a better understanding of unanticipated effects, but it must be clear that more research is necessary to map these consequences. Surprisingly very little attention is awarded to these consequences also by the European Commission and the unclarity of these effects should at least alert decision-makers. The Fourth Railway Package has already passed, but it is now up to the member states to weigh their options.

## 7.2 RECOMMENDATIONS FOR EUROPEAN MEMBER STATES

The opening of the European railway markets is due for 2022<sup>4</sup> and in that sense it could be said that the introduction of open access is inevitable. However, what the results of this masterthesis show, is that governments still have means by which they can influence the scope of open access. Some countries will want to craft a system that is rather receptive of open access and therefor look for means to establish an attractive open access market, others are probably more wary of allowing to many new entrants to their respective system. Uniform recommendations for both groups are rather difficult to establish, therefor 7.2.1 offers recommendations for countries that despite the European directive

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<sup>4</sup> Some parts of the network are exempted from this provision until 2025

seek to limit the scope of open access. 7.2.2 offers recommendations for those countries that want to reap the benefits of a more market oriented system by stimulating open access.

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### 7.2.1 KEEPING OPEN ACCESS LIMITED

Governments that want to protect their incumbent and/or want to safeguard the income that it receives as the letting party, should opt for restrictions to open access entrants.

One direct way of lowering the attractiveness of entering the market while also sending a positive message to (potential) concession holders is the imposing of extra costs onto open access operators. In contrast to what one might think, the fourth railway package does allow the imposing of a levy so the first recommendation is:

*i. Impose a levy on open access operators.*

Furthermore, member states could opt for strong regulation in the form of an economic equilibrium test. Such an equilibrium test limits the risk that open access operator skim the cream of those lines that are commercially interesting. Although the negotiations on the EET are not concluded yet, it is important to note that the British authorities do expect that their stringent NPA-test is compliant with the most probable form of the EET. This effectively allows countries to set conditions with respect to quality and raises the barrier to enter the market.

*ii. Conduct an Economic Equilibrium test and include quality standards.*

Finally, if a country wishes to conduct such a test, it is best to establish a specialized regulator that is fairly close to the ministry. A specialized rail regulator that has to balance responsibilities vis-à-vis the competitiveness of the market with upholding the quality of the product is probably more closely related to the goals set by the ministry, such as in the cases of Poland and Germany, but also in the case of Sweden and the United Kingdom.

*iii. Establish a new rail regulator with 'short lines' to the ministry.*

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### 7.2.2 LETTING THE MARKET DO ITS JOB

If in contrast member states want to reap the benefits of a market oriented rail way system, with its attractive perks for passengers, governments should opt for an attractive and open market. Governments who want to stimulate competitiveness best refrain from setting regulatory checks and barriers. A naturally formed market can only be reached by allowing companies to rise and fall. Therefor the first recommendation is to

*i. Refrain from conducting an EET test, as is currently customary in Sweden and Germany.*

Second of all, new entrants do not want to be bothered with lengthy and unclear (and thus expensive) processes. Therefor it is imperative that member states guarantee a clear and speedy entry process. The second recommendations is therefor:

*ii. Guarantee a transparent access process, in contrast to for instance Romania.*

An open and welcoming entrance process is important, but not sufficient. Competition needs space on the tracks in the most literal way. The third and fourth recommendations are therefor as follows:

- iii. Increase Infrastructure capacity, for instance by investing in more double tracks and state of the art safety systems.
- iv. Free attractive timeslots on profitable lines for competitors of the incumbent, for instance through its priority rules.

