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Abstract

Liberalization of long-distance railway passenger services in the European Union was scheduled for December 2020. The Spanish infrastructure manager decided that the Spanish high-speed network was congested so an optimization plan would be needed to accommodate newcomers and ensure an 'orderly' transition to competition. The infrastructure manager defined a full schedule for cadenced train paths in the three main high-speed corridors. The network capacity was divided into three asymmetric packages combining all three corridors (of 60%, 30% and 10% of the capacity). The infrastructure manager put out the three packages of capacity rights for tender (for a 10-year period), with the assignment criterion being greater use of the capacity. As a result, three undertakings will compete for the provision of high-speed services in Spain. They have committed to a sharp increase in supply in all three corridors, assuming the risk of demand. Fierce competition is expected.

Keywords

Railways, high-speed, tender, ADIF, liberalization.

1. Introduction

A new model of liberalization of the long-distance passenger railway market has been implemented by the Spanish railway infrastructure manager in charge of the high-speed network, ADIF AV. A tender process has been used to appoint three railway undertakings that will sign framework agreements with ADIF AV, ensuring them infrastructure capacity in the main high-speed corridors for up to 10 years. In this way, an element of 'competition for the market' has been introduced in the 'open access' 'competition in the market' model designed by the European Union for the construction of the Single European Railway Area.

EU Directive 2012/34 imposed the liberalization of railway services in Europe by 14 December 2020. 'Competition in the market' is the preferred model for long-distance commercial passenger services, in particular high-speed services, as opposed to a 'competition for the market' model for services under public service obligations. In some countries such as Italy, the Czech Republic, Austria and Sweden, competition in the market already exists, as new railway undertakings have entered the market in recent years. Competition in these countries is somewhat limited as it tends to be concentrated in a few routes (sometimes only one route in the country) and only one competitor has entered the market (the Czech Republic is an exception with two new entrants). There is no legal constraint in the form of special rights, tenders, etc. If the number of competitors is low, it is due to the free decisions of potential competitors not to enter a market with well-known barriers to entry (Nash & Preston 1999).

The Spanish infrastructure manager has opted for a different strategy. After consultation with potential newcomers, ADIF AV identified a high interest in market entry on the part of a high number of railway undertakings. According to ADIF AV, the Spanish high-speed network cannot accommodate all the services planed by the newcomers. In Europe, the Spanish high-speed network is leading in terms of kilometres, but it is also the network with the lowest intensity of use. However, the stations in Madrid and Barcelona are bottlenecks. ADIF AV identified that the scarce capacity of these stations would not allow the demand for capacity by railway undertakings to be accommodated.

As a consequence, in October 2019 ADIF AV published a new version of its Network Statement, with an optimized distribution of capacity for framework agreements, which would later be assigned with specific departure times in the annual assignment of capacity (ADIF AV 2019A). The infrastructure manager's engineers built an optimum cadenced timetable for the three busiest high-speed corridors in the country: northeast (Madrid-Barcelona), east (Madrid-Valencia) and south (Madrid-Seville). The timetable defined the departing times for each service (with a control period of one hour), the stations that would be used for each corridor, the stops along the corridor, the average speed, and even the waiting time in the stations before the return trip. The timetables for all three corridors were perfectly coordinated to produce maximum capacity, increasing the previous capacity by around 60%.

The next step was to make 70% of this optimized capacity available for 'framework agreements,' which would be signed with railway undertakings. A framework agreement is defined in Directive 2012/34/EU as "a legally binding general agreement […] setting out the rights and obligations of an applicant and the infrastructure manager in relation to the infrastructure capacity to be allocated and the charges to be levied over a period longer than one working timetable period" (Article 3(23)). A specific implementing regulation on framework agreements was adopted (Implementing regulation 2016/545). ADIF AV decided 10 years would be the optimum duration for framework agreements.

ADIF AV decided that only three framework agreements would be concluded, and that they would be asymmetric, in the sense that each of them would provide access to a different amount of capacity: 60%, 30% and 10% of the available capacity. Finally, as six applicants were interested in these framework agreements, a competitive tender was arranged to appoint the three winners (Stojadinovic et.al., 2019). In this way, ADIF AV introduced a 'competition for the market' element in what was supposed to be an 'open access' model.

On 27 November 2019, ADIF AV made public the winners of the three framework agreements. Of the six candidates, the three winners were the Spanish incumbent Renfe, Trenitalia's participant ILSA and French incumbent SNCF.

In this paper, this liberalization model will be analysed. In section 2, the drivers behind the strategy are identified. In section 3, the tendering process will be described in more detail. In section 4, the economic pros and cons of the model will be described, and conclusions will follow in section 5.

