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Goodbye monopoly: the effect of open access passenger rail competition on price and frequency in France on the High-Speed Paris-Lyon Line

Florent LAROCHE

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Keywords: Open-access competition, price, frequency, France, regulation, railroads

J.E.L. Classification: L1, L110, L130, L5, L920

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ABSTRACT

The Paris-Lyon line is the busiest High-Speed Line in Europe and has been open to competition in open access since 18 December 2021. This paper explores how the effects for users with respect to price and frequency compare with the existing literature and is the first academic examination of the French case. The analysis is based on a large database (*n* = 1 243) collected by web scraping from September 2019 to October 2022. The method relies on a Difference in Differences approach with a similar route without competition (Paris-Bordeaux) in the comparison group. The results highlight an increase of frequency by 15% and a decrease in price by 23%. The prices charged by the newcomer are lower than those of the incumbent (-30% to -60%). The comparison with the control route suggests a positive effect on price that moderates the economic catch-up effect following the COVID-19 pandemic in an inflationary context. More specifically, SNCF appears to take a wait and see attitude to competitive pressure from Trenitalia. It has moderated its prices since the new offer was introduced and has maintained its trains.

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INTRODUCTION

Initially planned for 2020, but postponed due to the COVID-19 pandemic, the first competitor finally entered the French national rail passenger market in open access on 18 December 2021. The newcomer, Trenitalia France, launched its service on the Paris-Lyon High Speed Line (HSL). It is currently limited to this route but this event already marks a historic step for French rail, after more than 80 years of state monopoly by the SNCF, and represents a symbol for European transport policy, 30 years after the well-known Directive 91/440/EEC. A major railway network in the European Union, France was often described as a "fortress" by its neighbours because of its slow progress in the deregulation process.

The purpose of this paper is to draw up the first overview of the market by considering prices and frequencies after one year of competition. To our knowledge, no study has been yet been carried out on the new French case and it appears pertinent to compare this situation to other markets already opened to competition, like in Italy (Bergantino *et al.*, 2015; Beria *et al.*, 2016; Desmaris and Croccolo, 2018; Beria *et al.*, 2019; Beria *et al.*, 2022), the Czech Republic (Tomes *et al.*, 2016; Tomes *et al.*, 2018; Jandova and Paleta, 2019; Fitzova *et al.*, 2021; Tomes, 2022), Sweden (Alexandersson and Rigas, 2013; Froidh and Nelldal, 2015; Vigren, 2017), the UK (Temple, 2015) and, more recently, Spain (Montero and Melero, 2022). There are several reasons for carrying out a specific analysis of the French case in the literature. Firstly, the results expected by the literature highlight a benefit for users in terms of price and frequency. However, the relevance of their results strongly depends on the initial context and the national organisation of the market (Laroche and Lamatkhanova, 2022). Also, many barriers to competition remain (Bougette *et al.*, 2021) and experiments in open access are still rare in Europe, with a large number of bankruptcies and failures (Alexandersson, 2009; Finger, 2014; Perennes, 2017; Tomes, 2022). Secondly, the newcomer is far from being an unknown entity. Trenitalia France has experience in High-Speed Rail competition in open access, gained by its mother company, Trenitalia, in Italy. It has also gained experience of the French network since 2011 thanks to the night service "Thello", which was the first independent rail passenger operator to run in France on the international market from Paris to Venice. Consequently, the company already had good knowledge of the French network, its technical specificities, and constraints (Crozet *et al.*, 2022). Only a few companies had as many advantages when entering a market, thereby increasing the interest of the French case. This is also the first time in Europe that a national incumbent has been directly engaged in open access competition on an HSL against another major incumbent, as the Spanish case is different because of the tendering process (Montero and Melero, 2022). Thirdly, the Paris – Lyon HSL was the first line to be built in Europe and has since become the busiest, with 44 million passengers in 2019. It is also the most profitable for the national incumbent. This line is renowned for high access charges, capacity constraints and its role of laboratory for SNCF, with the development of several technical and service innovations such as the signalling system in the cab, the Duplex (double deck) High Speed Train (HST) and, since 2013, the low-cost service Ouigo ("homemade" competition). Last but not least, the institutional context in France is favourable to competition which has been planned for a long time with a proactive policy from the regulatory agency (ART) and the network manager SNCF Réseau. For its first year, Trenitalia obtained a discount of 37% on access charges and facilities (-16% for the second year and -8% for the last year) to find available slots in accordance with the system in force intended to offset the entrance costs for a newcomer.

The analysis is based on a large database (n = 1 243) collected from September 2019 to October 2022. Key variables like price for second class seats, schedules, travel times, etc., were collected every Tuesday, one week before departure. The method deals with two challenges: assessing the effect of competition and isolating the COVID-19 effect. Laroche (2022a) showed that the long-distance market

was affected during the pandemic with a falls of -5% in frequency and -16% in average price for long distance train services between September 2019 and November 2021. To assess the specific effect of competition, we use a Difference in Difference approach in a way similar to Beria *et al.* (2022). The route chosen for the comparison group is the Paris – Bordeaux High Speed Line. It presents similar characteristics to the Paris – Lyon line (distance, travel time, offer, etc.) but without competition. Concerning the COVID 19 effect, we chose a long period of analysis from October 2019, before the pandemic, to October 2022, seven months after the end of the sanitary restrictions in France and 10 months after the entry of the newcomer.

The main results highlight a contrasted situation. On the one hand, the newcomer maintained its role by reducing its price (between -30 and -50%) and increasing its offer (from two to five services per day). The effect had to be moderated by a discount on the access charges and the difference could be reduced with the end of subsidies. On the other hand, the incumbent demonstrated moderation by stabilizing its premium offer (Inoui) and reducing its prices (-21%) between 2019 and 2022. The low-cost offer (Ouigo) also remained stable (0%) and prices decreased by 13%. Considering the two HST services offered by SNCF and Trenitalia, the frequency on the Paris-Lyon line increased by 15% and prices decreased by -23%. The results are in line with the literature even if the prices for trains in direct competition with Trenitalia decreased less than the rest (-17%), highlighting a position of limited sensitivity from the incumbent to competitive pressure.

There are several policy implications. Firstly, it is clear that competition should have a positive effect on user welfare, with a consistent offer with more diversity and moderate prices. The last point is significant in an inflationary context. Secondly, the development of the newcomer highlights the importance for public institutions to anticipate competition with adapted regulatory tools such as support for access charges and the identification of available slots. The French national regulatory agency and the network manager have carried out extensive and profitable preparatory work, and gained feedback from other experiences to make the first year of competition a success without major technical or organisational failures. Finally, a danger could be to consider only the user benefit. Traditionally, the Paris-Lyon HST line provided the resources for the incumbent to subsidise other HST routes in deficit. A price war could jeopardise this equilibrium and have a negative effect for users on the other routes.