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## APPENDIX 1: RELATIONS OF THE RELEVANT ACTORS

### AUSTRIA

1. OAO-ÖBB Infra: Open Access operators are dependent on the IM for access to infrastructure/infrastructure and train stations (ÖBB, 2018). This is important and non-substitutable. IMs are dependent on operators for raising revenue. While this is important, the demand from one particular actor can be replaced by that of another, so it is not primarily non-substitutable.
2. OAO-SCHIG: OAOs are dependent on the SCHIG for guarantees to an indiscriminate access to path and time allocation. This is important and non-substitutable. SCHIG is not dependent on OAOs.
3. ÖBB personenverkehr-ÖBB Infra: The incumbent is dependent on the IM for access to infrastructure/infrastructure and trainstations (ÖBB, 2018). This is important and non-substitutable. IMs are dependent on operators for raising revenue. Bearing in mind that the incumbent is responsible for 88% of the railway market, this is highly important and not easily substitutable.
4. ÖBB Personenverkehr-BMVIT: The incumbent is dependent on the ministry (and thus its owner!) for general directions and funding (for subsidized lines). This is important and non-substitutable. The ministry is dependent on ÖBB Personenverkehr for the crystallization of its transport policy. This is important, but indeed also substitutable for instance by dividing tasks over a number of other tenderers and OAOs (see the case of Great-Britain for example).
5. ÖBB infra-BMVIT: the IM is dependent on the ministry for funding, this is important but also substitutable for instance by increasing track access charges. BMVIT is dependent on the IM for the implementation of its transport policy. While this is important, it is also substitutable for instance by tendering the management of infrastructure to another.
6. OAO- Schienen-Control: as the entering party with a structural disadvantage (see for example Nicita & Belloc, 2016), OAOs are dependent on the regulator for guarantees to an indiscriminate entrance on the market. This is important and non-substitutable. Schienen-control is not dependent on OAOs.
7. Schienen-control – BMVIT: The regulator is dependent on the ministry for funding, this is important and non-substitutable. The ministry is dependent on the regulator for oversight over its policy domain, this is important and non-substitutable.
8. SCHIG-BMVIT: SCHIG is dependent on the ministry for funding, this is important and non-substitutable. The ministry is dependent on SCHIG for capacity allocation, while this is surely important, it is also substitutable by opting for the more conventional choice to allocate this to the infrastructure manager.

Relation	OAO- Infra	ÖBB	OAO- SCHIG	ÖBB - ÖBB Infra	ÖBB- BMVIT	ÖBB infra- BMVIT	OAO- Schienen- Control	Schienen- control – BMVIT	SCHIG- BMVIT	TRUTH TABLE
<b>Interde- pendency</b>	.67		.33	1	.67	.33	.33	1	.67	.62/.67

### BULGARIA

1. NRIC-RAEC: The infrastructure manager is dependent on RAEC for mediation in conflicts with and between railway undertakings (NRIC, 2018). This is important, but substitutable. RAEC is not directly dependent on NRIC.
2. RAEC-Ministry: RAEC is dependent on the ministry for funding and is an executive agency of the ministry, it's dependency is important and non-substitutable. Bearing in mind the very prominent set of tasks of the RAEC, the dependency of the ministry on RAEC is also non-substitutable and important.
3. OAO-RAEC: Open access operators are dependent on RAEC for indiscriminate access to the market, safety licenses and conflict mediation (see above). It's dependency is important and non-substitutable. RAEC is not dependent on OAO's
4. OAO-NRIC: OAOs are dependent on NRIC for granting track access, this is important but it can be substituted by an overriding decision of the RAEC. NRIC is in principle dependent on OAOs for track access charges, but bearing in mind that open access has so far failed to set foot on Bulgarian soil, this is not important and non-substitutable.
5. OAO-Ministry: OAOs are dependent on the ministry for the required operating license (NRIC, 2018), this is important and non-substitutable. The ministry is not dependent on OAOs.
6. Ministry-NRIC: The NRIC is dependent on the Ministry for the lion's share of its funding, this is important but substitutable through higher TACs. The ministry is dependent on the infrastructure manager for the implementation of its policy. While this is surely important, it could be substituted in the long-run by tendering

Relation	NRIC-RAEC	RAEC-Ministry	OAO-RAEC	OAO-NRIC	OAO-Ministry	Ministry-NRIC	Average
Interdependency	0	1	.33	0	.33	.33	<b>.33</b>

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## THE CZECH REPUBLIC

1. Český Dráhy – SZDC: The incumbent is dependent on the IM for access to rail infrastructure, this is important and non-substitutable. SZDC is dependent ČD for raising track access revenue, this is important, and due to the prominence of ČD on the Czech railways, also non-substitutable.
2. OAO-UPDI: as the entering party with a structural disadvantage (see for example Nicita & Belloc, 2016), OAOs are dependent on the regulator for guarantees to an indiscriminate entrance on the market. This is important and non-substitutable. UPDI is not dependent on OAOs.
3. OAO-SZDC: Open Access operators are dependent on the IM for access to infrastructure and train stations (SDCZ, 2018). This is important and non-substitutable. IMs are dependent on operators for raising revenue. While this is important, the demand from one particular actor can be replaced by that of another, so it is not primarily non-substitutable.
4. OAOs- Drazni Urad: OAOs are dependent on Drazni Urad for the mandatory licenses and certificates necessary for entering the market. This is important and non-substitutable. Drazni Urad is not directly dependent on OAOs.
5. Ministerstvo Dopravy-SZDC: the IM is dependent on the ministry for funding, this is important but also substitutable for instance by increasing track access charges. BMVIT is dependent on the IM for the implementation of its transport policy. While this is important, it is also substitutable for instance by tendering the infrastructure responsibility.
6. UPDI-Ministry: UPDI is dependent on the ministry for funding, which is important and non-substitutable. The ministry is dependent on UPDI for oversight which is also important and non-substitutable.