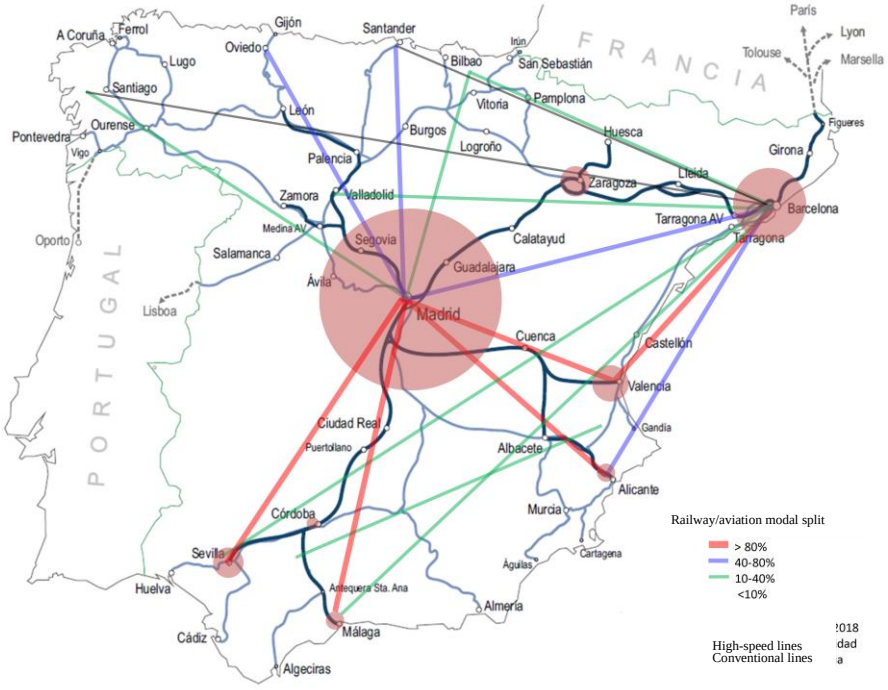
2. The Spanish High-Speed System

The liberalization strategy designed by the infrastructure manager was largely determined by two drivers of high-speed railway policy in Spain (Montero, Ramos & Ganino, 2019). On the one hand, there was a need to increase the volume of passengers, which is lower than in other high-speed networks. On the other hand, there was a perception that newcomers would cherry-pick the Madrid-Barcelona route, cream-skimming the system. The tender organized by ADIF AV responded to these circumstances.

2.1. An opportunity to increase ridership

The Spanish authorities consider liberalization to be an opportunity to improve the intensity of the use of the high-speed network. Spain has one of the largest high-speed networks in the world, with a total distance of 2,718 km. The network is hub-and-spoke, with its centre in Madrid, the fifth most highly populated metropolitan area in Europe, located right at the centre of the Iberian Peninsula. Four corridors depart from Madrid, and become more capillary as they move to the coasts towards different cities (García, 2012): northeast to Barcelona, east to Valencia and Alicante, south to Malaga and Seville, and north, still under construction).

Figure 1. Long-distance railway routes and their modal shares with aviation



Source: CNMC 2019.

Track access charges for high-speed services in Spain are high compared with other countries (CNMC 2018). The revenue generated for the use of the infrastructure (and other commercial activities) covers 56% of ADIF AV's total costs (ADIF AV, 2018 p. 98). ADIF AV is highly indebted as a result of the development of the high-speed network (€15 billion).

However, the volume of passengers on the Spanish network is low compared with other high-speed networks. In fact, the Spanish network has the lowest usage intensity in the world.

Table 1. Kilometres of high-speed lines and usage intensity (2018)

Country	HSL (km)	Passenger-kms (10^9)	Million passengers/km per HSL km
Japan	3,041	103.6	34
Taiwan	354	11.6	32.7
China	3,1051	680.5	21.9
France	2,734	56.8	20.7
Germany	1,571	31.1	19.7
South Korea	893	15.3	17.1
Italy*	921	15.1	16.3
Spain	2,718	16.1	5.9

*2017

Source: (UIC) 2020 https://uic.org/passenger/highspeed/article/high-speed-database-maps

Paradoxically, despite the low usage intensity, the stations in Madrid and Barcelona are bottlenecks, creating congestion in the network. The high-speed network has been developed using the international gauge, while the rest of the rail network uses the traditional Iberian gauge. As a result, high-speed traffic is completely separate from the rest of the passenger and freight traffic. This is an advantage in the operation of the network, as high-speed services do not have to be coordinated with lower speed services. However, the networks converge in the stations. Different tracks exist for high-speed services and for the rest of the traffic. This makes the management of stations more complicated, particularly those in the largest cities. In Madrid, Atocha station – serving the northeast, east and south corridors – is not connected with Chamartin station – serving the north corridor and expected to grow to meet demand for all the corridors once it is connected with Atocha. In Barcelona, Sants station is particularly congested, and the new station – Sagrera – is only 40% complete with no date for termination.

