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WHICH ACCESS TO WHICH ASSETS FOR AN EFFECTIVE LIBERALIZATION OF THE RAILWAY SECTOR?*

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ABSTRACT

In the European rail industry, to enable competition in the market, entrants should be granted access to a large set of complementary services, beyond access to the tracks. For an efficient and effective entry, temporary access to quasi-essential complementary assets like rolling stock, mechanical maintenance workshops, data, schedules, etc. is required. In the liberalized rail sector, several observed anticompetitive practices involve distorted access to these quasi-essential facilities. Therefore, competition agencies must deal with litigation between the incumbent and new entrants. Most cases have been settled, resulting in commitments from the incumbent. We argue that such transitory and case-by-case remedies fail to produce favorable conditions for a secure and efficient entry. Thus, we propose to systematize such remedies through asymmetric and enduring *ex-ante* regulation.

JEL Codes: K21, L51, L92, L98

Keywords: rail, liberalization, essential facility, anticompetitive practices, asymmetric regulation

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1. INTRODUCTION

The railway sector in the European Union (EU) is undergoing deep transformation and radical change. Starting in the 1990s, after a constant decline in railway's share of the transport market, the EU proposed a novel organization of the sector to rely more on market mechanisms and enable competition between operators.

The legislative framework for organizing the single market for rail services was completed in 2016, with the adoption of the 4th Railway Package. It contains provisions to foster the integration of European rail networks, improve infrastructure governance and fully liberalize commercial rail services to facilitate the emergence of new players and it regulates competition in the public services market. But, as we will show in the paper, many obstacles remain before Europe achieves an effective competition in the market.

There are two main options for introducing market forces in the rail industry. One approach is to separate or “unbundle” train operations from infrastructure so that independent train-operating companies can compete with one another over the *same tracks* (Pittman, 2007). In other words, this option consists in a vertical separation between “below” and “above” the rail. This *open access* (OA) deregulation model—or *on-track competition*—implies that several train operators are allowed to compete for transport services. In this case, guaranteeing to new entrants “fair and undistorted access” to the network and beyond is a necessary condition, though we will show it is not sufficient to ensure successful liberalization. The EU has mainly chosen the OA deregulation model for long distance passenger services and freight services, and the model is already implemented in countries such as the UK, Sweden, Netherlands or Germany. As of December 2020, this market segment is fully open in the EU.

The OA model was partially inspired by the telecommunications⁴ and energy industries in the 1980s where potentially competitive activities—such as long distance or mobile telephony—were separated from less competitive ones (i.e., local hard-wire services). It was also inspired by air transportation where airlines have long competed while using airport facilities provided by separate entities (Gómez-Ibáñez and de Rus, 2006).

The second approach is to organize competition *for the market*. In this case, operators compete for the provision of a given service, for a specified period using, at least partially,

⁴ See, for example, the work of Laffont and Tirole (1999) in the telecommunications sector. For an analysis of an optimal access regulation with downstream competition, see, e.g., Kao et al. (2014).

the existing assets and workforce. This model is well known in public transport and has been implemented in passenger rail services mostly for non-commercial services that are not economically viable without subsidies. There are exceptions to this case, such as in Spain where the independent infrastructure manager (ADIF) organizes competitive tendering for the supply of high-speed services on its network. Three packages are allocated, with different frequencies on the three main high-speed routes. The contracts last for 10 years and the ADIF allocates capacity on its infrastructure and access to its stations.⁵

From a theoretical perspective there is no consensus in the economic literature on the optimal structure for liberalizing railways (see, e.g., Besanko and Cui, 2016, 2017, 2019). The trade-off between vertical integration and separation is not clearly determined. Besanko and Cui (2016, 2017) show for instance that horizontal separation—several vertically integrated networks competing with each other—has a strong tendency to produce a higher network quality, while unbundling has a strong tendency to result in lower transport prices and higher consumer surplus. From an empirical point of view, one should stress the relative heterogeneity of results of different studies. For instance, on one hand, Cantos et al. (2012) review the rail reforms of 23 European countries. They estimate the determinants of inefficiency and confront different methodologies to test their robustness. The authors find that the best system corresponds to complete vertical separation with measures that introduce competition (*in* and *for* the market) in the passenger and freight rail markets. On the other hand, Nash et al. (2014) find ambiguous results depending on circumstances, but for more densely used railways and those with a higher proportion of freight traffic, vertical separation raises costs by mainly misaligning incentives, leading each player to seek to optimize their own costs rather than those of the system as a whole.

In this paper, we focus on unbundling, or the competition *in* the market produced when track management is sufficiently separated from the running of trains (OA). Europe has chosen this system for passenger services operated on a commercial basis (as opposed to public services). Independent infrastructure managers have to offer transparent and non-discriminatory access to the tracks and to service facilities and the supply of rail-related services in these facilities (Article 13(3) of Directive 2012/34/EU) to guarantee an effective access to the market. However, it seems that the ongoing reforms have taken time to deliver

⁵ This is not an OA regulation like in Italy, Austria, or the Czech Republic (*see infra*). Spain has undertaken an original deregulation model. See “The Spanish high speed officially liberalized,” <https://mediarail.wordpress.com/2019/04/24/the-spanish-high-speed-officially-liberalized>

their benefits. Experience shows that the level of competition several years after the liberalization appears to be unsatisfactory (Henry, 2019). The RMMS report⁶ reveals that competitors had only a 10% market share in national commercial passenger markets in the EU27 in 2018, a slight increase (+2%) compared to 2015.

Two issues are therefore raised. First, are the access provisions enough to remove barriers to entry for new competitors? For an effective access, competitors need access to services that are provided not only by the infrastructure manager but also by the incumbent train operators. At the same time, competition authorities have been dealing with numerous cases based on article 102, relating to margin squeeze, strategic downgrading of the service quality provided to new entrants, capacity withholding, and delays in communicating information necessary to access the network. These cases have mainly been settled through negotiated procedures but as these commitments are intrinsically transitory and market-player specific, they fail to ensure undistorted competition *in* the market, and they do not guarantee a level playing field between incumbents and new entrants in the long run.

Second, these practices and their remedies are systematically related to quasi-essential assets. In other words, the denial of access is not usually related to the tracks (the natural monopoly narrowly defined) but to the very specific complementary assets necessary to compete with the incumbent. If the incumbent controls such assets, its competitors must acquire them to operate. These assets can be analyzed as a *barrier to entry*. A barrier to entry may be defined as a sunk cost that new entrants must bear, and that the incumbent did not previously have to pay. This is exactly the case here since these assets have been funded under an exclusive right regime. Acquiring these assets requires significant upfront investment and may delay or deter entry. These assets can act as quasi-essential facilities since external financiers consider that they induce a prohibitive cost for a new entrant, which operates on a limited scale compared to the incumbent. In other words, mandating that all incumbents in the EU provide compulsory access to some of these assets may partially correct the apparent market failure. But the scope of assets for which access should be mandated depends on specific features of the market e.g., contrary to the tracks and stations, these complementary assets are not easily qualified as an ‘essential facility’ and this should be done on a case-by-case basis (Meaney, 2015). Therefore, we consider that an *ex-ante* regulatory intervention is the most appropriate option to address these difficulties.

⁶ The Rail Market Monitoring (RMMS) assesses the effectiveness of the European rail liberalization (European Commission, 2021).

Additional regulatory mechanisms are needed to make the market effectively contestable and competition sustainable. The scope of these mechanisms should be precisely identified, including the assets held by the incumbent that would be accessible by new entrants on reasonable and non-discriminatory terms⁷. Our approach stresses the complementarity between the European directives (e.g., the 2016 4th Railway Package), competition-law enforcement, and an asymmetric sector-specific regulation to achieve an effective liberalization process.

Many of the concerns we raise are linked to asset ownership by incumbent train operators. In Britain, anticompetitive practices by incumbents were *de facto* not a concern since the incumbent British Rail was dismantled by the 1993 rail reform. Furthermore, commercial services have been included in the franchises and open access entry has been limited (Nash et al., 2019). For these reasons, barriers to entry seem to be more limited in Britain than elsewhere in Europe, though the British model may have some problems on its own (McNulty, 2011).

The paper is structured as follows. Section 2 gives an overview of the liberalization process of European railways. Section 3 identifies the main obstacles to effective competition by stressing the importance of barriers to entry and the effects of incumbents' anticompetitive strategies. Section 4 aims to demonstrate that competition-law-based remedies may be insufficient to guarantee the effectiveness of the liberalization process. Section 5 identifies the scope of regulation and the tools needed to ensure the effectiveness of sustainable competition in this field. Section 6 concludes and suggests avenues for future research.

2. LIBERALIZATION OF EUROPEAN RAILWAYS

First, we describe the very progressive legal process of liberalization. Second, we assess EU Member States' experiences of the market opening, which demonstrate the difficulties encountered in promoting effective competition in the sector.