7. Ministry-Drazni Urad: is dependent on the ministry for funding, which is important and non-substitutable. The ministry is dependent on UPDI for oversight which is also important and non-substitutable.

Relation	ČD-SZDC	OAO-UPDI	OAO-SZDC	OAO-Drazni Urad	Ministry-SZDC	UPDI-Ministry	Ministry-Drazni Urad	TRUTH TABLE
<b>Interdependency</b>	1	.33	.67	.33	.33	1	1	<b>.67/0.67</b>

## GERMANY

1. OAO-DB Netz: Open Access operators are dependent on DB NETZ for capacity and infrastructure. This is important and non-substitutable. DB Netz is dependent on operators for raising revenue. While this is important, the demand from one particular actor can be replaced by that of another, so it is not primarily non-substitutable.
2. OAO-DB Stations & Service: Open Access operators are dependent on DB NETZ for access to train stations. This is important and non-substitutable. DB S&S is dependent on operators for raising revenue. While this is important, the demand from one particular actor can be replaced by that of another, so it is not primarily non-substitutable.
3. OAOs-other OAO/PSO: OAOs are dependent on other OAOs and PSOs for access to train stations (DB Netz, 2017). This is important but non-substitutable because although access can be enforced by the Bundesnetzagentur. (Nikitinas & Dailydka, 2016). Other OAOs/actors are not necessarily dependent on the new entrant,
4. OAO-EBA: OAOs are dependent on EBA for the required licenses to operate. This is important and non-substitutable. EBA is not dependent on new entrants (European Commission, 2012).
5. OAOs-DB mobility: OAOs are dependent on DB mobility for infrastructure. This is important and non-substitutable. DB mobility is dependent for revenues on OAOs. While this is important it is also substitutable in the sense that it is non-dependent on the demand of one particular operator (Nikitinas & Dailydka, 2016).
6. DB AG-DB Netze: DB AG is dependent on DB netze for the execution of its infrastructural responsibilities. This is important and non-substitutable. DB netze is responsible for DB for governance. This is important and non-substitutable (Nikitinas & Dailydka, 2016).
7. BNA-BDVI: BNA is dependent on the BDVI for funds and governance (important and non-substitutable) and BDVI is dependent on BNA for performing its responsibility of oversight and control over the railway system (Van de Velde & Röntgen), which is important and non-substitutable.
8. OAO-BNA: as the entering party with a structural disadvantage (see for example Nicita & Belloc, 2016), OAOs are dependent on the regulator for guarantees to an indiscriminate entrance on the market. This is important and non-substitutable. BNA is not dependent on OAOs.

Relation	OAO-DB NETZ	OAO-DB S&S	OAO-other operators	OAO-EBA	OAO-DB Mobility	DB AG – DB Netz	BNA-BDVI	OAO-BNA	AVG/TRUTH TABLE
<b>Interdependency</b>	.67	.67	0	.33	.67	1	1	.33	<b>.58/0.67</b>

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## GREAT-BRITAIN

Based on academic literature, reports and the websites of the relevant organisations, different relations could be derived from this system.