2.2. Risk of cream-skimming

Another driver of the railway policy in Spain is the relevance of the Madrid-Barcelona route. The northeast corridor connecting Madrid to Barcelona has the greatest patronage. It is the corridor that generates the most revenue and is also the most profitable as it presents the highest margins. The northeast corridor has traditionally generated most of Renfe's profits, profits that have cross-subsidized the non-profitable long-distance routes.

Table 2. Economic results of the long-distance passenger lines (2013)

Route	Revenue (in € million)	Margin (in € million)
Madrid–Barcelona	341	98
Madrid–Seville	144	16
Madrid–Malaga	101	6
Madrid–Valencia	90	4
All routes with positive margins	829	146
All routes with negative margins	314	-117

Source: Boletín Oficial de las Cortes Generales, July 16th, 2014, p.207

The authorities have always feared cherry-picking by newcomers. The Madrid-Barcelona route has always attracted the interest of the industry as it has the largest number of passengers, the highest revenue and, in particular, the largest margin.

The east and south corridors connect Madrid with smaller metropolitan areas. As a consequence, the number of passengers is smaller. This is the case even though high-speed services have attracted the highest share of passengers from air travel. Both in the east and south corridors railways have more than an 80% modal share against less than 20% for aviation. The modal share of railways against aviation is lower on the Madrid-Barcelona route (63.5%). Cities in the east and south corridors have less economic activity than Barcelona (fewer business travellers) and a lower GDP per capita. The distances are smaller, particularly in the east corridor, so cheaper road transport is more competitive in terms of traveling time.

Renfe has traditionally alerted about risk of cream-skimming triggered by liberalization, as profits from the Madrid-Barcelona route cross-subsidize the high number of long-distance services provided at a loss. It has to be recalled that long-distance services are not under public service obligations in Spain. Renfe receives no compensation for the provision of these services.

The liberalization policy has been determined by the objectives of increasing the volume of passengers and of increasing ridership on the routes with fewer passengers, not only on the successful Madrid-Barcelona route. This is why at a certain stage the Government designed a tender to operate in duopoly in competition with Renfe, but only on the east corridor (Montero, Ramos & Giuricin, 2017). The tender was finally abandoned, as a 'Fourth Package' was adopted and the date of 14 December 2020 was fixed for the full liberalization of commercial services. In any case, the idea of organizing a tender to control market entry was not entirely dismissed.

3. Description of the Process

3.1. Framework agreements

The model designed by ADIF AV took the form of the allocation of 'framework agreements,' a term defined in EU railway legislation.

A framework agreement is defined in the EU legislation as "a legally binding general agreement […] setting out the rights and obligations of an applicant and the infrastructure manager in relation to the infrastructure capacity to be allocated and the charges to be levied over a period longer than one working timetable" (Art. 3(23) Directive 2012/34/EU). Commission Implementing Regulation 2016/545 is specifically devoted to framework agreements.

Framework agreements allow railway undertakings to plan their activities beyond a mere annual assignment of rail path capacity. They were created to grant railway undertakings the necessary certainty

for long-term investment in rolling stock and all the necessary assets, which have long maturity terms, certainly beyond one year.

Framework agreements do not effectively grant access to rail infrastructure capacity. They do not even define train paths in detail. Specific train paths are still allocated on an annual basis by the infrastructure manager. However, preference is given to undertakings completing framework agreements.

EU legislation imposes limitations and conditions on framework agreements, as they might preclude the use of infrastructure by other applicants. For example, such agreements shall in principle cover a period of five years, even if derogations are made possible in Article 42 of Directive 2012/34/EU. Furthermore, capacity has to always be available to be allocated on an annual basis. Independent regulators are usually given authority to approve these agreements in order to exclude abuses by infrastructure managers. Coordination of parallel requests to sign framework agreements is imposed by Regulation 2016/545.

3.2. Competitive tendering

ADIF AV introduced a tender for the assignment of the right to conclude a framework agreement with the infrastructure manager. ADIF AV designed an allegedly optimized model to exploit the high-speed infrastructure. Optimized capacity was distributed into three asymmetric packages of rail paths for all three corridors, to be contracted in the form of framework agreements. These framework agreements were put out for tender. In this way, ADIF AV determined the number of competitors (three), the characteristics of the services the three competitors provide (frequencies, schedules, etc.), and finally the identities of the competitors.