⁷ Regulation has several advantages over the competitive tool; First, the timeframe is shorter. Second, the costs associated with competitive litigation must be considered. Third, it is a key signal for investment by entrants (lowering barriers to entry). Fourth, regulation allows for a broader scope than essential facilities. Fifth, the European framework with sectoral regulators who are certainly subject to competition law (unlike the USA) but who act in the first instance.

A/ Key steps in the European railway deregulation

The EU railway liberalization process consists of four Railway Packages adopted over the last two decades.⁸ The 1st Railway Package, adopted in 2001, focused on the governance of the rail sector. The text established the principle of vertical separation between infrastructure and operations. Accordingly, infrastructure managers were required to have separate accounts and to operate independently of service companies. There was no obligation, however, to have a legal or patrimonial separation between infrastructure and operations and, in many countries, the incumbent remained in charge of both, often organized within different business units. The 1st Railway Package established the principle of open, transparent and non-discriminatory access to infrastructure, and to make access effective, this provision was extended to complementary service facilities (Article 13, directive 2012/34/EU). A system of licenses for train-operating companies was organized and companies were required to have the appropriate license to operate trains on given lines. Finally, the international freight market was opened to competition.

The 2nd Railway Package, adopted in 2004, opened the domestic freight market from 2007. Although certain pioneers, such as the UK (1994), Germany (1994) and Sweden (1996), had already opened their national freight markets, most European countries did so between 2004 and 2007. In 2010, the 3rd Railway Package opened international passenger transport to competition. It included cabotage, i.e., the possibility for international carriers to offer domestic services as part of an international route.

Finally, the 4th Railway Package, adopted in 2016, provides for full liberalization of national passenger transport by 2020 (see, e.g., Gutiérrez-Hita and Ruiz-Rua, 2019).⁹ To promote competition, the 4th Railway Package strengthens the principle of OA and reinforces the independence of infrastructure managers.¹⁰ The purpose of these requirements

⁸ For a historical survey of the EU liberalization and preconditions for competition on the tracks, see Knieps (2003).

⁹ Directive (EU) 2016/2370 of the European Parliament and of the Council of 14 December 2016 amending Directive 2012/34/EU as regards the opening of the market for domestic passenger transport services by rail and the governance of the railway infrastructure, OJ L 352, 23.12.2016, p. 1-17.

¹⁰ For instance, para. 10 of the directive states that “*decision-making by infrastructure managers with respect to train path allocation and decision-making with respect to infrastructure charging are essential functions that are vital for ensuring equitable and non-discriminatory access to rail infrastructure. Stringent safeguards*

is to prevent conflicts of interest within companies that remain vertically integrated or when both the infrastructure manager and the train company are under public ownership.¹¹

Full liberalization is so far restricted to commercial lines. For public services, there is no on-track competition. However, from 2023 onwards, public services will also be outsourced and operated under contracts awarded following a competitive tendering process. By exception to this rule, direct award may be possible under certain conditions. Finally, we note that on-track competition may be restricted to protect the public service segments and avoid cherry-picking strategies by entrants.

B/ Country experiences in opening European railway markets

The liberalization of passenger rail services within the EU has been much slower than that of freight services, which was largely completed by 2007. The main difference between these markets is that freight transport is handled on a case-by-case basis while passenger transport is a regular service. This section presents the main European experiences of market opening both in freight and commercial passenger markets.

Freight services markets

Freight transport in the EU has been losing market share for years (from 12.51% in 2000 to 11.24% in 2016¹²) and it is well below the EU's goal to reach 30% by 2030. According to the European Commission, "*the overall situation of rail freight remains unsatisfactory: its modal share is around 19%*" (European Commission, 2021, pp.69). Nonetheless, Laroche et al. (2017) report that competition on the European rail freight market has been active between companies. They use indicators for the rail freight market such as persistence of profit and the ratio of capital cost to labor cost. These indicators show positive signs of increasing competition and attractiveness in the market despite the non-significant impact of liberalization at the European level. In 2017, the share of domestic incumbents—based on

should be put in place to avoid any undue influence being brought to bear on decisions taken by the infrastructure manager relating to such functions."

¹¹ The efficiency of vertical disintegration is challenged in the economics literature, especially in the case of dense networks with a significant share of the freight. See for instance Nash et al. (2014) and the McNulty report (2011).

¹² Based on tonne-kilometers, including inland modes only. See the European Commission's 2018 Statistical Pocketbook, available at https://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2018_en.

net tonne-kilometers—continued to decrease compared to 2015 but remains predominant. In the EU27, the average competitors’ market shares rose from 34% in 2015 to 42% in 2018.¹³

Operators have developed differentiation strategies and business models based on new services such as leasing and outsourced maintenance or drivers. These allow sunk costs to be reduced, increasing the attractiveness of market entry. Thus, the authors show a strong increase in the number of newcomers after the 2nd Railway Package.¹⁴ They argue that *“there is a market for rail freight in which it is possible to do business despite intra-modal competition, road competition and the imperfect European single market.”* (Laroche et al., 2017, p.60).

Several major obstacles remain, though (*see infra*). First, there are still barriers in the market which increase the costs for entrants. For instance, in Germany, Slack and Vogt (2007) documented that infrastructure was tailored to the needs of passenger traffic and the dominant Deutsche Bahn Group. Second, the persistence of profit analysis revealed imperfect competition in the market caused by imperfections in the single market itself (barriers and segmented market).

Marzano et al. (2018) list a series of obstacles in the rail freight sector, including persistent infrastructural gaps, delays and compromises in applying the EU Railway Packages, conditions of unfair competition with respect to rival modes, and difficulties in providing door-to-door instead of terminal-to-terminal railway services. Based on the Italian case, the authors designed an equitable incentive calculated on an origin-destination pair basis. In practice, they computed a discount to the access charge the rail operator is required to pay to the rail network infrastructure manager. The calculation also differs by type of train, to account for their different infrastructural needs, and can be adjusted on a yearly basis to account for ongoing network improvements. More generally, the Commission considers that the freight activity *“is suffering from the lack of a truly single European railway area, in particular from the lack of interoperability between the different networks and the lack of coordination of operations”* (European Commission, 2021, pp.70)

¹³ In a more a half of the Members States in which the incumbent is challenged, the market share of competitor is over 30%. See European Commission (2021).

¹⁴ Cowie (2015) reports the British experience for which there were few entrants. It is worth mentioning that rail freight was impacted by other factors like the developments in coal traffic.

To sum up, rail freight has been facing doubly imperfect competition (Crozet, 2017). On one hand, the intermodal competition between road and rail is unbalanced. On the other hand, intramodal competition between railway operators is still imperfect.

Passenger services markets

In 2017, domestic incumbents were still the largest market players in passenger rail services, with a market share of 76%, measured in passenger-kilometers. These services include public services. Foreign incumbents capture 8.4% of the market and new entrants 15.6% (IRG-Rail, 2019). There is currently competition on the market for passenger services (OA competition) in Germany, Sweden, Italy, Austria, Poland, Slovakia, and the Czech Republic.¹⁵ Britain also has a small amount of OA passenger competition. Other countries are in the process of implementing it. France is abiding by EU legislation which applies to all Member States: train paths can be booked since January 2019 and trains can operate on the high-speed network from December 2020.

Experience of on-track competition remains quite limited. Across Europe, Perennes (2017) identified 34 *open-access* competitors in the passenger sector in 7 countries¹⁶ and she reports that more than a half of the services were closed after a few months. Her study does not include joint services offered by several incumbents between their countries, like Thalys or Eurostar. She distinguishes four categories of competitors: new companies offering high-quality services on the most important routes (3); new companies on licensed segments that extend their service to OA segments in connection with their franchised network (8); low-cost companies (12), and niche operators (11). Very few services are competing directly with the incumbent on the commercial segments of the markets. And, among the three high-end services, only one is a pure entrant, the others are subsidiaries of a foreign incumbent

¹⁵ In France, the incumbent still controls almost the entire passenger market, either directly or through its subsidiaries (Thalys, Eurostar, etc.). Because of the COVID-19 pandemic, some operators have postponed their entries and Thello, SNCF's sole direct competitor, has put an end to the service provided on its Milan-Marseille and Venice-Paris routes (ART, 2021, p.47).

¹⁶ Austria, Germany, Czech Republic, Italy, the Netherlands, Sweden, and the UK.

operator.¹⁷ Commonly entry into rail passenger transport is often made by incumbents, particularly in the low-cost high-speed segment.¹⁸

These figures are therefore rather deceptive and competition in the market remains limited in the passenger services market. Indeed, in Germany, no competitor managed to capture significant market share in OA segments. Uncertainty seems to be a major obstacle to entry; Perennes (2017) mentions capital risk as the main obstacle to entry and documents that most of the entrants used refurbished rolling stock to minimize that risk. It is therefore not a surprise to observe that high-end competitors are few on the market. In France, Cherbonnier et al. (2017) show, using simulations, that the outcome of market opening remains highly uncertain and depends crucially on whether the incumbent distorts prices and how much access to the train paths the entrant obtains. Ivaldi and Pouyet (2018) provide a methodology to estimate the parameters of the railway systems that are relevant to the evaluation of various policy reforms. They show that the incumbent French rail operator has not been fully and properly regulated and argue that policy reforms should be designed to account for the incentives given to the incumbent.