1. OAO – ORR: OAOs are dependent on ORR for track access rights. This resource is non-substitutable and important. ORR is not dependent on OAOs.
2. OAO – NR: OAOs are dependent on the NR for time slots, capacity and initial track access rights. These resources are very important, however since ORR can override the decision of NR, it is also substitutable. NR is dependent on OAOs for track access charges. This is important, but due to the large number of operators in Great-Britain also in many cases substitutable.
3. ORR – NR: ORR is dependent on NR for its information on capacity and timeslots. This resource is important and non-substitutable. NR is dependent on ORR for mediation in conflicts, this is important and non-substitutable.
4. ORR – Franchise: ORR is not dependent on franchises. Franchises are dependent on ORR for the right to appeal the Open Access candidacy of the OAO. This good is non-substitutable, but relatively low in importance due to the fact that ORR balances the economic field with or without appeals.
5. NR-Franchise: Network Rail enables franchises to weigh in on the decision-making process by means of an open consultation. This resource is not important and substitutable (other franchises are also able to respond). Franchises are dependent on NR for timeslots and capacity. These resources are very important, however since ORR can override the decision of NR, it is also substitutable
6. OAO-RDG: In order to receive the initial track access contract from NR, an OAO has to enter the RDG. This resource is thus important and not substitutable. The RDG can only function by grace of its members and is in that respect to a certain extent also dependent on the OAO. However, the importance of one membership is relatively low and due to the number of possible operators also substitutable.
7. NR –DfT: The NR is dependent on the DfT for the lion’s share of its funding and for its general course. The DfT is dependent on the NR to implement its rail policy. Both resources are non-substitutable and highly important.
8. ORR – DfT: DfT is dependent on the ORR for the implementation of its policy. This is substitutable and important. ORR is dependent on the DfT for funding. This is important and non-substitutable.

Relation	OAO-ORR	OAO-NR	ORR-NR	ORR-Franchise	NR-Franchise	OAO-RDG	NR-DfT	ORR-DfT	TRUTH TABLE/score
Score	0.33	0.33	0.67	0	0	0.33	1	1	0.46/ <b>0.33</b>

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## ITALY

1. Trenitalia-RFI: The incumbent is dependent on the IM for access to infrastructure/infrastructure and trainstations (RFI, 2017). This is important and non-substitutable. IMs are dependent on operators for raising revenue, especially due to the incumbent prominent position in the market. This is important and not substitutable.

2. OAO-RFI: Open Access operators are dependent on the IM for access to infrastructure/infostructure and train stations (RFI, 2017). This is important and non-substitutable. IMs are dependent on operators for raising revenue. While this is important, the demand from one particular actor can be replaced by that of another, so it is not primarily non-substitutable.
3. OAO-ANSF: as the entering party with a structural disadvantage (see for example Nicita & Belloc, 2016), OAOs are dependent on the regulator for guarantees to an indiscriminate entrance on the market. This is important and non-substitutable. ANSF is not dependent on OAOs.
4. OAO-DFTFI: OAOs are dependent on DFTFI for the required licenses to operate. This is important and non-substitutable. EBA is not dependent on new entrants (RFI, 2017)
5. OAO-ART: as the entering party with a structural disadvantage (see for example Nicita & Belloc, 2016), OAOs are dependent on the regulator for guarantees to an indiscriminate entrance on the market. This is important and non-substitutable. ART is not dependent on OAOs.
6. Trenitalia-ART: The incumbent is dependent on ART for the protection of its concessions through conducting EET tests. This is important, but also substitutable, because other strategies can be employed for protecting concessions. ART is not directly dependent on Trenitalia.
7. MIT-RFI: RFI is dependent on the ministry for governance and funding, this is important but substitutable through higher track access charges.. The ministry is dependent on RFI for the execution of its policy. This is important and non-substitutable.
8. MIT-DGTFI: DGTFI is dependent on the ministry for governance and funding, this is important and non-substitutable. The ministry is dependent on DGTFI for the execution of its policy. This is important and non-substitutable.
9. MIT-ANSF: ANSF is dependent on the ministry for governance and funding, this is important and non-substitutable. The ministry is dependent on ANSF for the execution of its policy. This is important and non-substitutable.

Relation	Trenitalia - RFI	OAO -RFI	OAO - ANS F	OAO - DFTI	OAO -ART	Trenitalia - ART	MIT -RFI	MIT- DGTF I	MIT- ANS F	TRUT H TABLE
<b>Dependenc y</b>	1	.67	.33	.33	.67	0	.67	1	1	.63/.6 7

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## POLAND

1. OAO-UTK: OAOs are dependent on UTK for safety licenses, entrepreneur licenses and, taking the past behaviour of the incumbent in mind, also for guarantees for indiscriminate open access. These goods are important and not substitutable. UTK is dependent on OAOs for access charges. This is important, but since there are multiple actors, also substitutable.
2. PKP-PLK: PKP and PLK are co-members of PLK group. PKP is dependent on the PLK for access to infrastructure. This is non-substitutable and important. PLK is dependent on the PKP for the lion's share of its track access income, based on its market share (IRG,2018). Although the market share of the PKP is for an incumbent not particularly high with 55%, this dependency is still deemed both non-substitutable and important.
3. OAO- PLK: OAOs are dependent on the PKP group/PLK for access to train stations, infostructure and infrastructure. This is not substitutable and highly important. PKP group/PLK is indirectly

dependent on OAOs for track charges. This is important, but since there are multiple actors also substitutable.