The point of departure was the consideration of the high-speed rail infrastructure in Spain as being congested. This might be surprising, as it is the high-speed network with the lowest intensity of use in the world. However, the main stations in Madrid (Atocha) and Barcelona (Sants) might pose capacity constraints in the case of growth in demand due to liberalization. Works are underway to increase capacity in the existing stations, but the new capacity will not be available by December 2020 for the opening of the market.

The legal consequences of a formal declaration of congestion were not triggered. The capacity analysis required by Art. 50 of Directive 212/34/UE was not published before the signing of the framework agreements. ADIF AV did not identify the capacity constraints which prevented requests for capacity from being adequately met. No measures to ease congestion (re-routing of services, re-timing of services, speed alterations, infrastructure improvements) were published. No capacity-enhancement plan was published, as is required by Article 51 of Directive 2012/34/UE.

The possibility of introducing congestion charges as a response to congestion was ignored. Articles 31(4) and 47 of Directive 2012/34/UE allow Member States to increase access charges to provide the right incentives (Ait & Eliasson, 2019). This could have been an option to ease congestion in the stations, to identify the priorities of the railway undertakings for the use of the scarce capacity in the stations in Madrid and Barcelona and to exploit capacity more efficiently.

On the contrary, ADIF AV decided to fully optimize the three main high-speed corridors. It decided to define an optimized timetable coordinating services throughout the day. The control period, defined as the period for comparing allocated framework capacity and the remaining free capacity, was set to be of one hour. ADIF AV determined the optimum departure stations (railway undertakings will not be allowed to initiate/terminate services to Valencia and Alicante at Atocha station but at Chamartin), the optimum departure time for each service, the optimum speed, the optimum number of stops along the way, the optimum time of arrival at the destination, the optimum waiting time in the destination, the optimum departure time for the return trip and the optimum time to arrive back in Madrid and be ready for a new departure. In this way, the scarce capacity in Madrid (and also in Barcelona) will be used

efficiently by railway undertakings, which must adapt to an optimized timetable of perfectly 'cadenced' departure times throughout the day.

Second, ADIF AV decided to distribute the optimized capacity across three framework agreements. In order to meet the requirements in EU legislation, 30% of the optimized capacity was left for the annual allocation of capacity. The remaining 70% of the optimized capacity would be distributed in three framework agreements: Package A with 60% of the capacity, Package B with 30%; and Package C with 10%. No clear motivation was provided justifying this distribution of capacity. Package A seemed to be suitable for the incumbent (Renfe), while Package C was presented as particularly suitable for 'low-cost services.'

Third, ADIF AV decided that each single framework agreement would include capacity in all three high-speed corridors. The alternative of separate framework agreements for each corridor was excluded. Fourth, ADIF AV decided that a 10-year period would be the optimum duration of the framework agreements (with the exception of the agreement for Package A), despite the 5-year term recommended in Directive 2012/34/EU. As a reference, framework agreements in Italy last for 7 years.

3.3. The assignment criteria

ADIF AV defined the most intensive use of infrastructure capacity as the parameter to prioritize the conflicting requests to conclude framework agreements. Agreements would be concluded with the candidates requesting the highest number of days of use of the capacity over the 10-year period of duration of the framework agreements.

The key was how soon each undertaking would be ready to start operations, which mostly depended on the availability of rolling stock to operate in Spain (in particular in the south corridor, as it uses LZB signalling technology and not the most modern ERTMS). Undertakings which already had rolling stock were given an advantage over ones which would have to order the construction of new rolling stock and would only be able to start operations later.

In the case of a tie, further parameters were defined: i) commitments to reduce CO_2 emissions; ii) a lower percentage of employees with short-term labour contracts; iii) a higher percentage of women employed; and iv) a higher percentage of handicapped employees.
The key parameter to appoint the winning bidders was the scale of operations in terms of the rail paths used. In this way, bidders were incentivized to ask for the maximum available capacity in each 'package', or as near as possible to the maximum as allowed by the availability of rolling stock. In fact, ADIF AV imposed an obligation to explain plans to acquire rolling stock and reserved for itself the possibility to judge how realistic these plans were.

ADIF AV defined penalties in the case capacity is not used in the future (in line with the maximum contractual penalties admitted in Regulation 2016/545), and even fines for breaches of national railway legislation in such a scenario.

In any case, the key decision was to evaluate the offers not separately for each corridor but combined as single offers covering all three corridors. Railway undertakings committing to use capacity only on the Madrid-Barcelona route would in practice be excluded from the Spanish market. The more services provided on the less popular routes, the higher the chances of being granted capacity on the Madrid-Barcelona route.