The paper is organized as follows. In Section 1, we provide a more in-depth literature review of the results expected from open access competition. In Section 2, we describe the method. In Section 3, the initial context and the database method are presented followed by the main results in section 4. Finally, the results are discussed in section 6 before we conclude in section 7.

1. LITERATURE REVIEW

There is a great deal of literature on this topic, mostly based on national case studies. Several results from previous studies can be used to understand the those expected from the French case. The first result was the observation of a limited number of successes throughout Europe in terms of open access. Perennes (2017) showed that it usually takes several years for open access to settle after opening officially. Newcomers are rare and try to minimize the risks, with large scale entry extremely rare and bankruptcy common. Bougette *et al.* (2021) explained this limited entry by the persistence of barriers such as the burden of access charges to use the network and the recurring difficulties of access to essential facilities like rolling stock, mechanical maintenance workshops, data and competent staff. Nash *et al.* (2019) identified access to rolling stock and staff as major barriers because most of the time they are in the hands of the incumbent. These impediments have also been identified for the freight market (Laroche *et al.*, 2017). Consequently, 30 years after the start of the deregulation process in Europe, Tomes (2022) recently reported that the number of cases of open access since 2000 is limited. Nash *et al.* (2019) observed that until now, competition for the market has been more common than in open access because of fewer financial risks. Many attempts have led to bankruptcies and only a few of them can be considered as successes in Italy, Austria, the Czech Republic and Sweden. However, these successes are often limited to the main route and the best market shares obtained are around 30% for the newcomers MTR and Flixtrain in Sweden, and 49% for Westbahn in Austria (Crozet *et al.*, 2022). Also, competition was until recently mainly supported by outside operators on traditional lines. Regarding HSR, the newcomer Italo in Italy was an exception in Europe. This appeared to change after the entry of Ouigo in Spain in May 2021 and the entry of Trenitalia in France in December 2021. These last two entries have occurred in the face of national incumbents with strong financial support. It could be the sign of a new phase in railway competition in Europe.

The second result is global consensus about the benefit for users in terms of frequency and price. Theoretically, competition should have a positive effect on social welfare by increasing frequency and reducing price (Lang *et al.*, 2013; Feuerstein *et al.*, 2018; Broman and Eliasson, 2019). Empirically, the effect is clear on frequency. Bergantino *et al.* (2015) showed that frequency increased by 56% on the main route (Milano – Rome). This was confirmed by Desmaris and Croccolo (2018) for an Italian case study and more recently by Montero and Melero (2022) for a Spanish case. According to Tomes *et al.* (2018), frequency increased by 35% in Austria and 65% in the Czech Republic between 2010 and 2016 on routes subject to open competition. Also, Laroche and Lamatkhanova (2022) showed a significant relationship between routes with competition and frequency in a European benchmarking study. This effect can be explained by the structure of the railway industry which is characterized by large economies of scale (Crozet *et al.*, 2022). Consequently, competition is driven more by volume (Cournot competition) than price (Bertrand competition) and price decrease is a derived effect (Crozet *et al.*, 2022). There is more debate about prices. In some cases, they have decreased drastically, as in the Czech Republic (-46% between 2011 and 2014) and Austria (-20 to -25% between 2010 and 2016) according to Tomes *et al.* (2016) and Tomes *et al.* (2018). In other cases, the effect is more complex. In a recent detailed study, Beria *et al.* (2022) showed that price on the Turin-Venice route decreased by -21% to -26% after the entry of Italo in May 2018. However, more than six months afterwards, the reduction was around 15%. This confirms older results such as a decrease of -15% observed for the second-class price by Beria *et al.* (2016) on the Milano – Ancona route between 2013 and 2014. The newcomer (NTV) was presented as a price-taker. In Sweden, Vigren (2017) measured a fall of 12.8% in 2015 following the entry of the newcomer MTR on the Stockholm – Gothenburg route. Finally, Laroche and Lamatkhanova (2022) did not find a significant effect of competition on price when comparing

routes with and without competition in seven European countries. This does not mean that there is no effect but some networks can have more similar performances without competition than others. A large proportion of the effect depends on the initial stage, the capacity of the newcomer to compete in the long term, and the potential demand. For the French case, the equation is rather simple but the result difficult to predict. The initial stage shows an incumbent that is already competitive regarding price, especially because of its strategy of market segmentation between a premium and low-cost offer. It could be a challenge for the newcomer to find the right positioning to compete effectively. Regarding its capacity to compete in the long term, several questions must be answered regarding Trenitalia's financial support and capacity. Finally, according to Crozet *et al.* (2022), there is still potential demand to be captured on the already busiest route in Europe. In the following sections we propose to test these assumptions for the French case.

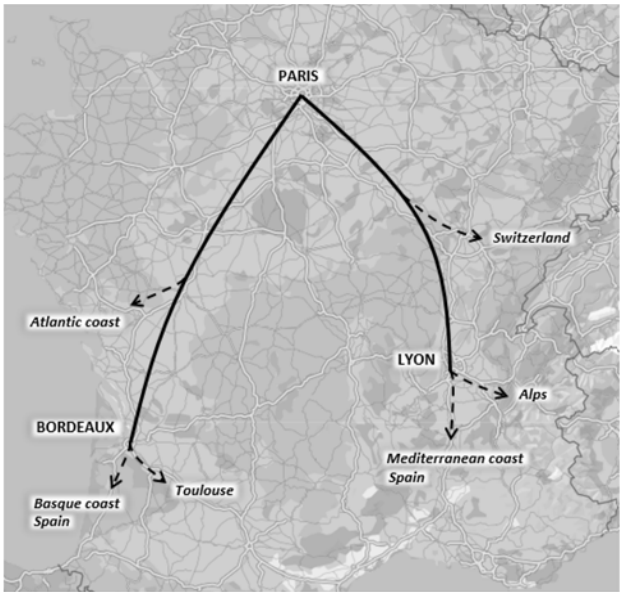
2. BACKGROUND ON THE PARIS – LYON HSL

Subsection 2.1 describes the context of the Paris-Lyon HSL then subsection 2.2 presents its services before competition.

2.1 Characteristics of the Paris – Lyon HSL

The Paris-Lyon HSL was commissioned in 1981. It was the first in Europe and 40 years afterwards it is still a success with 44 million passengers in 2019. 430 km long, figure 1 shows that the HSL concentrates a large number of origin-destinations from Paris to southeast France, Switzerland (Lausanne, Zurich, Geneva), the Alps (Grenoble, Chambéry), the French riviera (from Marseille to Nice), towards Spain, and, of course, Lyon and Saint Etienne. It is important to mention that several downtown and suburban stations in Lyon and Paris are linked to the HSL (Gare de Perrache and Gare Part-Dieu for Lyon, Gare de Lyon and Paris-Bercy for Paris). Saint Exupéry station is situated at the airport of Lyon, 28 km from the city. This station is used by few trains (exclusively Ouigo) but it is possible to reach the central station in Paris from the suburban stations of Marne La Vallée and CDG airport. In this paper, we consider all these origin-destinations between Paris and Lyon as one market.