4. PKP Group/PLK-ministry: is dependent on the ministry of infrastructure for funds and, distinctive for the Polish case, as an instrument in competition (Król, 2017). This is both important and not substitutable. The dependency of the ministry on the PKP is hard to estimate. It might be that the relationship is not so much a dependency as it has something to do with revolving doors. Król (2017) points out that many high ranking officials of the Polish ministry are in fact former employees of PKP group.
5. UTK-Ministry. The UTK is dependent on the ministry for its funding and for directions. The ministry is responsible on UTK for the implementation of its policy. In this case, the relationship is reciprocally dependent that can be characterized as bot non-substitutable and important.

Relations	OAO-UTK	PKP-PLK	OAO-PLK	PKP group (including PLK)-Ministry	UTK-Ministry	TRUTH TABLE
<b>Interdependency</b>	.67	1	.67	.67	1	<b>.8/.67</b>

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## ROMANIA

1. CFR Infrastructura – CFR Catalori: CFR Catalori is dependent on CFR Infrastructura for access to infrastructure. This is non-substitutable and important. CFR Infrastructura is dependent on CFR Catalori for the lion’s share of its track access income. Although the market share of the PKP is for an incumbent not particularly high with 55%, this dependency is still deemed both non-substitutable and important.
2. OAO-OLFR: The open access operator would be dependent on the OLFR for acquiring a safety license, which is important and non-substitutable. OLFR is not dependent on the OAO.
3. OAO-ASFR: The open access operator would be dependent on the ASFR for acquiring an operating license, which is important and non-substitutable. ASFR is not dependent on the OAO.
4. OAO – RSC: The open access operator would be dependent on the RSC for the indiscriminate access to the market, which is important and non-substitutable. The RSC is not dependent on the OAO.
5. CFR Infrastructura-Ministry of transport: CFR Infrastructura is dependent on the ministry of transport for its funds, which is important and non-substitutable, bearing in mind the precarious financial situation of CFR Infrastructura (World bank, 2011). The ministry is dependent on CFR Infrastructura for the implementation of its policy. While this is important, it is also substitutable, for instance through tendering the infrastructural responsibilities.
6. CFR Catalori-ministry of transport: CFR Catalori is dependent on the ministry for funds, bearing in mind that CFR Catalori is not profitable (World Bank, 2011), this is regarded important and non-substitutable. The ministry is dependent on CFR catalori for the implementation of its policy. While this is important, it is also substitutable, for instance through tendering the transport responsibilities.
7. ministry of transport-OLFR: OLFR is dependent on the ministry for funds, this is important and non-substitutable. The ministry is dependent on the OLFR for the implementation of its policy, this is important and non-substitutable.

8. ministry of transport-ASFR: ASFR is dependent on the ministry for funds, this is important and non-substitutable. The ministry is dependent on the ASFR for the implementation of its policy, this is important and non-substitutable.
9. OAO-CFR Infrastruktura: OAO's are dependent on CFR Infrastruktura for access to infrastructure and infostructure, this is important and non-substitutable. CFR Infrastruktura is dependent on OAOs for track access charges, this is not important, due to the fact that there are currently no active OAOs and also substitutable by allowing other open access operators on the tracks.

Relation	CFR Infrastruktura – CFR Catalori	OAO-OLFR	OAO-ASFR	OAO-ORSC	CFR Infrastruktura-Ministry	CFR Catalori-ministry of transport	ministry - OLFR	ministry - ASFR	OAO-CFR Infrastruktura	Average/ Truth table score
<b>Dependency</b>	1	.33	.33	.33	.67	.67	1	1	.33	.59/.67