3.4. The tendering process

ADIF AV invited railway undertakings potentially interested in framework agreements to submit their proposals before 31 October 2019. Railway undertakings could define their capacity needs according to

their business plans. It was not compulsory to adapt the request to the optimized capacity structure defined by ADIF AV, or according to the structure in three packages designed by ADIF.

Only if the capacity requests by all railway undertakings exceeded the available capacity would the tender actually take place. In this scenario, capacity requests would actually be transformed into bidding offers competing one against the other to be evaluated according to the criteria defined by ADIF AV. Six undertakings submitted capacity requests. ADIF AV considered the fact that capacity was not available to meet all the requests a "success" (ADIF, 2019B).

Table 3. Requests for paths by applicants

	Nº of paths requested	**% of the total nº of available paths in the package**
PACKAGE A		
Renfe	632,305	86%
Globalvia	43,088	6%
PACKAGE B		
Ilsa-Trenitalia	245,513	70%
Eco Rail	228,451	65%
SNCF	189,978	54%
Motion Rail (Talgo)	150,595	43%
Globalvia	43,088	12%
PACKAGE C		
SNCF	109,590	100%
Eco Rail	98,100	89%
Motion Rail (Talgo)	94,495	86%

Source: Author's elaboration based on data published by ADIF AV

ADIF AV made the results of the tender public on 27 November 2019. As expected, Renfe was assigned Package A, that is, the package with 60% of the capacity in the three leading high-speed corridors. In fact, Renfe did not bid for all the available capacity but only for 86% of it. This means it will operate around 104 return services a day in all three corridors (13% more than now). The Spanish regulator disputed whether the 10 years period was necessary in the case of the incumbent, considering that a framework agreement for 5 years would be enough to give certainty to acquire rolling stock.

ILSA-Trenitalia was assigned Package B. ILSA is a corporation controlled by regional airline Air Nostrum, with a 45% stake owned by Trenitalia, the Italian railway incumbent. ILSA committed to make use of 70% of the available capacity (around 41 return services a day starting in January 2022). ILSA announced that it will operate with 23 Bombardier Zefiro trains provided by Trenitalia.

SNCF, the French railway incumbent, was assigned Package C. SNCF committed to fully operate all the available capacity (13 return services a day, starting in December 2020).
The three candidates excluded were Eco Rail, a local consortium which bid to use 65% of the capacity in Package B, close to the offer made by ILSA, Talgo, a rolling stock manufacturer, and Globalvía, a worldwide infrastructure concession management leader.

One might wonder whether the excluded undertakings might still enter the market. It is not clear whether there is available capacity in attractive peak times or whether the available capacity is in off-peak times, making it of little interest to a fourth railway undertaking to enter the market. This is a key question in the evolution of the market.

The railway undertakings committed to use the capacity with contractual penalties and even fines to be imposed if they do not meet their commitments. Additionally, they committed to use specific rolling stock and to follow the model predefined by ADIF AV in terms of stations, timetables, stops etc. They can exploit further services, but they cannot reduce the minimum amount of services in each corridor, or transfer services from one corridor to another.

Overall, the three competitors have committed to exploit on average 55% more services than those Renfe provided before liberalization. The newcomers will exploit around 35% of the capacity assigned in framework agreements. In financial terms, ADIF AV has estimated a €2 billion increase in revenue over a 10-year period. However, there is no visibility in the evolution of access charges, as these are set annually by Parliament.

The signature of the framework agreements, scheduled for late April 2020, has been delayed by decision of the regulator to limit the duration of Renfe's framework agreement to 5 years, as well as by the COVID-19 crisis.

4. Economic Evaluation

4.1. Is the Spanish high-speed network congested?

The Spanish railway regulator – CNMC – had to intervene in order to remind ADIF AV that infrastructure managers can only employ priority criteria to exclude applicants, including for framework agreements, in the case of congestion of the infrastructure. ADIF AV was only allowed to trigger the convoluted system of competitive allocation if the conflicting requests proved an impossibility of the infrastructure meeting the demand for capacity.

Congestion, therefore, had to be declared by ADIF AV before triggering the use of the priority criteria. As previously explained, the congestion of the Spanish high-speed network is far from obvious. Only the stations in Madrid and particularly in Barcelona are bottlenecks.

ADIF AV could have followed the example of other countries and just waited for railway undertakings to ask for capacity in the framework of the annual procedure for the allocation of capacity. This was the procedure in Italy and it is going to be the procedure in other countries with extensive high-speed networks such as France. Both of these networks are more congested than the Spanish one.