In Poland, *Interregio*, a challenger of the state-owned PKP Intercity developed a large-scale supply of services and managed to capture a substantial fraction of the market (approximately one third) before it had to exit in 2015. Exit was caused by an alteration in the challenger's business strategy combined with an unfavorable change in the market environment and the incumbent's use of political action to put its competitor at a disadvantage (Król et al, 2018). It should be noted that *Interregio* was not financed by private investors but by regional public authorities.

Despite the lack of entry, there are some successful experiences where competition clearly benefits consumers, who are charged lower prices and receive higher quality services. Italy is probably the most successful story with two high-speed train companies competing

¹⁷ According to the IRG-Rail report (2019), rail operators should be differentiated between new entrants (pure players who are not subsidiaries of any incumbent operators), the incumbent(s) of the observed market, and foreign incumbents who are new entrants to the observed market but incumbents in their home market, for instance, SNCF in the German market. To provide an illustration, in 2016, market shares of the French freight market were the following: 17% pure players, 18% foreign incumbents, and 65% SNCF. According to a 2019 report of the French Transportation Regulation Authority the cumulated market share of the incumbent and its subsidiaries represents 75% of the freight traffic (ART, 2021, p.11).

¹⁸ For instance, the RMMS report provides cases of OuiGo (SNCF), Izy (Thalis), Avlo (RENFE), and eventually Rielsfera (SNCF) on the Spanish market (European Commission, 2021, pp. 129).

on the tracks. Beria et al (2016) observed an average 15% price decrease for the Milan-Ancona service. More broadly, Beria et al. (2019) found that prices are not the only drivers of intramodal competition for rail; demand, capacity, users' willingness to pay, and distance also play an important role. Furthermore, Bergantino et al. (2015) report a positive impact of entry on the supply of high-speed train services and a negative impact on the price of airfares on comparable routes.¹⁹ In Italy, as soon as it entered high-speed train services, the new entrant sought to innovate in terms of the quality of on-board train services (free Wi-Fi, multimedia services, high-end catering). In the end, both the new entrant and the incumbent operator have developed complementary buses, car rental, and car-sharing services. Both companies have also expanded their train station services (ARAFER²⁰, 2016).

Similarly, in Sweden, Vigren (2017) reports a 13% price decrease for the Goteborg-Stockholm service after the entry of a competitor. Other studies find an increase in the quality of services following entry. For instance, Tomeš et al. (2014) show an improvement in both frequency and services on the Prague-Ostrava line. Using a consumer survey, Tomeš et Fitzová (2019) conclude the same for the Prague-Brno line: OA competition increased the quality of services, especially for the incumbent's trains.

3. MAIN OBSTACLES TO EFFECTIVE COMPETITION

The examples above show that successful competition on the tracks benefits consumers. Entry remains limited, however, and in this section, we examine the main obstacles to the development of effective competition.

There are, indeed, important barriers to entry. These barriers can be structural (asset specificity) or linked to the incumbent's foreclosure strategies (e.g., anticompetitive practices). And even where there is entry, some operators may be forced to exit because they may not be able to compete on the merits.

A/ Structural barriers to entry: lack of entry and reasons for exit

¹⁹ Further evidence of intermodal competition can be found in Cascetta and Coppola (2014).

²⁰ Since October 2019 the French transport regulator (the ARAFER) was renamed as ART for *Autorité de régulation des transports*.

The ownership unbundling was not requested by European directives. For instance, the Deutsche Bahn has never been vertically separated. Furthermore, the French SNCF had abandoned its managerial unbundling to converge towards the German system. Even in the case of a functional unbundling as European directives recommend, the main problem identified across the EU is the following: transparent and non-discriminatory access to the train paths is not enough to remove all the structural barriers to entry. There are several barriers beyond access to the tracks that possibly hinder a new entrant from challenging the market.²¹ And, even if the access requirement imposes that infrastructure managers offer a full access package, access to assets beyond the track remains problematic and we identify at least four structural barriers to entry.

(i) Network and asset specificities and access to rolling stock

For passenger services, rolling stock is not available through leasing, as is the case for example in air transportation, and there is no second-hand market for rolling stock. Furthermore, the assets used abroad cannot be easily redeployed in other countries because of their technical specificities (Crozet, 2017).²²

Therefore, for an entrant, the provision of in-house traction services is not necessarily possible in the short term or even in the long term, because the investment can be too costly and not easily redeployable (e.g., Riordan and Williamson, 1985). The delivery times of the ordered material can be long, leading to a certain supply rigidity. Consequently, even if a strong challenger decides to enter the market, it will face potentially huge sunk costs in case of failure. To amortize the investment, the scope of entry must immediately be significant.

To overcome the high capital cost and facilitate entry, entrants should have access to high quality rolling stock. Those rolling stocks are owned either by the incumbent, by a public authority, for instance the franchising authority or by private leasing companies as it is the

²¹ Access to the train path is nevertheless identified by the European Commission as a barrier to entry since usage plans (e.g., timetables) are defined on a national basis, which has the effect of complicating the activity of trans-European operators (European Commission, 2021, p. 112). Freight activities are particularly exposed to these difficulties. It can explain some suboptimal ordering behaviors in terms of train paths.

²² For instance, rolling stock can be specific to a subset of a given network. Yvrande-Billon and Ménard (2005) stress that before the liberalization, the British railway system was decentralized with a segmented regional organization. Consequently, the rolling stock was very heterogeneous and so vehicles and locomotives were not interchangeable. The monopoly structure artificially maintained highly specific assets that generated important rigidities and impaired entries at the beginning of the liberalization process.

case in Britain with the ROSCOs.²³ Incumbent ownership is clearly a barrier to entry (Nash et al., 2019). In Slovakia, the incumbent company was fined for abuse of dominance after it refused to lease specific locomotives to new entrants or to refuel their locomotives in its specific and indispensable infrastructure.²⁴

Independent ownership can overcome this barrier to entry. But one important concern is the provision of appropriate incentives to invest in specific assets. For that, it is necessary to develop an approach that incorporates the redeployability of assets. This could be for instance a standardization of the material or a public guarantee (or public ownership) for part of the fleet. The regulator can tackle this issue by mandating sharing procedures of some of the assets controlled by the incumbent. These ones would give access to rolling stock at a substantially lower capital cost and facilitate investment and asset redeployability. The RMMS report identifies the lack of adequate rolling stocks available on the secondary market or in leasing, as “*a significant deterrent for market entry and fair competition*” (European Commission, 2021, p. 134), even if some new entrants invest in their own rolling stocks (IRG-Rail, 2020).

In addition, the specificity of the energy supply constitutes a barrier to entry if manipulated by the incumbent to increase rivals’ costs. The RMMS report emphasizes that “*differences in track gauges and electric current available for traction mean that the same locomotives and wagons cannot be used in all countries.*” (European Commission, 2021, pp. 132). For instance, the case related to Deutsche Bahn illustrates how an incumbent can engage in margin squeeze strategies against new entrants by artificially increasing their energy costs.²⁵ In this case the new entrants were obliged to use the electricity sold by subsidiaries of Deutsche Bahn because no other provider could supply electricity at the specific frequency of 16.7 Hertz used to power the locomotives on the network.

A difficulty also lies in the training and certification of train drivers. Incoming entrants may have difficulty finding qualified labor. Other barriers to entry may exist due to the requirement for certification, particularly in terms of safety and guarantees of compatibility with signaling systems. Difficulties are linked to the impossibility of easily using rolling

²³ In the UK, the rolling stock leasing companies (ROSCOs) own most of the coaches, locomotives, and freight wagons on the rails, which they hire out to train and freight operating companies.

²⁴ Antimonopoly office of the Slovak Republic, decision *Cargo*, 5 December 2014 <https://www.antimon.gov.sk/council-of-the-antimonopoly-office-upheld-the-10-million-fine-for-cargo>

²⁵ European Commission, decision No. 39678 *Deutsche Bahn I*, 18 December 2013.

stocks from one country to another, and the need to obtain authorizations from entities linked in each State to the operators in place.²⁶

(ii) Maintenance and commercial services access

Entrants need access not only to the tracks, but also to maintenance and repair centers.²⁷ The investments necessary for the construction of maintenance facilities and the characteristics of such facilities, held by the incumbent transport operator, are likely to give the latter a clear advantage over its rivals. The difficulty of accessing maintenance centers is a major barrier to entry for new players. The French rail regulatory authority, ARAFER (2018) reviewed practices in several countries and noted that regulation of technical and pricing conditions for access to existing maintenance facilities and services made it easier for new operators to enter the market.²⁸ It recommended that a significant range of services in maintenance facilities be regulated. Similarly, to increase transparency, it is important to have an inventory of existing maintenance facilities, the content of the services they provide, the capacities available in these facilities, and the price at which they can be accessed.