## SLOVAKIA

1. ZSSK-ZSR: ZSSK is dependent on the ZSR for access to qualitative infrastructure, this is important and non-substitutable. ZSR is dependent on the ZSSK for a large part of its income through track access charges, this is important, and due to the prominence of the incumbent, also non-substitutable.
2. OAO-ZSR: OAOs are dependent on ZSR for access to qualitative infrastructure, this is important and non-substitutable. ZSR is dependent on OAO for a part of its income through track access charges. This is due to the relative marginal role of OAOs and the fact that there are multiple open access operators not important and substitutable.
3. OAO-URZD: OAOs are dependent on URZD for guarantees of indiscriminate open access to the Slovak market. This is important and non-substitutable. URZD is not dependent on OAOs.
4. OAO-Dopravny Urad: OAOs are dependent on Dopravny Urad for the required licenses and safety certificates, this is important and non-substitutable. Dopravny Urad is not directly dependent on OAOs.
5. Ministry of Transport and Construction of the Slovak Republic-ZSSK: The ministry of Transport and Construction is dependent on the ZSSK for the implementation of its transport policy. While this is obviously important, it is also substitutable. ZSSK is dependent on the Ministry of Transport and construction for the directly allowing of its tender. This is important and non-substitutable.
6. Ministry of Transport and Construction of the Slovak Republic-ZSR: The ministry is dependent on ZSR for the implementation of its policy, this is important and non-substitutable. ZSR is dependent on the ministry for a significant part of its budget, this is important but substitutable, for instance through higher track access charges.

Relations	ZSSK-ZSR	OAO-ZSR	OAO-URZD	Ministry-ZSSK	Ministry-ZSR	Truth table
<b>Dependency</b>	1	.33	.67	.33	.67	.6/.67



## SWEDEN

1. OAO-JSF: OAO's are dependent on JSF for coordination. So far, it has resorted little effect (Van de Velde & Röntgen, 2017) therefore we regard this relation not important. It is also substitutable through other means of coordination. JSF is dependent on an OAO for the acceptance of its authority. While this is important, it is also substitutable, for instance by persuading other OAOs to become a member.
2. OAO-Trafikverket: OAOs are dependent on Trafikverket for the allocation of capacity and track access. This is very important and non-substitutable. Trafikverket is not dependent on individual operators (Trafikverket, 2018).
3. OAO-transportstyrelsen: OAO is dependent on Transportstyrelsen for safety licenses, national safety permits and permission to operate based on the company's reputation and background (Trafikverket, 2018), this is both important and non-substitutable. Transportstyrelsen is not directly dependent on OAOs.
4. Trafikverket-Naringsdepartementet: Trafikverket is dependent on the Naringsdepartementet for its budget and for its governance. This is important and non-substitutable. ND is dependent on Trafikverket for the execution of its policy. This is important but also substitutable, for instance through tendering the infrastructure management.
5. Trafikverket-Transportstyrelsen: Trafikverket is dependent on Transportstyrelsen for mediation whenever capacity conflicts arise. This is non-substitutable and important (Transportstyrelsen, 2018) Transportstyrelsen is not directly dependent on Trafikverket.
6. Naringsdepartementet-Transportstyrelsen: Transportstyrelsen is dependent on the Naringsdepartementet for governance and funding, this is important and non-substitutable. The ND is dependent on Transportstyrelsen for the execution of its policy. This is important and non-substitutable (Trafikverket, 2018).

Relation	OAO-JSF	OAO-Trafikverket	OAO-transportstyrelsen	Trafikverket-Ministry	Trafikverket-Transportstyrelsen	Ministry-transportstyrelsen	AVG/Truth table score
Dependency	0	.33	.33	.67	.33	1	0.44/.33

## APPENDIX 2: OVERVIEW OF TRUTH TABLE SCORES

### ACCESSIBILITY

#### TRACK ACCESS CHARGES

Cases	TAC	Truth table score
Austria	2.4	.67
Bulgaria	1	1
Czech rep.	1	1

<b>Germany</b>	5.1	0
<b>Italy</b>	2.5	.67
<b>Poland</b>	2.5	.67
<b>Romania</b>	1.9	.67
<b>Slovakia</b>	0.8	1
<b>Sweden</b>	1	1
<b>Great-Britain</b>	1.2	.67
<i>Cases not included in case study</i>		
<b>Estonia</b>	2.1	
<b>Hungary</b>	2.8	
<b>Latvia</b>	5.9	
<b>Lithuania</b>	4.2	
<b>Luxemburg</b>	2.1	