Figure 1: Map of the study analysis perimeter (Paris-Lyon and Paris Bordeaux).



Source: Author based on Google Map

The consequence of the high number of connections is the saturation of the HSL line during peak periods on the busiest part of the line. A victim of its own success, more than 200 trains per day run on the busiest part (Laroche, 2014). Several innovations have been provided to increase capacity such as the implementation in 1981 of a standard for a new signalling system (TVM 300), its improvement in 2001 to reduce the buffer time between each train to 4 min and in recent years, investment in the implementation of the European railway traffic management system (ERTMS level 2) by 2030. The objective is to increase commercial capacity by 30%, by reducing the buffer time to two minutes between each train (Laroche, 2014). Whatever the case, with around 30 trains per day between Paris and Lyon in 2019 and a high utilisation rate during peak periods, the network manager is faced with a huge challenge to open this route to competition and find competitive available slots.

From the economic viewpoint, the Paris-Lyon HSL is the most expensive in France in terms of access charges for two reasons. Firstly, the French network is well-known to be one of the most expensive in Europe because of the choice to cover its full cost on the basis of a Ramsay-Boiteux pricing policy (Crozet, 2018). Secondly, the HSL has the strongest market power in France due to the high number of surplus users (many business travellers).

Consequently, open access can lead to issues for traffic management, including the marketing of the slots and the business model to be adopted for the newcomers.

2.2 Service organisation before competition

The route was under the monopoly of the SNCF until 18 December 2021. However, it concentrates different types of services. The traditional High Speed Train service is the best known and oldest. To satisfy demand and take into account scarcity in slots, it is composed mainly of Duplex HST with a capacity of 510 seats in a single train. Most of the trains are doubled and the effective seat capacity is around 1020 seats per trip. The commercial objective is to run at least one train per hour from 6 a.m. to 21 p.m. between Paris and Lyon.

From 2013, to cope with the economic crisis and the development of intermodal competition (carpooling and coaches), SNCF launched the first low-cost HST in Europe (Ouigo). It was a considerable challenge for several reasons. Firstly, there is no bar or convenience as in the traditional offer. There are only second class seats with a total of 634 seats. Secondly, the O-D are outside the city centres, mainly at secondary stations in suburbs or further away such as Saint Exupéry station for Lyon and Marne la Vallée and CDG airport for Paris. Last but not least, there is no physical agency to market the new product. All the marketing is digital. The objective was clearly to capture a new, younger and less profitable market than that usually catered for. The basic price fell from €25 to €10 and has been a complete success. In 2019, it represented 30% of the train offer on the Paris-Lyon line and it is possible to travel from downtown to downtown or from suburbs to downtown.

Finally, mention can be made of a subsidised service on the Paris-Lyon line organised by the local authorities. This service is marginal insofar as there are only four trains per day and it uses the traditional line (no HST) for a travel time of around 5 hours. We will not consider this service in the rest of this paper.

The consequence of this situation is a diversified and original offer on the Paris-Lyon HSL. It raises questions regarding the market positioning of a newcomer between two already well-established offers: premium for Inoui and low-cost for Ouigo.

3. METHOD

Subsection 3.1 defines the conditions of the descriptive analysis after which subsection 3.2 presents the difference-in-difference approach used to compare the Lyon-Paris route to a route without competition.

3.1 Descriptive analysis

The method used to analyse the effect of competition on price and frequency is based on a descriptive analysis in three steps. The first one presents the positioning of Trenitalia on the time schedule and gives an overview of the evolution of the offer from 18 December 2021 to October 2022. The period of reference is October 2019. The second one gives the result for prices and frequencies. Finally, the last step is an original analysis based on a timetable approach (from October 2019 to October 2022) to discuss the positioning of Trenitalia, its pricing strategy and the reactions of the incumbent train by train.

The main challenge for the analysis was to isolate the effect of the COVID-19 pandemic. As France and a large part of the Europe were still subject to the COVID-19 pandemic in December 2021, it would be hazardous to consider only the year 2021 and 2022. To reduce bias, five periods are considered in table 1:

- October 2019: this period was before the COVID-19 pandemic and a normal month for traffic without strikes in France;
- October 2021: a month during the COVID-19 pandemic without lockdown but still under sanitary restrictions with the obligation of vaccination to use rail transport. This month gives a picture of the situation before the entry of Trenitalia;
- December 2021/January 2022: this period covers the first month of Trenitalia operation. It was still a difficult period in France with the biggest waves of COVID-19 infection in spite of vaccination;
- June 2022: 6 months after the entry of Trenitalia and three months after the end of sanitary restrictions. It is also at the beginning of the summer holidays in France;
- October 2022: 10 months after the entry of Trenitalia and at the same period as the two first ones (October 2019 and October 2021).

Table 1: Period for analysis and COVID or competition effect.

	Situation in monopoly	**Situation in competition**
No COVID restriction	October 2019	June 2022; October 2022
COVID restrictions	October 2021	December 2021/January 2022

Source: Author

Price and frequency are given as an average for the period considered. The global price is a weighted average to take into account the diversity of the offer and the weight of each service (Ouigo, Trenitalia and Inoui) in the total. The weight is based on frequency.

Finally, the analysis is circumscribed by several strong data limitations. It is not possible to assess the benefit from the operators because of the lack of information about the occupancy rate. Also, the absence of data on the demand structure and pricing distribution does not allow assessing the user surplus and the global equilibrium. A theoretical model could overcome these limits and be developed in future research.

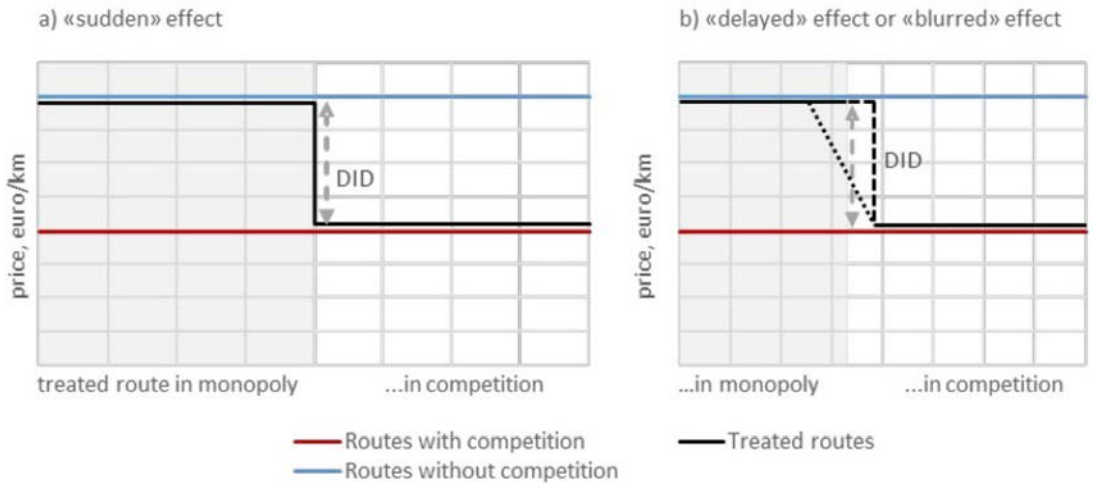
3.2 The difference-in-difference approach