The April 2019 ARAFER decision against SNCF illustrates that access to maintenance-related infrastructure and services is essential for containing the costs of new entrants and guaranteeing the quality of the service provided.²⁹ French regulations require that the incumbent operator provide access that meets all the needs of entrants at a price that covers the cost of the service plus a reasonable remuneration. The regulator found that the incumbent failed to comply with these requirements and showed deficiencies both in pricing and access.

²⁶ “Trains need certifications and homologations before being authorised to access the infrastructure. Certifications and homologations are provided by specialised companies. Given the knowhow needed for this kind of activity, these specialised companies may be subsidiaries of incumbent railway operators. In this case, particular attention must be paid to ensure that competition is not hindered through the authorisation process” (European Commission, 2021, pp. 134).

²⁷ For instance, the French railway regulator recommended in a May 2019 opinion to request from the incumbent to provide to the new entrants an access to its maintenance centers in transparent and not discriminatory conditions (para. 70). See ARAFER, opinion n°2019-028 of 9 May 2019.

²⁸ On October 1, 2019, ARAFER became the *Autorité de régulation des transports* (ART). Its competences have been extended.

²⁹ ARAFER, Decision n° 2019-O25 of 18 April 2019.

(iii) Difficulties in accessing data

Market access for entrants may be also impeded in two ways: limited access to schedules and online booking services and an imperfect access to information related to slots, availability, and customer data. The solution is to remove the information rent enjoyed by the incumbent by requiring the incumbent operator to give new operators access to its customer database, in compliance with privacy legislation. Competition impediment through distorted access to data can take place both in the case of competition in the market and for the market. For instance, the Dutch competition authority fined the incumbent in the Netherlands for providing incomplete and delayed responses to rivals' requests for access to information necessary for a bid, which disadvantaged the new entrants.³⁰ In the same vein, ARAFER underlines that the incumbent might voluntarily underinvest in its own information system to reduce its quality to impair the capacity of its potential competitors to provide good quality services and thus to raise barriers to entry.³¹ The Commission also points out that difficulties in ticketing and payment for trans-European routes can also act as barriers to market access.³² Regulators and organizing authorities have to settle procedures for sharing all the relevant information and data with the competitors. For instance, the British government requires that, for services operated under public service contracts, data on patronage to be supplied to itself and made available to competing bidders.

(iv) The incumbent's reputation

The economics literature tends to consider that the incumbent benefits from reputational advantage because of the *status quo* bias and in some cases its recognized quality of services (Paha et al. 2013, Fröidh et Byström, 2013). The incumbent's reputation among consumers could be a barrier to entry for new operators. Customers may face (psychological) switching costs, as surveys on the Cologne-Brussels and Cologne-Amsterdam lines demonstrate (Paha et al., 2013). Thus, to avoid this imbalance between the new operators and the incumbent

³⁰ Dutch Competition Authority, n° 16.0691.31, *Nederlandse Spoorwegen*, 22 May 2017.

³¹ See para. 52, ARAFER, avis n°2019-028 du 9 mai 2019 sur le projet d'ordonnance relative à la nouvelle SNCF.

³² European Commission (2019).

operator, ARAFER (2018) recommends that the various activities of the public rail group be clearly distinguished from the incumbent operator, in terms of brand and logo.³³

Another illustration can be found in the French *voyages.sncf.com* case (2009).³⁴ The *Cour de cassation* closing the case confirms the French competition authority's decision and insists on the advantage provided by the incumbent's reputation. The subsidiary benefited from advertising investments and from a perceived guarantee brought by the incumbent's reputation for a new activity (online booking).³⁵ According to the competition authority, the reputational advantage of the incumbent may be crucial in the first years of the development of a new market.³⁶

However, sometimes the users' experiences with the incumbent can be also a competitive disadvantage if the latter commonly has delivered low quality of its services in history. In their survey quoted above, Tomeš et Fitzová (2019) show that the incumbent's services were used more often by older people, people holding loyalty cards, and business passengers.

B/ Behavioral barriers to entry

Several cases show that the quasi-essential nature of some complementary facilities can be the basis of exclusionary strategies by incumbents. The effects of such strategies are similar to refusal of access and act as a barrier to permanent and efficient entry. Relative denial of access may be distinguished from absolute refusal in the sense that access is allowed but under degraded conditions that encourage exit. Some strategies make entry costlier or even impossible, while other practices degrade the effectiveness of the entrant's business model once it has entered.

The exclusionary risk stemming from the incumbent's strategic behavior is significant considering the asymmetries between actors. The incumbent can also implement an

³³ The same concern was expressed by the French energy regulator, the *Commission de régulation de l'énergie* (CRE), which mandated the incumbent to change the name and the logo of the electricity transmission and distribution system operators in accordance with the code of good conduct.

³⁴ French Competition Authority, decision n°09-D-06 of 5 February 2009, related to practices implemented by SNCF and Expedia Inc. in the online distribution of train tickets. See *infra*-Section 3B.

³⁵ French *Cour de cassation*, decision n°423 of 16 April 2013, 10-14.881.

³⁶ French Competition Authority, decision n°13-D-20 of 17 December 2013 relating to practices implemented by EDF in the services sector for the production of photovoltaic electricity.

anticompetitive behavior to foreclose the market. Importantly, these anticompetitive practices are not limited to access to the infrastructure.

In this context, one may wonder whether OA and infrastructure separation are enough, even though the 4th Railway Package strengthens the conditions of non-discrimination and the absence of conflicts of interests. However, it does not seem to ensure sustainable market contestability, or at least noncooperative oligopoly interaction. Along with the entry barriers related to access to (almost essential) assets, we should consider the anticompetitive practices implemented by the dominant operator. We provide three examples of anticompetitive practices simply to illustrate how market contestability may go unheeded.

(i) The Lithuanian case (2017)

This first case provides an example of how a new entrant's access to infrastructure may be impeded. It illustrates an incredibly blatant strategy undertaken by an incumbent. Here the denial of access to competitors took the form of the strategic dismantling of a rail infrastructure. The EU Commission imposed a fine of 28 million euros on the Lithuanian incumbent operator, Lietuvos Geležinkeliai, for hindering competition in the rail freight market. *"The European Union needs an efficient rail freight market. It is unacceptable and unprecedented for a company to dismantle public rail infrastructure to protect itself from competition,"*³⁷ Margrethe Vestager, the EU competition commissioner, stated. Despite its rather extreme nature, this case illustrates possible ways of denying access to an essential infrastructure.³⁸ Access may be refused if the infrastructure holder provides evidence that access is objectively impossible, however that impossibility must not, of course, result from its own behavior. A refusal of access can be considered abusive if the asset holder has not made the necessary investments to be able to respond to requests for access,³⁹ or if it has not taken internal reorganization measures to free capacity (see the Frankfurt airport case cited below). Another way of denying access to essential facilities is to delay acceptance of an access request and propose other timetables than those required, as for instance in the GVG case settled by the EC in 2003.⁴⁰

³⁷ Margrethe Vestager, European Commission, 2 October 2017.

³⁸ Commission decision, AT.39813 – Baltic Rail, 2 October 2017.

³⁹ For a comparable statement of objections in the energy industry, see the ENI case. European Commission, Decision COMP/39.315 – ENI, 29 September 2010.

⁴⁰ European Commission, Decision 2004/33/EC, 27 August 2003, case COMP/37.685 GVG/FS.

In November 2020, the General Court upheld the Commission’s decision and stressed that the access to an alternative longer path mainly located in the Lithuanian territory could rise specific competition concerns. While the rail paths are available, some additional rail services controlled by the incumbent can be used as a barrier to entry. As the Court underlines, *“the provision of additional rail services was not necessarily regulated or was regulated in a way which left some leeway regarding prices and the quality of the service provided. That was stated to be the case for certain maintenance services (for rolling stock), access to certain facilities (such as marshalling yards or parking and cleaning facilities for rolling stock) or back-up services (in particular in the event of a train breaking down and disrupting traffic).”* Therefore, the incumbent *“could largely dictate the terms upon which those services were provided, leading to uncertainty as to their quality and cost.”*⁴¹

(ii) The SNCF freight case (2012)

The following case exemplifies an exclusionary abuse at the expense of the new entrant, Euro Cargo Rail (a DB subsidiary).⁴² The practice must be placed in the context of the prevailing organization of the French network at the time. Despite a formal vertical disintegration, the train operator (SNCF) remained the delegated infrastructure manager on behalf of the track owner (RFF).⁴³ In the same vein, specific and costly assets such as freight-dedicated wagons⁴⁴ and locomotives were pooled to facilitate new entries by lowering access and exit barriers, however, these assets were also managed by the incumbent. The incumbent operator thus had an informational advantage over new entrants: it could

⁴¹ Judgment of the General Court of 18 November 2020. Lietuvos geležinkeliai AB v European Commission. Case T-814/17, paragraph 259.