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#### AVAILABLE CAPACITY

<b>Cases</b>	<b>Capacity Availability</b>	<b>Truth table score</b>
<b>Austria</b>	0%	.67
<b>Bulgaria</b>	0%	.67
<b>Czech rep.</b>	0%	.33
<b>Germany</b>	0%	.33
<b>Great-Britain</b>	0%	.67
<b>Italy</b>	37%	1
<b>Poland</b>	16%	.67
<b>Romania</b>	34%	.33

<b>Slovakia</b>	78%	1
<b>Sweden</b>	63%	.33

#### ENTRY REGULATION

Case	EET	Non-economic conditions	Process constraints	Truth table score
<b>Austria</b>	No	No	No	1
<b>Bulgaria</b>	Yes	Yes	Yes	0
<b>Czech republic</b>	No	No	Yes	.67
<b>Germany</b>	No	Yes	No	.67
<b>Great-Britain</b>	Yes	Yes	No	.33
<b>Italy</b>	No	No	Yes	.67
<b>Poland</b>	Yes	No	Yes	.33
<b>Romania</b>	No	Yes	Yes	.33
<b>Slovakia</b>	Yes	Yes	No	.33
<b>Sweden</b>	No	No	No	1

#### OWNERSHIP

##### INFOSTRUCTURE

Cases	Timetabling	Path allocation	Track Access granting	Truth table
<b>Austria</b>	Integrated	Unbundled	Integrated	0.33
<b>Bulgaria</b>	Unbundled	Unbundled	Unbundled	1
<b>Czech rep.</b>	Unbundled	Unbundled	Unbundled	1
<b>Germany</b>	Integrated	Integrated	Integrated	0
<b>Great-Britain</b>	Unbundled	Unbundled	Unbundled	1
<b>Italy</b>	Integrated	Integrated	Integrated	0
<b>Poland</b>	Integrated	Integrated	Integrated	0
<b>Romania</b>	Integrated	Integrated	Integrated	0

<b>Slovakia</b>	Unbundled	Unbundled	Unbundled	1
<b>Sweden</b>	Unbundled	Unbundled	Unbundled	1

## INFRASTRUCTURE

<b>Cases</b>	<b>Train stations</b>	<b>Infrastructure</b>	<b>Truth table</b>
<b>Austria</b>	Integrated	Integrated	.33
<b>Bulgaria</b>	Unbundled	Unbundled	1
<b>Czech rep.</b>	Integrated	Unbundled	0.67
<b>Germany</b>	Integrated	Integrated	.33
<b>Great-Britain</b>	Unbundled	Unbundled	1
<b>Italy</b>	Integrated	Integrated	.33
<b>Poland</b>	Integrated	Integrated	.33
<b>Romania</b>	Integrated	Integrated	.33
<b>Slovakia</b>	Unbundled	Unbundled	1
<b>Sweden</b>	Unbundled	Unbundled	1

## OVERSIGHT

<b>Cases</b>	<b>Position of political incumbent</b>	<b>Position of regulator</b>	<b>Truth table score</b>
Austria	Ambivalent	Independent	.67
Bulgaria	Ambivalent	Independent	.67
Czech rep.	Ambivalent	Dependent	.33
Germany	Ambivalent	dependent	.33
Great-Britain	Contra	independent	.33

Italy	pro	dependent	.67
Poland	Contra	dependent	0
Romania	Contra	independent	.33
Slovakia	Pro	Dependent	.67
Sweden	Pro	dependent	.67

## COMPLEXITY

### NUMBER OF OPERATORS

Cases	Number of operators	Truth table score
Austria	40	0.67
Bulgaria	14	0
Czech Republic	19*	.33
Germany	340	1
Italy	32	0.67
Poland	82	1
Romania	26	.33
Slovakia	37	0.67
Sweden	21	.33
Great-Britain	36	0.67

### NUMBER OF RELATIONS

Cases	Number of dependency relations	Truth table score
Austria	8	.67
Bulgaria	6	.33
Czech Republic	7	.67

<b>Germany</b>	8	.67
<b>Italy</b>	9	1
<b>Poland</b>	5	.33
<b>Romania</b>	9	1
<b>Slovakia</b>	5	.33
<b>Sweden</b>	6	.33
<b>G</b>	8	.67