The difference-in-difference approach proposes to identify the effect of a change over the time for a group of the population by comparison to another not affected by the change (Wing *et al*., 2018). The group affected by the change is called the "treatment group" then the other is the "comparison group". The method is especially well adapted to our case study and has been already applied to railway analysis by Beria *et al.* (2022). The authors compared routes in Italy with competition to routes without competition to better assess the effect of competition on price. They found that prices decreased more significantly on the route with competition than others by -21 to -26% in the first six months and -15% in the long term.

In our context, we propose to apply a similar approach for the Lyon-Paris route. The comparison group is limited to the Bordeaux-Paris route. It has the interest of being similar with no competition yet. Also, data are available and will be presented in the section 4.

According to Beria *et al.* (2022), we should obtain the following result in figure 4 where two situations are possible. The effect of competition is "sudden" and the incumbent has to quickly reduce its prices or the effect is "delayed" because the incumbent anticipates or is subject to considerable inertia.

Figure 2: Theoretical expectations about the effect of competition, without exogenous effects.



Source: Beria *et al.*, 2022

4. DATA

Subsection 4.1 describes the method used for the data collection then subsection 4.2 presents the characteristics of the control group Bordeaux – Paris HSL. Finally, subsection 4.3 gives the descriptive statistics.

4.1 Collection method

The data were collected every week from September 2019 to October 2022. The day of collection was Tuesday followed by (d-7); the method used to collect the data was manual web-scraping. In spite of the time required, manual collection is more reliable than automatic collection to avoid double counting or other usual mistakes on official websites. The collection was based on the following three websites. The main website was SNCF-connect.com for the largest share of the offer from the

incumbent. However, it was necessary to complete the research with the website dedicated to its low-cost offer, Ouigo.com. Finally, the data for the newcomer were collected on its website, Trenitalia.com.

The collection was done train by train in one way (toward Paris). We took into account the price for the second class, the type of train (Ouigo, Inoui, etc.) and the departure/arrival schedule. By deduction, it gave different useful variables such as the price per kilometre, travel time, frequency, etc.

4.2 Characteristics of the control group: Paris – Bordeaux HSL

Two routes were considered (cf. figure 1): Paris-Lyon and Paris-Bordeaux. The interest of the second route is that it is comparable with the first one but without competition. The travel time is quite similar, a little longer for Bordeaux because of the greater distance (586 kilometres for Bordeaux versus 466 kilometres for Lyon), and they both have large hinterlands, the Basque coast and Toulouse for Bordeaux and the French Riviera and Marseille for Lyon. Also, both routes have the characteristic of serving different stations at their departure and arrival. We took into account all these stations without discrimination. Consequently, Lyon-Saint Exupéry to Marne la Vallée is considered as a full part of the Paris-Lyon route as is Bordeaux Saint-Jean to Massy TGV for Bordeaux-Paris. It is certainly the best case for a reliable control route in France.

However, the comparison has to consider certain limitations in terms of socio-economic criteria and organisation. From the economic and demographic standpoints, they are not strictly comparable. Lyon has a bigger metropolitan area (1.3 million inhabitants) and stronger economic dynamics in comparison to Bordeaux (749 595 inhabitants). Also, the HSR is more recent in Bordeaux (2018) than in Lyon (1981) and is managed by a private network manager (LISEA) independent from the French rail network manager (SNCF Réseau) in charge of the Lyon-Paris route. Consequently, the strategy of access charge pricing can differ between both network managers as can the traffic design. Indeed, there are few studies comparing both strategies and it is difficult to identify strong differences. In this study, we assume that differences in terms of organisation are limited and make the comparison possible.

4.3 Descriptive statistics

Table 2 gives an overview of the data available for the study. In total, 1 243 observations were used in this study; 760 for Lyon-Paris and 483 for Bordeaux-Paris. The data are disaggregated according to the type of service. For the conventional HSR delivered by the incumbent, the average price on both routes is €72.2for the second class with a minimum to €30 and a maximum to €111. Unsurprisingly, the average price is higher for the first class (€104.5) with a minimum of €37 and a maximum of €175. The amplitude is less important for the travel time between 01:43:00 and 03:25:00 for the HSR which makes several stops on the Bordeaux-Paris line. Finally, the average number of trains per day is 20 and the minimum was obtained during the COVID 19 pandemic in 2020 and 2021. However, from the general standpoint, the specificity of the rail offer is that it is stable with low variations. Concerning the newcomer, the number of observations is lower (48) because of the shorter period for data collection and the limited offer in terms of number of trains per day. It started with two trains, then three before stabilizing since June 2022 at five trains per day. The average price for the second class is around€ 40 with prices between €23 for the lowest to €59. There are no data for the first class in so far they hyave not been collected for this first period of observation. The travel time is quite similar between the minimum and maximum because of considerable homogeneity in terms of traffic (only direct trains between the central station “Paris Gare de Lyon” and “Lyon Part Dieu”). It is interesting to consider the last two types of service separately. The low-cost HSR accounts for 30% of the HSR traffic. The average price is €26.5 with no difference between the first and second class because of the existence of only one class. However, the price variation can be high depending on demand, with a

minimum of €10 and a maximum of €99. This is the highest variation in our panel. Also, the number of trains per day can vary depending the seasons and the demand. In our case, the minimum was obtained during the COVID 19 pandemic. Finally, the travel time is quite similar to the conventional HSR with a difference between the best and longest times because of the heterogeneity of the rail service (direct versus omnibus). The last point is that the conventional services excluding the HSR are more marginal in our analysis. They concern only the Lyon-Paris route and mix two different services: the regional train services and a new intercity service between Paris and Lyon ("Ouigo Classique"). They are both similar in terms of travel times. The frequency is higher for the regional services than intercity services. This difference can be explained by the fact that the intercity offer is a commercial service driven only by the incumbent as a cheaper alternative to the HSR without reservation and with low price variations. The regional service is managed by the local authorities. The normal price for second class tickets is more expensive (€65) but users can benefit from several social discounts according to their age, etc. In any case, these services are marginal and will not be considered in our study. We assume that their substitutability to the HSR is low as they are more in competition with the other modes like carpooling and coach services.