⁴² French Competition Authority, decision No. 12-D-25 of 18 December 2012 on practices implemented in the rail freight transport sector.

⁴³ One may observe vertical reintegration through the new French law related to railways. See law n° 2018-515 of 27 June 2018.

⁴⁴ For instance, one of the anticompetitive practices at stake in the French freight case concerned the “EX”-type wagons, which are specifically used for large-tonnage transportation. As the competition authority states, *“in 2006, when the railway freight sector opened up to competition, the only rental company providing such wagons in France was SGW (a subsidiary of the SNCF group), to whom all other EX-wagon owners and holders had entrusted their fleet’s rental management”*. However, the SNCF kept the exclusive use of the whole EX-wagon fleet and did not make them available to new entrants. The competition authority stated that *“during the first two years after the market opened up to competition, EX wagons represented an essential resource in the short term that would have enabled SNCF’s competitors to enter and develop in the market”*.

anticipate their commercial strategy (via requests for access to the rails to establish estimates); it knew the reliability levels for each piece of equipment in the pools; finally, it had complete information on the location of the loading and unloading areas. The incumbent's very particular position facilitated the implementation of foreclosure strategies.

The incumbent employed three foreclosure strategies. The first was to exploit its informational advantage (leaks on train path bookings, leaks on technical visits necessary for entrants, etc.) that allowed targeted predation of entrants. The second was to overbook tracks⁴⁵ and wagons (despite additional costs and penalties). A substantial fraction (20%) of the reserved tracks were unused and the incumbent operator systematically reserved single-track sections to make access by its competitors impossible. Similarly, specific freight wagons were overbooked and were therefore unavailable to new entrants. Overbooking is not anticompetitive in itself, but it can raise competition-related concerns when it goes beyond what is necessary to cover the railway's operating risks. Paying for an unnecessary booking does not make economic sense, except in terms of hindering competition. The incumbent willingly loses money with no prospect of compensation except increasing its future market power by creating an artificial bottleneck that limits the capacity of new entrants to access the market. Such an overbooking can be analyzed as predatory behavior. The third strategy was to use its knowledge of the equipment in the pools to make the least reliable locomotives available to competitors. This made it possible both to increase rivals' costs and to degrade the quality of service they provided to users. SNCF reserved the modernized locomotives for its own use only. One can draw a parallel with the Slovak case quoted above in which the incumbent obliged the new entrant to use diesel locomotives and not the more efficient electric ones, and in addition refused to refuel these locomotives in its own facilities.⁴⁶

(iii) *The voyages.sncf.com case (2009)*

⁴⁵ The French competition authority recognizes that overbooking practices could be necessary to “anticipate the hazards inherent in rail transport activity and ensure the continuity of their transport plan.” (para. 130). However, “it is reproached [to the incumbent], on the one hand, for having implemented a policy of overbooking on a massive, even generalized scale, and in any case disproportionate to the possible need to prevent the aforementioned hazards, and, on the other for not having returned these train paths when they were not used.” (para. 431). See Footnote 41.

⁴⁶ Antimonopoly office of the Slovak Republic, decision *Cargo*, 5 December 2014.

A third type of practice, still based on a distorted access to a quasi-essential facility, involves behaviors aimed at consolidating the incumbent's dominant position in the passenger transport services market and at extending it to downstream markets (e.g., online booking). Such behaviors correspond to anticompetitive leverage strategies. The *Voyages.sncf.com* case⁴⁷ provides an interesting example of such practices.

The incumbent, SNCF, had concluded an agreement with Expedia to commercialize online tickets. This joint venture enjoyed privileged conditions of access to a database for reservations, ResaRail.⁴⁸ Competitors were required to purchase a license to use a computer interface, Ravel, in order to access the database. This led to both tariff and technical discriminations. The first was financial. SNCF and Expedia benefited from direct and free access to ResaRail. Traditional travel agencies accessed it through an intermediary (Global Distribution Systems), which charged a binomial tariff: 20 € per month fixed cost plus 0.004 € per ticket issued. The situation was significantly worse for online agencies: the price for acquiring the Ravel license ranged from 1,500 to 54,000 € and each ticket issued cost €1.10. The financial conditions of access induced significant distortions in the downstream market of online railway ticket commercialization, consolidated the relative advantage of the incumbent, and targeted its most dangerous competitors. The practice also induced technical discriminations. The service provided by new entrants could not be as valuable as that of the incumbent because the system initially did not allow them to issue electronic tickets or to display (less costly) iDTGV offers on the first page of search results.⁴⁹

4. CURRENT LAW DOES NOT ALLOW FOR EFFECTIVE COMPETITION

We have seen that the need for access for new entrants goes beyond the tracks. Complementary quasi-essential assets are required for efficient entry into the railway market, especially when there is no viable alternative. In this section, we will see that several previous competition-law-based decisions by the European Commission and national competition authorities have settled cases relating to access and have imposed access where

⁴⁷ French Competition Authority, decision n°09-D-06 of 5 February 2009, *op. cit.*

⁴⁸ The ResaRail database contains information on timetables, available seats, and ticket prices of SNCF rail passenger transport services.

⁴⁹ This competition-law-based case was also settled through a negotiated procedure. The theoretical advantage of such a settlement is to immediately ensure a level playing field. However, SNCF competitors have stated it was too late to save competition.

necessary. However, the complementary assets were never qualified from a legal point of view as “essential facilities”,⁵⁰ and the remedies were obtained through commitment procedures. In other words, these commitments are only negotiated on a case-by-case basis without any mandatory effects on other incumbents and are intrinsically transitory. Therefore, they do not produce a real case law and do not address the structural difficulties of the railway liberalization. In other words, access beyond the tracks should be better organized to facilitate the entry of the competitors (see Meaney, 2015).

In this section, we present the scope of such remedies and ask whether a sector-specific regulator could be the best body to provide a general framework for an effective and sustainable competition on the market. Clearly, for an effective market liberalization, barriers to entry should be removed. This can be done by providing access to other facilities besides train paths. A competing railway undertaking would need the following services to operate on the market: access to train tracks, traction services (locomotives and drivers), terminal services, commercial and technical spaces, and schedules and booking services. Effective access is, in principle, guaranteed by the Directive but, in practice, this might not be the case.

A/ Effective access requires more than access to the tracks

Relying on competition-law-based remedies is possible as case law demonstrates. However, it remains notably insufficient. Commitments are negotiated on a case-by-case basis. They involve only one relevant market and one market player, and they cannot produce structural effects on the whole EU internal market. As it appears that the 4th Railway Package does not address this issue, a more systemic approach must be implemented.

Providing complementary institutional arrangements seems relevant to ensure an effective, practicable, and sustainable competition in the field. The structural barriers and the strategic behaviors used against new entrants demonstrate that an open access to the network is not enough to achieve this competition. In EU case law, competition remedies,

⁵⁰ According to the essential facilities doctrine, while a dominant operator controls an asset that its competitors cannot bypass and if this asset is indispensable to access the market because of its natural monopoly situation or because of the unreasonableness of its replication in financial or in technical terms, the essential facilities owner may be bound to provide new entrants an access in fair, reasonable and non-discriminatory terms.

particularly through negotiated procedures (commitment decisions), have often been used to supplement liberalization directives or to counterbalance incumbents' market power (see, e.g., de Hauteclocque et al., 2011). However, competitive tools alone may not be enough. They are implemented on a case-by-case basis and they do not make it possible to impose EU-wide uniform and long-term remedies, as we demonstrate in our next subsection.

B/ Competition-law-based remedies are insufficient

For access to these complementary services, competition authorities can hardly rely on the essential facilities doctrine (EFD) as these assets are unlikely to fit the definition of an essential facility. Furthermore, the existence of a viable alternative for non-track assets is case specific and the lack of clear guidelines regarding access is clearly detrimental to entry. The dominant operator is particularly responsible for preserving an effective competitive process, even though it may mean that asymmetrical duties will be imposed on it, as illustrated by the case law produced in other network industries. An incumbent may be bound by competition-law-based remedies that require access to be given to assets exceeding the strict scope of the essential facilities.

To illustrate the scope of these remedies, we can draw parallels with other utilities, such as airports. The Frankfurt/Main AG case (Commission, January 1998),⁵¹ for example, dealt with physical barriers to entry. The available spaces for ground handling services were all used by the incumbents. New entrants were only given the option of remote, costly, and inefficient locations a long distance away from the planes. On the surface, the refusal of access appears reasonable; a dominant undertaking should not have to increase its costs or to impair its internal efficiency to favor its competitors. However, the Frankfurt airport manager was obliged by the Commission to reorganize its own services to make room for incoming competitors. Similar remedies were also imposed to ensure equal access to terminals and to commercial and technical areas. The purpose was to ensure a level playing field and to limit the incumbency-related advantage.⁵² In the same way, competition

⁵¹ European Commission, Decision of 14 January 1998 relating to a proceeding under Article 86 of the EC Treaty (IV/34.801 FAG - Flughafen Frankfurt/Main AG).