Railway undertakings would have entered the Spanish market on the basis of their business plans, including the availability of rolling stock. In fact, the date for the opening of the market was set in the Fourth Package back in 2016, so undertakings had time to order rolling stock for December 2020. As in the other European markets, entry by a competitor would deter further market entry. Railways does not seem to be a market for more than two or three undertakings on the same route, according to experience in other markets. Competition in the market would have grown organically, and the capacity would have been allocated on a first come, first served basis.

Congestion in the Spanish market, on the contrary, might be the result of a self-fulfilling prophecy. ADIF AV's call to railway undertakings to submit their capacity requests triggered scarcity. Six candidates submitted requests for capacity. Does this mean that all six of them were interested in using all the requested capacity, independently of the capacity requested by the other undertakings? Certainly not. There is no demand in Spain for the aggregated supply of all six requests. Experience in other markets shows that there is not even room for six competitors in the market.

The requests for capacity were in reality strategic offers designed to defeat other offers in the competition for the market organized by ADIF AV. The rules of the competition rewarded the most intensive use of the infrastructure. It is no surprise that requests – i.e. offers – were, first, in line with

the packages designed by ADIF AV, second, included capacity in all three corridors, and third, requested as much capacity as possible with the rolling stock available.

A more transparent procedure would have involved two different stages. In a first stage, undertakings would have been invited to plainly submit their requests, under no pressure from any assignment criteria in a future competition for the market. Requests would have been analysed to identify whether conflicts existed and whether coordination would be possible. In a second stage, and only if coordination were not possible, would undertakings have been requested to make a new request different form the first one. The assignment criteria would have been defined to coordinate the requests and meet as many of them as possible and not exclude applicants.

4.2. Planning an 'orderly' transition to competition

The self-fulfilling prophecy of congestion empowered ADIF AV to define the business model the railway undertakings would implement. Planners in the infrastructure manager designed the business plan for railway undertakings with the objective of "favouring the introduction of service competition in an orderly and gradual manner" (ADIF, 2019A).

The solution designed by ADIF AV determined the number of competitors in the market when it decided three framework agreements would be signed. No formal explanation has been provided to support this choice.

The model determined that competitors would have to be active in all three high-speed corridors, and not in individual corridors selected by each competitor. This option was imposed when activity in all three corridors was defined by ADIF AV as the priority criterion for the allocation of the agreements.
In addition, the size of the operations of each of the three competitors was predetermined, as the number of paths assigned in each framework agreement would be asymmetric, with the three agreements covering around 60%, 30% and 10% of the available paths. This decision determined the size of each competitor's operation, and as a consequence the market share that they can obtain.
ADIF AV even determined the number of frequencies, the schedule, the stations and the stops for the competitors on the basis of the need to optimize the network's capacity.

Finally, the market structure has been ossified for the next 10 years, as capacity requests have been transformed into contractual commitments with heavy penalties in the case of breaches and there is little margin for review.

Certainly, capacity optimization is one of the priorities for an infrastructure manager. Infrastructure managers have a legal obligation to "make optimum effective use of the available infrastructure capacity" (Art. 26 Directive, 2012/34/EU). However, one might wonder whether the obligation to optimize the use of infrastructure capacity grants the right to the infrastructure manager to determine the business plans of the railway undertakings in the amount of detail defined by the Spanish infrastructure manager.

The consequence of this model is that ADIF AV has transferred to the railway undertakings the risks deriving from the implementation of a business plan they did not design. The assignment criteria incentivized the most intensive use of capacity in all three corridors. The result is that a sharp increase in supply is now a contractual obligation for the railway undertakings.

Similarly to concession contracts, railway undertakings have assumed the obligation to provide a minimum amount of services independently of the evolution of the demand. An example is the franchising of railway services in the United Kingdom.

The 10-year duration of a framework agreement is a very long period during which changes in the conditions of supply and especially of demand can occur at any time. One example is the current

uncertainty about the evolution of demand as a consequence of the economic crisis caused by COVID-19. The virus is introducing new risk in supply, as railway undertakings might have problems to have access to the rolling stock needed to comply with the supply plan of the framework agreement. Furthermore, supply will be limited for a certain period, as only a percentage of seats in each train will be available to ensure the minimum social distance. In parallel, the impact of the virus in the demand of public services is expected to be very substantial.

This uncertainty will most likely lead to renegotiations of the terms of the framework agreement. Although the rules on framework agreements allow for flexibility when the contract cannot be fulfilled for reasons beyond the control of the successful tenderer, experience shows that renegotiations are always complex. It can be even questioned whether signing the framework contracts after the COVD-19 crisis exploded, being aware of the need to review the contract, is to be considered a reasonable option.

4.3. Future evolution of the market

The economics literature suggests that liberalization delivers the best results when there is market potential, i.e. the possibility for the market to grow in volume (Preston, Whelan & Wardman, 1999). In other words, the literature suggests that competition is welfare-improving if it generates enough new passengers (Alvarez et al., 2016). Otherwise, price competition with homogenous services merely triggers a devastating price war (Villemeur, Ivaldi & Pouyet, 2003).