Table 2: descriptive statistics

		Obs.	Av.	Min.	Max.
Rail - conventional HSR *(incumbent: Inoui, TGV)*	2nd class price (€)	804	72.2	30	111
	1st class price (€)	743	104.5	37	175
	Frequency (per day)	804	20.1	15	23
	Travel time (h)	804	02:08:50	01:43:00	03:25:00
Rail - conventional HSR *(newcomer: Trenitalia)*	2nd class price (€)	48	39.7	23	59
	1st class price (€)	-	-	-	-
	Frequency (per day)	48	4	2	5
	Travel time (h)	48	01:58:00	01:54:00	02:02:00
Rail - low-cost HSR *(incumbent: Ouigo)*	2nd class price (€)	309	26.5	10	99
	1st class price (€)	-	-	-	-
	Frequency (per day)	309	7,7	3	13
	Travel time (h)	309	02:05:00	01:43:00	03:03:00
Rail - HSR excluded (TER, Ouigo Classique)	2nd class price (€)	82	57	10	65
	1st class price (€)	-	-	-	-
	Frequency (per day)	82	4.1	3	7
	Travel time (h)	82	05:12:48	05:04:00	05:48:00

Source: author

5. RESULTS

Subsection 5.1 gives an overview of the offer and schedule positioning of the newcomer. Subsections 5.2 and 5.3 provide an analysis of the effect on frequency and price respectively.

5.1 Market positioning analysis

Historically, Trenitalia is not a pure newcomer in France. It entered the market in 2011 after the deregulation of the international passenger market. It ran a night train from Paris to Venice/Rome and a day train between Marseille and Milan under the brand "Thello". During this period, it was the first and the only passenger operator to run alongside the SNCF. It positioned itself on a niche market with only two trains per day running on the traditional line. It stopped its activities in July 2021 because of the COVID-19 pandemic but also to prepare for the new service with the introduction of high-speed

passengers trains between Paris and Milan for the first time on 18 December 2021. The service was progressively strengthened to reach five services per way and per day in June 2022, including three services between Paris and Lyon only. The first train running only on the French network was launched in April 2022 before the introduction of two others in June 2022. At the same time, it should increase its seating capacity. The newcomer started with the HST Frecciarossa 1000 with a capacity of 462 seats running as a single unit. The objective is to transform each train into a double unit by 2023 to improve capacity and obtain economies of scale (Guihery, 2022). In addition, Trenitalia obtained a discount of 37% on access charges and facilities (-16% for the former and -8% for the latter) to find available slots in accordance with the system in force intended to compensate for the costs of entrance for a newcomer

Figure 2 shows the timetable for the Paris-Lyon route when Trenitalia entered in December 2021. The grey area represents the peak period for the morning (from 6:00 to 8:00) and the afternoon (from 16:00 to 18:30). Two comments can be made. Firstly, Trenitalia entered the market only during the off-peak period at 11:26 in the morning and 20:30 in the evening. Both services are far from the peak period. This may be a strategy to test the market and organisation, and to reduce the financial risk. The two services benefit from a lower access charge on the French network because of the off-peak period and take less risk for demand with a base from Milan (Milan – Paris). Secondly, there is a clear difference between the premium and low-cost offer from the incumbent. The premium offer (Inoui) is positioned every hour from 6 a.m. to 9 p.m. (15 hours). This amplitude is rather low as a European study showed an average of 16 hours per day for the other European countries (Laroche and Monchambert, 2019). Also, the offer is doubled during the peak periods (every 30 minutes) with a peak in the morning between 6:00 to 7:00. On the contrary, Ouigo is mainly positioned during the off-peak period with less regularity. This can be explained by the marketing target. The low-cost offer is oriented toward the leisure market which is less sensitive to frequency than the business market (premium offer).

Figure 3: Paris - Lyon timetable in December 2021.



Source: Author

Figure 3 gives the timetable ten months later in October 2022. The first observation is the increase of the Trenitalia offer from two to five services during a day. The second one is the new positioning with one train during the morning peak period and another in the afternoon. The third train is positioned at noon. These new services are provided only on the Lyon-Paris axis and highlight the desire of the newcomer to construct a stronger timetable to capture more demand that includes business travellers. Faced with this development, the incumbent has moved slowly. The global amplitude is unchanged with the principle for the premium service of one train per hour throughout the day and one every 30 minutes during peak periods. The low-cost offer has been adapted but it is difficult to draw conclusions as the timetable is usually floating. However, a remarkable fact is the introduction of a new low-cost service “Ouigo classique”. The principle is the contrary of the high-speed offer with a return to traditional trains on traditional lines. The basic price is €10 and rarely more than €20. The objective is

not to compete with Trenitalia but rather with the alternative modes (coach and carpooling) and may anticipate the entry of new competitors into this market segment. For example, this was the project of Flixtrain in 2019 but the COVID-19 pandemic put an end to it.

Figure 4: Paris - Lyon timetable in October 2022.



Source: Author

5.2 Effect on frequency and price

Table 3 gives the evolution of frequency (average number of trains per day) on the Paris-Lyon routes only for the high-speed services over five periods: October 2019, October 2021, December 2021/January 2022, June 2022 and October 2022. The objective is to compare the situations by taking into account the effect of the COVID-19 pandemic on the period. Three points of comparison have been defined. The first one encompasses the entire period from October 2019 to October 2022. The second assesses the specific effect of COVID-19 on the offer between October 2019 to October 2021, before the entry of Trenitalia. The last considers the last ten months with Trenitalia from December 2021 to October 2022. Finally, the frequency is given by type of offer distinguishing Inoui from Ouigo and Trenitalia. Also, the total account is given for the SNCF only and for the incumbent with Trenitalia.

Table 3: Evolution of the frequency by type of service on the Lyon-Paris route between October 2019 to October 2022.

Frequency (per day)	Oct-19	Oct-21	Dec-21/Jan 22	Jun-22	Oct-22	19/22	*Covid (19/21)*	*Trenitalia (dec21/22)*
Inoui	22	18	21.5	19	22	0%	*-18%*	*2%*
Ouigo	11	13	9.3	10.8	11	0%	*18%*	*19%*
Trenitalia	0	0	2	5	5	-	-	*150%*
Total SNCF (Inoui & Ouigo)	33	31	30.8	29.8	33	0%	*-6%*	*7%*
Total (SNCF+Trenitalia)	33	31	32.8	34.8	38	15%	*-6%*	*16%*

Source: Author

As can be seen, the global evolution of the offer during the period 2019/2022, increased by 15%. This covers various elements. The offer from the incumbent stayed stable for Inoui and Ouigo (0%). Trenitalia entered the market with 5 services per day. The total number of trains in October 2019 was 33 and around 38 in October 2022. These additional trains can be associated with the entry of the newcomer, increasing the global frequency as expected in the literature.