⁵² As the EU Commission stated in its decision: "*FAG's decision not to open up the market for the provision of ramp-handling services is not justified by the consideration that it is the airport operator and as such is entitled to determine how to organise the activities that take place within the airport area. The airport must exercise its organisational rights in accordance with the rules on competition*" (§98).

agencies can impose an undistorted access to the tracks. In the GVG case, for instance, the Italian incumbent's commitments provided access, as discussed below.

Furthermore, access to the complete supply chain and not only to the essential assets must be guaranteed to ensure effective entry into the rail industry. A profitable entry is difficult to achieve in a limited number of market segments. From an economic point of view, one should consider the entry and exit barriers that define the critical size necessary for a profitable entry. Lowering these barriers may require extending the scope of mandatory access to not obviously essential assets. Indeed, the entry of new competitors is only possible through OA to several (almost) essential asset types.

This issue is common to several network industries. It is nevertheless a particularly acute problem for railways because of the multiplicity of assets for which access is needed (energy, rolling stock, data, etc.) and the multiplicity of actors at stake (essential facilities managers, competitors, etc.). As discussed in Section 3, for an entrant, the provision of in-house traction services is not necessarily possible in the short term (or in the long term in fact). Access (at least temporarily) to the incumbent's traction services may be a way to overcome these obstacles, as the GVG EC Decision (2003) demonstrates.⁵³ Again, a competition-law remedy was used to address this issue but only in a specific case.

What was the situation at stake for GVG? The Commission obtained a negotiated remedy that extended essential facilities beyond the natural monopoly. *“By refusing to provide Georg Verkehrsorganisation GmbH with traction comprising a locomotive, a qualified driver familiar with the route and the technical support necessary for the purposes of the abovementioned service, Ferrovie dello Stato SpA abused its dominant position on the traction market and thereby prevented GVG from entering the international rail passenger transport market, in breach of Article 82 of the EC Treaty”*. In this case, settled through a commitment procedure in August 2003, the Commission accepted the proposals of the Italian incumbent to provide access to this new entrant to its network (from Domodossola to Milan), to constitute an international grouping to enable GVG to provide international services and traction services.

In addition, two decisions by the French competition authority with respect to the gas and electricity sectors show that access to incumbents' consumer data might be required to

⁵³ European Commission, Decision 2004/33/EC, 27 August 2003, case COMP/37.685 GVG/FS.

ensure a level playing field.⁵⁴ Data might be at the heart of an incumbent's competitive advantage. It can anticipate which consumers will potentially be attracted by specific offers or are likely to respond favorably to new entrants' marketing. The incumbent can micro-target its marketing investments and limit the potential market of its competitor. Mandating incumbents to share their data may mitigate such risks.

In February 2019, the Spanish competition authority (CNMC) approved a resolution allowing railway operators to access stations and other facilities, such as workshops and service centers, owned by the Spanish infrastructure manager ADIF.⁵⁵ The decision included a series of measures to favour the entry of new operators, particularly in view of the complete opening of the sector by December 2020. The CNMC also set a maximum deadline of one month for operators of service facilities to answer requests made by railway companies or other candidates, thus allowing them to know the true capacity of these services. The regulation and resolution issued by the CNMC compels the companies that operate this type of facility (passenger stations, freight terminals, workshops) to publish a document detailing the installation that includes basic information on the conditions for access.

Competition-law-based remedies address the specific concerns about competition in the cases in question but fail to provide a general framework that guarantees access to these quasi-essential facility assets. As competition agencies cannot qualify these complementary assets as essential facilities because of the legal requirement imposed on this qualification, they can only use negotiated procedures in a regulatory way. This can be a satisfactory transitory solution (as commitments are only made for a limited period of time) but cannot be the method for imposing an EU-wide regulatory approach that provides permanent access to these facilities and accepts an asymmetric regulation of competition.

5. EFFECTIVE COMPETITION NEEDS MORE THAN ACCESS TO THE RAIL

If competition-law-based remedies are to address some of the issues discussed above, such as data sharing and asset mutualization, it would appear that these remedies must be imposed

⁵⁴ French Competition Authority, decision n°13-D-20, 17 December 2013, related to practices implemented by EDF in the sector of services related to photovoltaic generation, and decision n°17-D-06, 21 March 2017 related to practices implemented by Engie in the supply of gas, electricity, and energy-related services.

⁵⁵ "Spain: Rail liberalization moving forward with CNMC resolution," *Competition Policy International* (CPI), February 5, 2019.

on a wider scale. However, competition law is not enough to guarantee a level playing field and effective competition in the market. What is required is not only a strong sectorial regulation but also the implementation of regulatory devices accepting an asymmetric logic.

A/ Competition-law enforcement should be completed by a strong sector-specific regulation

A sector-specific regulation is needed if it appears that, at the very beginning of the liberalization process, competitors cannot be viable in financial and strategic terms. Two situations may be observed. The first is the inability of competitors to be as efficient as the incumbent (because of its larger scale and scope). The second involves the structural disadvantages discussed above, which call for asymmetric regulations. Similar regulations have been implemented in the telecommunications sector and can be reproduced in the rail sector.

Several approaches can be considered. The first one consists in giving access to not-obviously essential assets controlled by the incumbent, with the aim of lowering both entry and exit barriers. The ladder of investment approach is one example (Odale and Padilla, 2004). Another approach can be compulsory sharing of strategic assets (data, facilities, etc.) and can include asymmetric duties imposed on the incumbent.

Strong remedies such as those related to data can be imposed on incumbents. Some examples from the telecommunications and energy sectors show the regulatory remedies needed to promote effective competition in the rail sector. For instance, the French competition authority mandated EDF (2013) and ENGIE (2017) to share with their competitors their databases of customers eligible for regulated sales tariffs. Similarly, in the telecommunications sector, the French competition authority intervened when incoming users' access to essential information was blocked (e.g., a list of subscribers eligible for ADSL). In the case of railways, the sector regulator should be responsible for defining and monitoring these corrective measures. The higher the complexity of the economics of the liberalized sector, the stronger the need for sector-specific regulation.

B/ Asymmetric regulation is needed

However, this regulation should not be limited to guaranteeing a level playing field, as asymmetric remedies may be needed to achieve an effective liberalization. Twenty years ago, in the broadcasting industry, Deakin and Pratten (1999) described the continuous need

for regulatory interventions to maintain effective competition on markets that are not the product of *spontaneous orders* but are the voluntary and conscious product of organisational rules resulting from a sectoral liberalization.

Beyond competition-law measures, one must assess what kind of regulatory asymmetric measures are needed to compensate the imbalance between the incumbent and new entrants. A complementary and potentially asymmetric sector regulation must be designed. The examples of other network industries may be useful, in particular the liberalization of the telecommunications sector.⁵⁶

This sector was characterized by several asymmetries. Some of them were related to costs, such as mobile call termination tariffs, which were differentiated according to the market share, irrespective of the actual cost, in order to correct for the higher financial costs borne by new entrants compared to the incumbent. Other asymmetric measures were related to asset access. The most typical – and controversial – approach was the ladder of investment approach. This guaranteed to new entrants a temporary access to assets beyond essential ones. It promoted entries by reducing risks on new entrants' investments. It limited free-riding risks and, through its transitory nature, preserved the incumbent operators' incentives to invest.⁵⁷

In the telecommunications sector, this model has led to impose facilities sharing beyond the scope of the natural monopoly in order to facilitate competition for services as a first stage of the liberalization process (Cave, 2006). According to this approach, infrastructure-based competition is only possible at a second stage, when the market share of the new entrants is sufficiently developed to make the funding of their investments possible. Entering the market through the services segment may help the new competitors “*to invest in experience before investing in their own physical infrastructures*” (Bourreau and al., 2010). There are two main advantages to this progressive entry. The first is an investment in reputation. As consumer awareness of the services provided by the new entrant increases, the consumers' willingness to pay increases thereby reducing the associated demand risk,

⁵⁶ For instance, these concerns were addressed in the telecommunications sector through the implementation of the ladder of investment approach and through MVNO-type solutions for a given span of underlying services.

⁵⁷ Activating GVG-type remedies may lead to subsidizing inefficient competitors. A competition-law-based logic, putting the emphasis on consumer welfare, may limit such remedies to a “representative” efficient competitor on the market (that has already reached “*the minimum efficient scale to enter the relevant market*”) that cannot finance such assets (Castaldo and Nicita, 2007).

which may make it easier for the new entrant to invest in the future in its own facilities. The second advantage is to reduce the risk premium imposed by financiers, who may be reluctant to support a costly entry in such a market.⁵⁸

The underlying idea is the following: a new entrant cannot reasonably invest immediately in all the assets necessary to compete efficiently against the incumbent. Investing in specific assets is necessary to be as efficient as the incumbent but is not financially viable considering the potential sunk costs,⁵⁹ the incumbents' advantages related to the disposal of adequate rolling stocks, economies of scale and scope,⁶⁰ its reputation, and its informational knowledge (customer data), and the fact that a new entry commonly starts on very specific routes.