Liberalization has led to sharp increases in the supply of services in all the countries that have already liberalized their railway services. On the Rome-Milan route, frequencies increased by 56.4% between 2010 and 2013 (Bergantino, 2015). In the Czech Republic, on the Prague-Ostrava route the number of frequencies increased (from 20 in 2010 to 35 in 2014) but the number of seats per train was simultaneously reduced, from 465 in 2010 to 333 in 2014 (Tomes, 2016). In Austria, on the Vienna-Salzburg route the number of frequencies increased significantly. New-entrant Westbahn initially offered 15 connections a day and announced an increase to over 30 in its 2018 timetable, while ÖBB offered 33 daily connections (Finger, Kupfer & Montero, 2016).

In Spain, the railway undertakings have committed to an increase of 55% in frequencies. This increase is not limited to the Madrid-Barcelona route but applies to all three high-speed corridors. In fact, daily frequencies might even double on the less attractive route (Madrid-Alicante). This is the main difference between the model implemented in Spain and the liberalization in other European countries, where expansions of services are being freely decided by railway undertakings, with service expansion being very conservative, limited to the most profitable services and implemented gradually.

It is often stated that competition leads to growth in patronage, particularly in high-speed services. In Italy, the number of high-speed passengers grew from 23.4m in 2011 (before NTV's market entry) to 40.3m in 2015 (of which the incumbent had a market share of 77.4%). On the Prague-Ostrava route, a ridership increase of 92% was observed between 2010 and 2015 and the incumbent had a market share of 41% in 2015 (Tomes & Jandova, 2017). On the Vienna-Salzburg route, demand increased by 25% between 2013 and 2016 (Finger, Montero & Kupfer, 2016). Overall, the market share of the incumbent ÖBB on all passenger routes in Austria is around 88% (IRG-Rail, 2014). In Sweden, the total rail passenger-kilometres increased by 1.9% in the first half of 2017 compared to the same period in 2016 (Trafik Analys, 2017).

The Italian example is often cited. However, competition in high-speed services in Italy coincided with the completion of the high-speed infrastructure between Milan and Rome (Desmaris, 2016). It has been argued that growth in demand in Italy can be explained by the availability of the high-speed infrastructure rather than by the introduction of competition. In fact, the ridership growth in Italy when the high-speed infrastructure was introduced mirrored growth in France, where no high-speed competition existed (Olarte, Brunel & Sigaud, 2019).

Growth in ridership in Italy, as in France, is explained by the transfer of passengers from aviation to railways. Competitive travel times made possible by the high-speed infrastructure and cheaper fares have led to high-speed services reaching a modal share over 80% (against aviation below 20%) on the most popular routes in Italy (Milan-Rome), but also in France (Paris-Marseille), where no competition exists yet. It has been observed, however, that high-speed services have not attracted a substantial number of private car users in Italy (Borsati & Albalate, 2019), and in France car-pooling is actually detracting passengers from high-speed services (Montero, 2019).

On the Madrid-Barcelona route, high-speed has a modal share of 66.3% against air transport. High prices – to cross-subsidize loss-making services – and capacity constraints due to scarcity of rolling stock explain this low share. As a consequence, there is room for growth. However, this room is limited, as the modal share is not as low as it was in Italy when high-speed was introduced (41%).

The situation is different in the other corridors. High-speed railways already have a modal share over 80% in the east and south corridors in Spain. No major increase in ridership can be expected from a modal shift from air to rail in these corridors. New demand can only be induced with more aggressive marketing techniques. Some passengers can be attracted from road transport, particularly from coach services, which are very popular in Spain among low-income individuals such as students, young professionals and retired people. Aggressive yield management can attract some of these passengers, as happened in the United Kingdom. However, it is difficult to substantially increase ridership when air passengers, the low-hanging fruit, have already migrated to high-speed services. The shock in supply might not be met by a parallel increase in demand. Furthermore, the current sanitary crisis has introduced more uncertainty. These corridors connect Madrid with the more popular tourist destinations in the Mediterranean coast. COVID-19 might make it more challenging to attract touristic traffic currently traveling by private car. On the contrary, existing travellers might move from public transport to use the private vehicle.

Furthermore, the decision to have three competitors raises some questions about the competitiveness of the newcomers. The incumbent will have access to 2.5 times the capacity of the second competitor. The newcomers might have difficulty in reaching the necessary economies of scale and density to compete with the incumbent. The two newcomers will be exploiting around 18 million and 1 million train-km per year in a network of 1.900 km, which might not be enough to reach the necessary economies of scale and density (Wheat & Smith, 2015).