Considering the frequency per period, we can observe that the offer from the SNCF was highly unstable with a minimum in June 2022 due to the COVID-19 effect and the new equilibrium vis-à-vis the newcomer. It is interesting to observe that the evolution was dissimilar for the low-cost offer, with a maximum in October 2021 and a minimum in December 2021. This highlights the difficulties that the

incumbent had to adapt its offer first during the period of the COVID 19 pandemic and then with respect to the newcomer. However, the last period between December 2021 and October 2022 suggests that the global frequency increased due to the Trenitalia offer. October 2022 marks a maximum in the number of trains since 2019, with 5 more trains and a return for the incumbent to its initial offer. This is in line with the literature.

Regarding price, table 4 gives an overview of the evolution using the same method as shown in table 3.

Table 4: Evolution of prices by type of service on the Lyon-Paris route between October 2019 to October 2022.

Price (€)	Oct-19	Oct-21	Dec-21/Jan 22	Jun-22	Oct-22	19/22	*Covid (19/21)*	*Trenitalia (dec21/22)*
Inoui	89.7	65	63.5	78.4	71.2	-21%	-28%	12%
Ouigo	23	20.2	27.9	39.5	20.1	-13%	-12%	-28%
Trenitalia	0	0	33.5	44.6	37.4	-	-	12%
Total SNCF (Inoui & Ouigo)	67.4	46.2	53.1	64.3	54.2	-20%	-32%	2%
Total (SNCF+Trenitalia)	67.4	46.2	51.9	61.5	52	-23%	-32%	0%

Source: Author

Considering the full period from October 2019 to October 2022, the average price per day for all the high-speed services decreased by -23% in total and -20% for the incumbent only. This change is considerable and comprised different trends. More than frequencies, prices were strongly impacted by the COVID-19 pandemic, with a fall of -32% between October 2019 and October 2021 on the Lyon-Paris route. The Inoui services were more impacted than those of Ouigo, -28% and -12%, respectively. Although we observe a dynamic of economic catch-up during the first six months after the entry of Trenitalia (from December 2021 to June 2022), the situation stabilized in October 2022 to a price 25% lower than that of 2019 and the catch-up effect was cancelled over the last period (from June 2022 to October 2022).

To better assess the effect of competition, it is interesting to consider only Inoui and Trenitalia. The global result integrates the low-cost offer which is difficult to compete with regarding price and is not fully substitutable in terms of the comfort provided by Trenitalia. In this case, the effect was stronger insofar as the average price for the newcomer was €37.4 versus €71.2 for the incumbent (+47%). This type of situation is in line with the literature. However, the economic context is different in our case from the previous studies because of the COVID 19 pandemic. The price decrease could also be the result of a strong change in the behaviour of travellers, such as the reduction of business trips. The comparison with the Paris-Bordeaux route without competition should give more elements to distinguish effects from competition and the economic context.

5.3 Results for the difference-in-difference approach

Table 5 gives an overview of the evolution of frequency for the Bordeaux-Paris line. It is surprising to observe that the frequency increased by 18%, more than on the Lyon-Paris line, for both market segments: Inoui (11%) and Ouigo (67%). Although the evolution between October 2019 and October 2021 was quite similar between both routes for the Inoui and Ouigo services (with better performance on the Bordeaux-Paris line), the trajectories changed after the entry of Trenitalia. Without competition, the Inoui services caught up and increased their frequency between December 2021 and October 2022. The path has been dissimilar to the Lyon-Paris route and places in perspective the effect of competition on frequency. It also confirms the strategy of wait and see employed by the SNCF to

maintain its profits in the face of Trenitalia and uncertainty on travel behaviours after the COVID-19 pandemic.

Table 5: Evolution of frequency by type of service on the Paris-Bordeaux route between October 2019 to October 2022.

Frequency (per day)	Oct-19	Oct-21	Dec-21/Jan 22	Jun-22	Oct-22	19/22	*Covid (19/21)*	*Dec-21/Oct-22*
Inoui	20	17	17.3	22	22.3	11%	*-15%*	*29%*
Ouigo	3	5	5	4.3	5	67%	*67%*	*0%*
Total (Inoui+Ouigo)	23	22	22.3	26.3	27.3	18%	*-4%*	*22%*

Source: Author

Regarding price, table 6 reveals a radically different situation from that of the Lyon-Paris line. Prices decreased less during the COVID-19 period on the Bordeaux-Paris line to increase in 2022 in comparison to October 2019 (4%). The entry of Trenitalia could have a positive effect on price by moderating the temptation for the SNCF to make up for the loss due to COVID-19 on the Lyon-Paris line for the benefit of the users. It could also explain its moderation in terms of frequency to maintain its financial equilibrium.

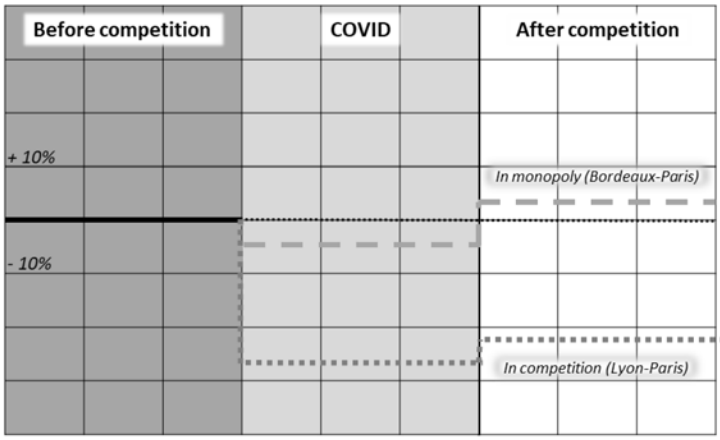
Table 6: Evolution of prices by type of service on the Paris-Bordeaux route between October 2019 to October 2022.

Price (€)	Oct-19	Oct-21	Dec-21/Jan 22	Jun-22	Oct-22	19/22	*Covid (19/21)*	*Dec-21/Oct-22*
Inoui	64.9	60.5	68.7	89.4	69.6	7%	*-7%*	*1%*
Ouigo	20.7	21.1	33.2	46.8	25.7	24%	*2%*	*-23%*
Total (Inoui+Ouigo)	59.1	51.5	60.6	82.6	61.5	4%	*-13%*	*2%*

Source: Author

Finally, figure 5 shows the model from Beria *et al.* (2022) applied to our case study. Some adaptations were necessary to take into account the COVID-19 effect with three periods: before competition in October 2019, "during" the COVID-19 pandemic between October 2019 and October 2021 and after competition started in October 2022. The result confirms the prediction by Beria *et al.* (2022), with a higher price on the route under monopoly and a lower one in the case in competition. The price per kilometre became similar on the Bordeaux-Paris line in October 2022 in comparison to the Lyon-Paris line. It was respectively €0.10 and €0.14 in October 2019 versus €0.10 and €0.11 in 2022. The convergence between prices can be seen as a positive effect of competition.