Thus, the ladder of investment approach aims at enhancing market contestability by lowering both barriers to entry and barriers to exit through asymmetric regulatory-type remedies. It is not a matter of guaranteeing a level playing field but of reducing the costs and the risks associated with entry for new competitors.

However, this regulatory remedy has potential negative side-effects. If access prices are too low and if the access is seen as permanent by the market players, investing in its own infrastructures may represent a significant opportunity cost for new entrants (Bourreau and al., 2010). A new entrant may be deterred from investing in its own capacities as it involves

⁵⁸ Lenders may be particularly risk averse considering the difficulty of recouping these very specific investments in a limited market segment. In addition, a lender, considering the specificity of traction-related assets, may anticipate that the only possible buyer in case of exit would be the incumbent.

⁵⁹ The entrant may have to overcapitalize in order to achieve the same level of reliability as the incumbent enjoys, due to its level of redundancy. The relative cost of the reliability is higher for the new entrant because it cannot mutualize its investment over many routes. One possible solution is to pool some of the incumbent's assets under third-party management or supervision. See para. 75 of the ARAFER opinion, n°2019-028 du 9 mai 2019 sur le projet d'ordonnance relative à la nouvelle SNCF. The opinion recommends creating a specific subsidiary in charge of the management of maintenance centers as the Spanish Renfe and the German Deutsche Bahn had already implemented.

⁶⁰ This type of asymmetric treatment may be compared with the criteria used for exclusionary prices. It echoes the difference between the *as efficient competitor* test and the *reasonably as efficient competitor* one. Considering that a new competitor cannot be immediately as efficient as the incumbent, the competition authority must check not only if a given price strategy may lead to the exclusion of a competitor, actually as efficient as the incumbent, but also a competitor who might be hypothetically as efficient if it were to operate in a similar range of activities.

a cost without any immediate benefit (see the *replacement effect* as described by Vogelsang (2007)).

The ladder of investment approach aims to preserve incentives to invest through a micro-management of the regulation. If the steppingstone to favour initial entries remains the service-based competition approach, full access to the incumbent facilities should be time-limited. If the entry assistance provided by the regulator is extensive, it must remain transitory. This regulatory remedy is implemented in a ramp-up manner. Consequently, the access charge must be progressively increased, or the access has to stop after a given period of time in order to incentivize new entrants to climb up the ladder. To neutralize the risks related to the *replacement effect* described above, the new competitors must know that the regulator will *burn up the rung on which the entrant is currently standing*. The process should continue until access is limited to the natural monopoly segment.

Following Bourreau et al. (2010), three issues need to be considered in terms of regulatory management. The first issue is related to information. How to manage the necessary regulatory fine-tuning since information is both incomplete and asymmetric. The second issue is related to the regulator's credibility. How to guarantee that the regulator does not renege on its commitment to progressively remove the rungs of the ladder, if its decision might lead to a market exit (Odale and Padilla, 2004). The last issue is related to late entries. If some rungs are already removed, should the regulator put them back for a late comer?

6. CONCLUDING REMARKS

To conclude, it appears that the liberalization requires the implementation of far-reaching competition-law-based remedies and that simply ensuring access to necessary facilities (within the meaning of the 1998 Bronner judgment⁶¹) is not enough. Guaranteeing an effectively level playing field implies removing barriers to entry and exit. As market players remain significantly dissymmetric⁶² and as the incumbent might easily impair the new entrants' access to the market, it appears necessary to accept "competition imperfections" to avoid "liberalization failures" (see Gaffard and Quéré (2006) for an equivalent trade-off in

⁶¹ EU Court of Justice, case C-7/97, Oscar Bronner GmbH & Co. KG / Mediaprint Zeitungs- und Zeitschriftenverlag GmbH & Co. KG e.a, 26 November 1998.

⁶² The Britain experience is in that sense particular as there is no more incumbent nor publicly owned train companies. In that respect, many barriers to entry we identified are not in place in Britain.

the field of competition-law enforcement). In other words, guaranteeing an effective and sustainable competition implies a *free but distorted* competition with, for example, an asymmetric regulation of competition. In order to be practicable and sustainable under these specific circumstances, competition should be imperfect. One must accept (or even to generate through regulatory interventions) imperfections to make the competitive process effective.

Such asymmetric regulation has already been implemented in former liberalization experiences, such as the telecommunications sector.⁶³ It involves a broad and transitional access to other quasi-essential assets (rolling stock, commercial and technical premises, data) and even asymmetric treatments aimed at counterbalancing incumbents' market strengths (for instance in terms of economies of scale and scope). However, such an asymmetric treatment should not last an indefinite time, considering its side-effects in terms of incentives. It should be limited to a transitory period, as for instance in ladder-of-investment-based remedies. The ultimate purpose is to ensure free entry and to address "competition imperfections" (informational asymmetries, difficulties in reaching a proper market scale immediately, asset specificities, etc.) and not to distribute rents to new entrants. Such a mechanism should remain the equivalent of an "educational regulation" for infant liberalized markets, to echo Friedrich List's argument regarding trade policies.

Competition-law enforcement and sector-specific regulation are not alternative but rather complementary tools to supervise markets. Sector-specific, asymmetric provisions should be analyzed and "competition imperfection" considered in order to avoid facing a "competition failure".

These approaches may be necessary to unblock and accelerate the liberalization process. However, they fundamentally suppose an asymmetric treatment of market players and they require supervision of cross-subsidisations between them. The risk that new entrants could benefit from collectively unproductive windfall profits cannot be excluded. Therefore, the sector-specific regulator should fine-tune its interventions to maintain proper incentives for the market players to invest. In the case of the ladder of investment approach, the result depends on the regulator's capacity to extract information and to credibly commit to progressively removing the different rungs of the ladder, whatever the consequences on the market structure. This approach leads to even more difficulties than the ones that would

⁶³ See for instance, the opening to competition of the British market with an asymmetric regulation between BT and Mercury, or the mobile termination call costs regulation case.

result from an EFD implementation. As Ridyard (2004) stated, “*such regulation should be confined to cases where there has been an extreme and chronic breakdown of the competitive process*”.

The example of the railway liberalization shows that competition-law-based remedies cannot be sufficient to guarantee a real market contestability because of the high level of barriers to entry and exit. These barriers can only be removed by extending the notion of essential facilities. Furthermore, these competition-based decisions cannot be infringements because they risk being overturned by the General Court or the Court of Justice. The reluctance of courts to endorse the EFD demonstrates this. Therefore, remedies based on competition law are normally commitment decisions, with all the limits associated with these settlements. As competition-law enforcement provides only an imperfect tool to apply these quasi-regulatory remedies, an implementation of these remedies by a sector-specific regulator appears to us a better way to achieve this goal.

An asymmetric regulation that enables new entrants to access quasi-essential facilities might provide a good signal to them and reduce the risk of unethical strategies by incumbents by relying on the competencies of regulators. The last question could be related to the link between the ex-ante regulation and the ex-post enforcement of competition law: should they be complementary or should a system like the one implemented in the UK be preferred, where the sector-specific regulator is also in charge of the enforcement of competition law in its field?

REFERENCES

- ARAFER. 2018. “L’ouverture à la concurrence du transport ferroviaire de voyageurs en France.” Report <https://www.arafer.fr/actualites/ouverture-a-la-concurrence-ferroviaire-larafer-alimente-le-debat-et-reaffirme-le-role-essentiel-de-son-avis-conforme-sur-la-tarification-ferroviaire>
- ART. 2021. *Rapport annuel sur le marché français du transport ferroviaire en 2019*, January, <https://www.autorite-transports.fr/wp-content/uploads/2021/01/bilan-ferroviaire-2019.pdf>
- Beria, Paolo, Renato Redondi, and Paolo Malighetti. 2016. “The Effect of Open Access Competition on Average Rail Prices. The Case of Milan-Ancona.” *Journal of Rail Transport Planning & Management* 6 (3): 271–83.
- Beria, Paolo, Samuel Tolentino, Alberto Bertolin, and Gabriele Filippini. 2019. “Long-distance rail prices in a competitive market. Evidence from head-on competition in