The need to increase demand to meet the committed increase in supply is expected to lead to very aggressive competition between the three competitors, particularly in the east and south corridors.

Rates can be expected to be sharply reduced in all the corridors. This has been the experience in competitive rail markets. The Italian incumbent reduced high-speed fares by an average of 31% just before competition started (Cascetta & Coppola, 2014) and has maintained a similar level of prices. These prices have been calculated to be around 30%-35% higher than those of the new entrant (Bergantino, Capozza & Capurso, 2015). In the same way, in the Czech Republic fares went down by 46% on the Prague-Ostrava route between 2011 and 2014 (Tomes, Kvizda, Jandova & Rederer, 2016). In Sweden, prices on the Stockholm-Goteborg route went down by 12.8% in the period between March 2015 and June 2016 (Vigren, 2016). After Westbahn's market entry in Austria, prices for long distance connections were reduced overall (the new entrant offered tickets on the Vienna-Salzburg route at 50% of the incumbent ÖBB's standard). This was followed by a shift towards a more sophisticated pricing regime at ÖBB, with better rates for early bookings and higher discounts for owners of loyalty cards (Finger, Kupfer & Montero, 2016). This is in line with economic models (Broman & Eliasson, 2017; Ruiz & Palacin, 2013).

Prices tend to stabilize after a period of competition, particularly when there are only two competitors in the market (Montero, Ramos & Giuricin, 2017). However, economic theory predicts that in markets with a higher number of competitors, particularly when they have asymmetric market shares and there

is a maverick (the role that SNCF could play with a small volume of rail paths), equilibrium is often not reached and prices tend to fall to the level of variable costs.

This effect is reinforced when substantial barriers to exit are introduced, which is the case in Spain as ADIF AV has introduced heavy penalties in the case that an applicant misses its commitments to make use of the infrastructure. We should remember that these commitments have been made for a period of 10 years. Operators can be expected to differentiate their products. If they are successful, product differentiation can reduce constraints on prices.

Price reduction will have a steep impact on competing transport modes. Aviation can be expected to reduce its modal share on the Madrid-Barcelona route. Coach services will be severely affected by the reduction in prices. Passengers on the main lines connecting the larger cities will migrate to rail services. As a result, they will not be able to cross-subsidize the other lines served in packages under concession rights. The model of coach concessions will have to be reconsidered as internal cross-subsidies are not sustainable when inter-modal competition is strong.

5. Conclusions

Framework agreements are regulated in the EU railway legislation to provide certainty to railway undertakings, and particularly to newcomers entering the railway market when it is liberalized in December 2020. This certainty has to be balanced with the necessary efficiency in the management of railway infrastructure, and certainly it should not preclude further market entries due to exhaustion of capacity. These are the objectives protected in Commission Implementing Regulation 2016/545 on framework agreements.

Congestion in railway stations in Madrid and Barcelona has empowered ADIF AV to plan an orderly introduction of competition. ADIF defined the stations to be used for each route, the departure times, the stops to make, the speed, the arrival time, the waiting time in the destination and the time to be back at the origin for a new service, constructing a rigid timetable of cadenced services throughout the day in all three high speed corridors.

Furthermore, ADIF decided that only three framework agreements would be concluded, making 70% of the total capacity available for these framework agreements. Three asymmetric packages were defined for the framework agreements. Package A would have 60% of the capacity reserved, Package B 30% and Package C 10%. The packages would include services in all three main high-speed corridors connecting not only Madrid with Barcelona but also with less profitable destinations such as Valencia, Alicante, Malaga and Sevilla.

ADIF celebrated the “success” of not having capacity to meet all the demand from the applicants. Some applicants had to be excluded according to priority criteria, meaning that strategic overbidding could not to be excluded from the market. Six offers were made. The winners were Renfe for Package A, ILSA/Trenitalia for Package B and SNCF for Package C. There is still capacity available for assignment to a fourth competitor in the annual allocation procedure, but it is not clear if such market entry is really feasible, as available capacity might be limited to relatively unattractive off-peak hours.

High-speed railway services will be provided under competitive conditions in Spain. The tender procedure has ensured a sharp increase in services and it promotes effective competition. Passengers will certainly benefit from more frequencies and lower prices in the short term.

However, the winning railway undertakings will be subject to very rigid commitments for the next 10 years in terms of the routes they will operate, their frequencies, timetables, stations, stops, etc. Such rigidity for such a long period might be an obstacle against supply adapting to demand, and might pose a risk to the viability of these railway undertakings in the long term. Rigidity in very ambitious commitments might be the winners’ curse.

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