Figure 5: Comparison of the effect of competition on price between Lyon-Paris and Bordeaux-Paris, with the COVID-19 pandemic effect.



Source: Author

6. DISCUSSION: price effect train by train

This last section discusses the effect of Trenitalia on prices train by train through an original timetable approach. It is based on five timetables. The first is the timetable in October 2019, the second in October 2021, then in December 2021/January 2022 and in June 2022. The last one is that for October 2022. In each slot, the type of train (Inoui, Ouigo and Trenitalia) is given as well as the average price observed in the period. The two offers on the traditional line (TER and Ouigo classique) are excluded from the analysis. The results are shown in two tables, before 12:00 for table 7 and after for table 8. They allow better understanding of the introduction of the new offer by substitution or creation.

The analysis is conducted in three steps. The first considers the positioning and the price of Trenitalia in comparison to the direct train competitor. The second consists in measuring the evolution of the incumbent's prices from 2019 to 2022. The last step consists in assessing the effect of Trenitalia on the incumbent, assuming that the trains before and after the Trenitalia train should be cheaper than the average.

Table 7: Compilation of five timetables by type of service and average price from October 2019 to October 2022 on the Paris-Lyon route (part 1 from 6:00 to 12:00).

Period		06:04	06:26	06:30	06:34	06:54	07:02	07:34	07:45	08:04	09:02	09:04	09:32	09:53	10:04	11:04	11:12	11:26	11:34	11:34	11:55	11:55	11:56
Oct-19	Type	INOUI			INOUI	INOUI	INOUI	INOUI	OUIGO	INOUI	INOUI	OUIGO		OUIGO	INOUI	INOUI			OUIGO	INOUI			
	Av. Price	97,0			97,0	97,0	97,0	97,0	28,5	97,0	97,0	21,0		37,0	86,5	75,8			25,5	81,3			
Oct-21	Type	INOUI			INOUI	INOUI	INOUI	INOUI	OUIGO	INOUI	INOUI	OUIGO	OUIGO	OUIGO	INOUI			INOUI	OUIGO		OUIGO		
	Av. Price	68			69,75	69,75	69,75	69,75	17,5	77,5	72,75	13,75	29,5	23,75	49,5			42	18,5		22		
Dec-21/Jan-22	Type	INOUI	INOUI			INOUI	INOUI	INOUI	OUIGO	INOUI	INOUI	OUIGO	OUIGO		INOUI	INOUI		TRENITALIA	OUIGO	INOUI	OUIGO		
	Av. Price	73,18	72,3			80,6	85,5	76,9	30,6	56	70,8	17	26,6		59	60		39,6	19,1	49	28,6		
Jun-22	Type	INOUI	INOUI		TRENITALIA	INOUI	INOUI	INOUI	OUIGO	INOUI	INOUI	OUIGO	OUIGO		INOUI	INOUI	OUIGO	TRENITALIA	OUIGO	INOUI	OUIGO	TRENITALIA	
	Av. Price	80,1	91		41	97	89,8	78,5	44,8	73,7	72	28,7	44,7		74,1	66,3	45,3	65,5	49	59,5	47	34,5	
Oct-22	Type	INOUI	INOUI		TRENITALIA	INOUI	INOUI	INOUI	OUIGO	INOUI	INOUI	OUIGO	OUIGO		INOUI	INOUI	OUIGO	TRENITALIA	OUIGO	INOUI		TRENITALIA	OUIGO
	Av. Price	79,5	79,5		33,5	97	97	86,5	19,25	59,25	83,75	16	25,5		49	49	22,75	50,5	19,25	48,25		27,5	22,75

Source: Author

Train of 6:34

The first train of the day operated by Trenitalia is a creation. It replaces an Inoui moved 8 minutes before at 6:26. It is interesting to observe that the change for the SNCF was made on the entry of Trenitalia in December. It may be the sign of anticipation by the incumbent or by the infrastructure manager. In terms of price, the slot is during the peak period with an average price from the SNCF for the train before and after of €97 and €79.5, respectively. With an average price of €33.5 (October 2022), Trenitalia is highly competitive (-62%) and represents a strong gain for the users. However, we observe that in spite of Trenitalia, the incumbent adopted different pricing strategies between 2019 and 2022. Indeed, the reduction was -18% for the first train in direct competition at 6:26 but 0% for the next train at 6:54. The trend is similar for the two other trains in indirect competition (6:04 and 7:02). The incumbent seemed to be insensitive to the newcomer in this peak hour slot.

Train of 11:26

This was the first train to run on the French network on 18 December. The Inoui train of 11:04 was temporarily moved to 11:26, making it a creation. The interest of the Trenitalia train is that it came from Milan and was positioned during an off-peak hour between two Ouigo trains (11:12 and 11:34). The direct Inoui competitors are scheduled at 11:04 and 11:34. We propose to base the analysis only on these trains, the others being too far in the schedule to be competitive (10:04 and 13:04). Regarding price, although Trenitalia was cheaper in the beginning, this was no longer the case. The average price in October 2022 was €50.5 versus €48.6for SNCF (-4%). However, the incumbent's prices decreased from 2019 to 2022 by -35% for the train at 11:04 and -41% for the train at 11:34. This situation was unexpected, with a newcomer being more expensive than the incumbent. We can assume that the

competition from Trenitalia was not for the Paris-Lyon segment but certainly more for the Milan-Paris route with higher charges because of its international status.

Train of 11:55

This train is a creation and has the feature of being in almost direct competition with the previous one. The difference is that this service was dedicated to the Paris-Lyon route while the latter was dedicated to the Milan-Paris route. The price is more competitive with the SNCF train at 11:34 and even with the direct competitor Ouigo at 11:55. With two Trenitalia trains within a period of 30 minutes, the pressure could be maximal on the incumbent which has three trains. The prices for the two Ouigo trains decreased by -12% between 2019 and October 2022 with Trenitalia becoming 31% more expensive but remaining cheaper than the Inoui train at 11:34 (-43%). This confirms the price positioning of the newcomer between the low-cost offer of the incumbent in terms of price and the premium offer for quality.

Table 8: Compilation of five timetables by type of service and average price from October 2019 to October 2022 on the Paris-Lyon route (part 1 from 12:00 to 21:00).