- Italy.” *Journal of Rail Transport Planning & Management*, 6 September 2019. DOI: 10.1016/j.jrtpm.2019.100144
- Besanko, David, and Shana Cui. 2016. “Railway Restructuring and Organizational Choice: Network Quality and Welfare Impacts.” *Journal of Regulatory Economics* 50 (2). Springer US: 164–206.
- Besanko, David, and Shana Cui. 2017. “Erratum to: Railway Restructuring and Organizational Choice: Network Quality and Welfare Impacts (J Regul Econ, (2016), 50, (164-206), 10.1007/S11149-016-9309-3).” *Journal of Regulatory Economics* 51 (1). Springer US: 119–21.
- Besanko, David, and Shana Cui. 2019. “Regulated versus Negotiated Access Pricing in Vertically Separated Railway Systems.” *Journal of Regulatory Economics* 55 (1): 1–32.
- Bergantino, Angela S., Claudia Capozza, and Mauro Capurso. 2015. “The Impact of Open Access on Intra- and Inter-Modal Rail Competition. A National Level Analysis in Italy.” *Transport Policy* 39: 77–86.
- Bourreau, Marc, Pinar Doğan and Matthieu Manant, 2010. “A Critical Review of the ‘Ladder Investment’ Approach.” *Telecommunications Policy* 34(11), 683-696.
- Cantos, Pedro, José Manuel Pastor, and Lorenzo Serrano. 2012. “Evaluating European Railway Deregulation Using Different Approaches.” *Transport Policy* 24 (November): 67–72.
- Cascetta, Ennio, and Pierluigi Coppola. 2014. “Competition on Fast Track: An Analysis of the First Competitive Market for HSR Services.” *Procedia - Social and Behavioral Sciences* 111 (February): 176–85.
- Castaldo, Angelo and Nicita Antonio, 2007. “Essential Facility Access in Europe: Building a Test for Antitrust Policy.” *Review of Law and Economics* 3(1), 83-110.
- Cave, Martin, 2006. “Encouraging Infrastructure Competition via the Ladder of Investment.”, *Telecommunications Policy*, 30, 223-237.
- Cherbonnier, Frédéric, Marc Ivaldi, Catherine Muller-Vibes, and Karine Van Der Straeten. 2017. “Competition *for* Versus *in* the Market of Long-Distance Passenger Rail Services.” *Review of Network Economics* 16(2), 203-238.
- Cowie, Jonathan. 2015. “Does Rail Freight Market Liberalisation Lead to Market Entry? A Case Study of the British Privatisation Experience.” *Research in Transportation Business & Management* 14 (March): 4–13.
- Crozet, Yves. 2017. “Rail Freight Development in Europe: How to Deal with a Doubly-Imperfect Competition?” *Transportation Research Procedia* 25 (January): 425–42.

- Deakin, Simon and Stephen Pratten, 1999. “Reinventing the market? Competition and regulatory change in broadcasting”, *Journal of Law and Society*, 26(3), September, 323-350.
- European Commission, 2019. *Remaining challenges for EU-wide integrated ticketing and payment systems*, final report, Directorate-General for Mobility and Transport.
- European Commission, 2021. 7th *Report on monitoring development of the rail market*, Rail Market Monitoring (RMMS) report, 13.01.2021, and its Accompanying Commission Staff Working Document. Directorate-General for Mobility and Transport. https://ec.europa.eu/transport/modes/rail/market/market_monitoring_en
- Fröidh, Oskar, and Camilla Byström. 2013. “Competition on the Tracks - Passengers’ Response to Deregulation of Interregional Rail Services.” *Transportation Research Part A: Policy and Practice* 56 (October): 1–10.
- Gaffard, Jean-Luc and Michel Quéré. 2006. “What’s the aim for competition policy: optimizing market structure or encouraging innovative behaviors”, *Journal of Evolutionary Economics* 16(1-2), 175-187.
- Gutiérrez-Hita, Carlos, and Aurora Ruiz-Rua. 2019. “Competition in the Railway Passenger Market: The Challenge of Liberalization.” *Competition and Regulation in Network Industries* 20 (2): 164–83.
- Hauteclouque (de) A., Frédéric Marty, and Julien Pillot. 2011. “The essential facilities doctrine in European competition policy: the case of the energy sector.” in Glachant Jean-Michel, Dominique Finon, and Adrien de Hauteclouque (eds), *Competition, Contracts and Electricity Markets: A New Perspective*, Edward Elgar, London: 259-292.
- Henry, David. 2019. “Competition Law in the Railway Transport Sector: An Overview of EU and National Case Law”, *e-Competitions Special Issue Transport (rail)*, 6 June 2019.
- IRG-Rail. 2019. “Seventh Annual Market Monitoring Report.” <https://www.irk-rail.eu/irk/documents/market-monitoring/220,2019.html>
- IRG-Rail. 2020. “Eighth Annual Market Monitoring Report.” <https://www.irk-rail.eu/irk/documents/market-monitoring/260,2020.html>
- Ivaldi, Marc, and Jérôme Pouyet. 2018. “Eliciting the Regulation of an Economic System: The Case of the French Rail Industry.” *Transport Policy* 62 (February): 21–30.
- Kao, Tina, Flavio M. Menezes, and John Quiggin. 2014. “Optimal Access Regulation with Downstream Competition.” *Journal of Regulatory Economics* 45 (1): 75–93.
- Knieps, Günter. 2013. “Competition and the Railroads: A European Perspective.” *Journal of Competition Law and Economics* 9 (1): 153–69.

- Król, Marcin, Jakub Taczanowski, and Arkadiusz Kołoś. 2018. "The Rise and Fall of Interregio. Extensive Open-Access Passenger Rail Competition in Poland." *Research in Transportation Economics* 72: 37–48.
- Laffont, Jean-Jacques, and Jean Tirole. 1999. *Competition in Telecommunications (Munich Lectures in Economics)*. MIT Press.
- Laroche, Florent, Christa Sys, Thierry Vanelslander, and Eddy Van de Voorde. 2017. "Imperfect Competition in a Network Industry: The Case of the European Rail Freight Market." *Transport Policy* 58 (August): 53–61.
- Meaney, Andrew. 2015. "Non-Discriminatory Access beyond the Tracks" in Finger, Matthias. and Pierre Messulam (eds), *Rail Economics, Policy and Regulation in Europe*, Edward Elgar, London: 303-322.
- McNulty, Roy. 2011. *Realising the potential of rail in Great Britain*. An independent report of a study chaired by Sir Roy McNulty and commissioned by the Secretary of State for Transport.
- Nash, Chris A., Andrew S.J. Smith, Didier van de Velde, Fumitoshi Mizutani, and Shuji Uranishi. 2014. "Structural Reforms in the Railways: Incentive Misalignment and Cost Implications." *Research in Transportation Economics* 48 (December): 16–23.
- Nash, Chris., Andrew Smith, Yves Crozet, Heike Link and Jan-Eric Nilsson. 2019. How to liberalise rail passenger services? Lessons from european experience, *Transport Policy* 79, 11-20.
- Odale, Alison, and Jorge Padilla. 2004. "From State Monopoly to the 'Investment Ladder': Competition Policy and the NRF." In *The Pros and Cons of Antitrust in Deregulated Markets*, 51–77. Stockholm: Swedish Competition Authority.
- Paha, Johannes, Dirk Rompf, and Christiane Warnecke. 2013. "Customer Choice Patterns in Passenger Rail Competition." *Transportation Research Part A: Policy and Practice* 50: 209–27.
- Perennes, Patricia. 2017. "Open Access for Rail Passenger Services in Europe: Lesson Learnt from Forerunner Countries." *Transportation Research Procedia* 25. Elsevier B.V.: 358–67.
- Pittman, Russell. 2007. "Options for Restructuring the State-Owned Monopoly Railway." In *Railroad Economics*, edited by Scott Dennis and Wayne Talley, 179–98. Amsterdam: Elsevier B.V.
- Pittman, Russell. 2017. "The Underappreciated Connection between Rail Restructuring Strategies and Financing." *Review of Network Economics* 16 (2): 161–69. doi:10.1515/rne-2017-0040.
- Ridyard, Derek. 2004. "Compulsory Access under EU Competition Law: A New Doctrine of "Convenient Facilities" and the Case for Price Regulation", *European Competition Law Review* 11, 669-674

- Riordan, Michael H., and Oliver E. Williamson. 1985. "Asset Specificity and Economic Organization." *International Journal of Industrial Organization* 3 (4): 365–78.
- Slack, Brian, and Alexander Vogt. 2007. "Challenges Confronting New Traction Providers of Rail Freight in Germany." *Transport Policy* 14 (5): 399–409.
- Tomeš, Zdeněk, Martin Kvizda, Tomáš Nigrin, and Daniel Seidenglanz. 2014. "Competition in the Railway Passenger Market in the Czech Republic." *Research in Transportation Economics* 48: 270–76.
- Tomeš, Zdeněk and Hana Fitzová. 2019. "Does the Incumbent have an Advantage in Open Access Passenger Rail Competition? A Case Study on the Prague-Brno Line." *Journal of Rail Transport Planning & Management*, 12:100–140.
- Vigren, Andreas. 2017. "Competition in Swedish Passenger Railway: Entry in an Open Access Market and Its Effect on Prices." *Economics of Transportation* 11–12 (September 2016). Elsevier Ltd: 49–59.
- Volgelsang, Ingo. 2010, "Incentive Regulation, Investments and Technological Change", *CESifo Working Paper Series*, n° 2964, March.

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