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(INTER)DEPENDENCY

Cases		10	9	8	7	6	5	4	3	2	1	AVG/TTS
<b>Austria</b>				.67	.33	1	.67	.33	.33	1	.67	.62/.67
<b>Bulgaria</b>						0	1	.33	0	.33	.33	..33/33
<b>Czech rep.</b>					1	.33	.67	.33	.33	1	1	.67/.67
<b>Germany</b>				.67	.67	0	.33	.67	1	1	.33	.58/.67
<b>Great-Britain</b>				0.33	0.33	0.67	0	0	0.33	1	1	0.55/0.67
<b>Italy</b>			1	.67	.33	.33	.67	0	.67	1	1	.63/.67
<b>Poland</b>							.67	1	.67	.67	1	.53/.67
<b>Romania</b>			1	.33	.33	.33	.67	.67	1	1	.33	.59/.67
<b>Slovakia</b>							1	.33	.67	.33	.67	.6/.67
<b>Sweden</b>					0	.33	.33	.67	.33	1	0.44/.33	0.4/0.33

AGGREGATED DATA

NR.	Case	Access.	Ownership	Oversight	Complexity	Outcome
1	Austria	.67	.33	.67	.67	1
2	Bulgaria	.33	1	.67	.33	0
3	Czech Rep.	.67	.67	.33	.67	1
4	Germany	.33	0	0	.67	.33
5	Great-Britain	.33	1	.33	.67	.33
6	Italy	.67	0	.67	.67	1
7	Poland	.67	0	0	.67	.33
8	Romania	.67	0	.33	.67	.33
9	Slovakia	.67	1	.67	.67	.67
10	Sweden	1	1	.67	.33	1

*-continues on next page-*

Cases	Accessibility				Ownership			Complexity			Oversight		Outcome measured as success	
	Entry regulation	Track access charges	Available Capacity	Infrastructure	Infostructure	Infrastructure & Stations	Number of operators	Number of relations	Inter-dependency	Markshare on Relevant line	Goal attainment			
Austria	1	.67	0	0	.67	0	.67	.67	.67	1	1			
Bulgaria	0	1	.33	1	1	1	.33	.33	.67	0	0			
Czech Rep.	.67	1	0	.33	1	.33	.67	.67	.33	1	1			
Germany	.67	0	0	0	0	1	.67	.67	.33	0	.67 <sup>1</sup>			
Great-Britain	.33	.67	0	1	1	.67	.67	.33	.33	0	1			
Italy	.67	.67	.33	0	0	.67	1	.67	.67	.67	1			
Poland	.33	.67	.1	0	0	1	.33	.67	0	0	.67 <sup>1</sup>			
Romania	.33	.67	.67	0	0	.33	1	.67	.33	0	.67			
Slovakia	.33	1	.67	1	1	.67	.33	.67	.67	.67	.67			
Sweden	1	1	1	1	1	.33	.33	.33	.67	1	.67			



### Factual state of affairs

1. As a means of introduction, could you indicate:
  - i. How many open access operators have been active between 2010 and now in the Czech Republic ?, What is the market share of open access operators in passenger miles currently?
  - ii. What has been the effect on fares of the introduction of open access?
  - iii. What has been the effect on the service quality of the introduction of open access?
  - iv. To what extent are there any unintended (positive and negative) side effects that have been introduced as the result of open access introduced in the Czech Republic?

### Entry

2. In what respect is the impact of a new entrant on the economic equilibrium tested? Does The Czech Republic already conduct an equivalent to the European EET? If so, could you shortly take us through the process?
3. To what extent are non-economic conditions measured for open access applications (i.e. quality of service, background of railway operator etc.)
4. To what extent do open access operators have the ability to influence time tabling, train path allocation and the sharing of information?
5. Is in principle every path open to open access or are certain paths designated with an open access status?
6. Who ultimately decides whether an open access operator gets entry to the Czech Railway Market?
7. To what extent is the level playing field guaranteed in The Czech Republic and have there been challenges regarding the level-playing field between open access operators and the incumbent in the past?

### Regulation and oversight

8. To what extent are open access lines monitored, for example concerning fares? (If there is currently no operator, please indicate what the normal procedure would be).
9. In what way is the service quality on open access lines monitored? Are there any requirements that need to be fulfilled?
10. The UK recently had a discussion on a possible levy for open access operators, due to the fact that the latter exclusively pay variable costs. To what extent is there a discussion on levies imposed on OAOs in the Czech Republic ?
11. What is the role of your regulator regarding open access?
  - a. What is the relation between the regulator and your ministry?

### Fourth Railway package

12. On first sight, what will be the impact of the fourth railway package on open access as it currently exists in the Czech Republic ? Which measures will need to be taken in order to be compliant with European legislation?