Period	13:04	13:19	14:04	14:39	15:04	15:08	15:36	15:51	16:04	16:17	16:34	17:04	17:22	17:34	17:52	18:04	18:19	18:38	19:04	19:21	19:41	20:00	20:04	20:30	21:04
Oct-19	INOUI		INOUI	OUIGO	INOUI				INOUI	OUIGO	INOUI	INOUI		INOUI	OUIGO	INOUI	OUIGO	INOUI	INOUI	OUIGO	OUIGO	OUIGO		INOUI	INOUI
	73,0		97,0	25,8	97,0				86,5	14,5	97,0	97,0		97,0	34,5	97,0	14,0	97,0	91,8	20,8	20,0	19,0		76,0	45,0
Oct-21	INOUI	OUIGO	INOUI		INOUI		OUIGO	OUIGO	INOUI		INOUI	INOUI		INOUI	OUIGO	INOUI	OUIGO		INOUI	OUIGO		OUIGO	INOUI		
	42	22,75	74,75		76		16	23,5	69		76	90		73,25	22,75	61,5	14,5		49,5	22		16	45,75		
Dec-21/Jan-22	INOUI	OUIGO	INOUI		INOUI		OUIGO	OUIGO	INOUI		INOUI	INOUI		INOUI		INOUI	OUIGO	INOUI	INOUI	OUIGO		OUIGO	INOUI	TRENITALIA	INOUI
	47,5	24,5	62		64		20,6	24	60		74,1	85,5		83		66,1	19,8	60,6	62,5	16,8		20	47,3	34,4	43
Jun-22	INOUI	OUIGO	INOUI		INOUI	OUIGO	OUIGO		INOUI		INOUI	INOUI	TRENITALIA	INOUI		INOUI	OUIGO		INOUI			OUIGO	INOUI	TRENITALIA	INOUI
	56,5	43,8	69		72,2	34,5	47,7		80,7		81,2	87	44,5	90,8		92	33,1		74			29,6	61,5	54,5	45
Oct-22	INOUI	OUIGO	INOUI		INOUI		OUIGO	OUIGO	INOUI		INOUI	INOUI	TRENITALIA	INOUI		INOUI	OUIGO	INOUI	INOUI			OUIGO	INOUI	TRENITALIA	INOUI
	49	22,75	76		80,25		18,5	22,25	63,25		76	97	35	97		68,25	15,25	70	70,75			16,75	46,5	40,5	45

Source: Author

Train of 17:22

The train of 17:22 is a creation, the second for Trenitalia during the peak period with two direct competitors at 17:04 and 17:34. The situation is similar to the morning with a strong price difference between the newcomer and the incumbent (-64%). The average price for the SNCF did not change much between the initial stage and October 2022, with respectively €97 and €97 (0%). Also, the average in October 2022 is higher than the average of the Inoui prices. Consequently, we find a situation similar to the morning with a creation by the newcomer and no specific reaction from the incumbent.

Train of 20:30

Finally, the last train is a creation between the two last trains of the day by the SNCF (20:04 and 21:04). The Trenitalia train is the second to link Milan to Paris during the day. It is interesting to note that it is in a situation similar to its counterpart especially in terms of price. It is more expensive than the average Trenitalia services (€40.5) but a little bit less than the SNCF (€45.75).

To conclude this subsection, the train-by-train price analysis highlights highly diverse situations behind the global trend. We note that all the Trenitalia services are creations and not substitutions of Inoui trains. In general, Trenitalia is cheaper by -35% than the SNCF, considering the direct trains in competition. There is only one case out of five where Trenitalia is more expensive. But this train comes from Milan and was the first to run in December 2021. The difference may stem from technical or organisational constraints, making the service costly, as is usually the case for international traffic. Last but not least, the SNCF seems to be less sensitive than expected to competitive pressure from

Trenitalia. It changed its price for trains directly in competition by -17% versus -21% in general for Inoui (table 9). This result suggests that competition is not the only one factor to have an effect on price. The crisis on the business market can also be an explanation. Further research should be carried out on the evolution of the demand and its effects on the offer.

Table 9: Prices changed for Inoui vs Trenitalia between October 2019 and October 2022

	Oct 19/Oct 22
Inoui in direct competition	- 17%
Inoui not in direct competition	- 23%
Trenitalia in direct competition	- 35%
Trenitalia in direct competition (Paris-Lyon only)	- 56%
Trenitalia in direct competition (Paris-Milano only)	- 4%

Source: Authors

7. CONCLUSION

The objective of this paper was to explore the first effects on price and frequency of the new competition in open access from Trenitalia with the incumbent, SNCF, on the Paris-Lyon HSL. This topic is of great interest for research and public policies. Firstly, it is a symbol of Europe and the policy in favour of competition implemented since the 1990s by the European Commission. The French network is the last of theEurope's major networks to open up to competition. It is also an interesting case study as the Paris-Lyon HSL was the first to be built in Europe and is well-known to be the busiest HSL with strong limits to infrastructure capacity during peak hours. Finally, this is the first time in Europe that two old national incumbents are competing directly in open access on an HSL. In Italy, Trenitalia was faced with a new company while the Spanish case is different due to the type of competition (tendering) and services with low-cost from SNCF versus traditional services from RENFE (Montero and Melero, 2022).

According to the literature, the expected results were a net effect on frequency by increasing it and on prices by decreasing them in favour of the users. The main results are in line with the literature. First of all, the market positioning analysis showed that Trenitalia started cautiously with two trains in the off-peak period on the international Paris-Milan route via Lyon. It increased its offer during the first six months to reach five trains in October 2022. The three other trains were specific to the Paris-Lyon route and with two being positioned during the morning and the afternoon peak periods. This could be a strategic move to attract a larger share of demand from business travellers during the peak period. However, the offer remained marginal versus that of the incumbent. Secondly, the analysis of the global trend for frequency and price between October 2019 and October 2022 highlighted an increase by 15% and a decrease by -23%, respectively. This is an interesting result. Regarding frequency, Trenitalia created five new trains while the SNCF's offer remained stable. However, it is surprising when considering the Paris-Bordeaux control route where frequency increased by 18% without competition. The incumbent could also be applying a strategy of moderation to maintain its profits through better control of volume in reaction to the newcomer. Whatever the case, the users gained five services on the Paris-Lyon route and a better travel choice. Regarding prices, we observe a total reduction of -23% (including the Trenitalia offer) between October 2019 and October 2022. This is higher than the change in price observed on the control route Bordeaux-Paris which increased by 4% between October 2019 and October 2022. The difference can be understood as a positive effect of the

newcomer on the incumbent. The prices practised by Trenitalia are lower on average by -47% with those of Inoui but higher by 86% with those of Ouigo. This highlights a pricing positioning by the newcomer between the low-cost offer and the classic offer with a quality of service close to the classic offer from the incumbent. However, the competitive pressure from the newcomer should be nuanced. The analysis train by train shows a limited sensitivity of the incumbent to competitive pressure. The prices for the Inoui trains in direct competition with Trenitalia ones during the peak period changed less between October 2019 to October 2022 than the rest of the time.

To conclude, the implications of this research are several. Firstly, this study is one of the first on the French case. It gives key results on the effect of competition in open access between two major operators and highlights the considerable inertia of the incumbent. Secondly, the analysis proposed an original approach based on the analysis of the timetable and prices train by train. It highlighted the complexity of the reality behind the global trends. Finally, the results open the way to a wider area of research to better assess the benefit of competition and better understand the regulatory process implemented for this competition, the strategies employed by the actors and the challenges of traffic management for the network manager.

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