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Fare strategies and head-on competition. The case of Italian rail market

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Abstract

The end of the vision of rail as a closed and protected system with respect to the rest of long-distance transport market is growing, but its implementation is far from homogeneous across European countries. Italy, thanks to a liberalization process started well before the deadline imposed by European norms, is now one of the most interesting markets in Europe, at least limitedly to long-distance segment.

The paper aims at studying the trends of rail prices and discuss them in terms of competition and companies' strategies, but also of capacity of the system. In particular we find that incumbent's prices are higher than competitor's ones. However, the incumbent is – surprisingly, being monopolist – not applying higher prices on non-competing routes (rather the opposite). This apparently counterintuitive fact can be commented in terms of supply: routes in competition are those with more demand, best services (they are all high-speed connections) and more willingness to pay. Finally, we can demonstrate that the Italian market is not, today, suffering of a generalized overcapacity, which is a threat to the long-term sustainability of the market.

From the methodological point of view, the paper will compute the price per km and the price dispersion for about thirty significant OD pairs in Italy and for a time span of nearly two years, by means of appropriately defined indicators. Routes cover the entire mainland of the country and represent different situations in terms of high-speed/conventional infrastructure and existence of competition.

Keywords: rail prices; competition; intermodality; Italy

1. Introduction

The end of the vision of rail as a closed and protected system with respect to the rest of long-distance transport market is growing, but its implementation is far from homogeneous across European countries.

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Past experiences of liberalisation processes, mainly related to air transport, determined a general change in supply (increase of services, expansion of destinations, new network models), an improvement of quality and decrease of prices (with respect to pre-liberalisation ones). Negative outcomes can also occur, such as failure of market players, withdraw from least profitable routes and consequent marginalization of some places, and a general instability of the market.

While air and coach competition is now present in many contexts, and consequently studied, examples of rail competition are scant. Italy, thanks to a liberalization process started well before the deadline imposed by European norms, is now one of the most interesting markets in Europe (Bergantino et al., 2015; Beria & Grimaldi, 2017) , at least limitedly to long-distance segment.

1.1. Italian rail market overview

Italian long-distance rail market has been opened to competition already in 2003, with the *Decreto Legislativo* n.188 of 8 July 2003, implementing the European Directives on rail competition (2001/12/CE, 2001/13/CE and 2001/14/CE). According to the decree, any authorised rail company can have access to the national RFI rail network and operate both open access or contracted services. The decree was not only adopted much earlier than 2010 (year of European liberalisation of international services), but it was much more advanced including also cabotage.

A first private long-distance company was founded (ArenaWays), but the barriers elevated by the incumbent together with some unwise organisational choices, drove it quickly to bankruptcy. A second company, NTV, was founded in 2007 and started operations in 2012 under the brand *Italo*. NTV decided to concentrate in the segment of High-Speed (new lines opened since 2006) and started with a significant fleet of 25 new Alstom AGV 575 trains. The first years of operation generated significant losses, but since 2015 the company, also thanks to an accurate market repositioning and to a general reduction of access charges, started to shows black figures and inaugurated a further expansion of fleet and network with the purchase of 22 new trainsets Alstom Pendolino EVO ETR.675.

In the meantime, Trenitalia – the train operating company owned by the public holding Ferrovie dello Stato – did not relax and evolved radically its market services in terms of quality, frequency, pricing, network and more recently also with the purchase of about 67 new HS trains.

In terms of demand, the liberalisation has increased significantly the figures of the HS segment (Desmaris and Croccolo, 2018), from 23 in 2011 to 45 Mpax/year in 2017. Of these, 34 are served by Trenitalia, resulting in an increase of nearly 50% with respect to 2011, despite the 11 MPax served by the newcomer (24.6% market share). Interestingly, this overall increase is only partially at detriment of long-distance PSOs, already significantly reduced since the 2000s by the air low-cost phenomenon (Beria and Bertolin, 2018).

The vitality of Italian rail market is due both to the liberalisation and to the new HS lines, but depends also by the peculiar asset of the air market – not dominated by the former flag-carrier – and to a certain extent also to the coach market – very competitive and pulling down prices for the lower bound of the demand.

1.2. Paper aims

By means of a 2-years long database of rail prices covering 30 relevant OD pairs in Italy, supported by a similar survey on coach prices (Beria and Nistri, 2017; Beria et al., 2018), the paper aims at analysing rail prices, according to different themes. In particular, we will discuss how fares are structured and which are the drivers of such structure:

- To what extent the "classical" discrimination techniques are used, in particular seat classes and flexibility in booking change;
- If, and how much, prices of routes in competition differ from routes provided by the incumbent only;
- How early-booking price discrimination is applied;
- The load factors of trains through the analysis of incidence of fully-booked trains.

The interest of the paper lays in the possibility to test the themes suggested by literature by means of a massive observation of real-world conditions, both under competition and monopoly. In some cases, we will confirm expectations, for example in terms of time-variability of fares or in the application of yield management techniques.

In other cases we will find that expectations are (sometimes just apparently) not met for a range of reasons, for example about the obvious assumption that routes in competition are priced less than routes in monopoly.

The paper is organized as follows. In Section 2 the dataset underlying all the analysis is presented; Section 3 deals with the structure of the railways fare system and 4 investigates the relationship between competition and prices considering route length, type of trains and advance booking. Fares are used for a capacity analysis in Section 5 with the distinction between high-speed, tourist routes and non-tourist ones. Conclusions are drawn in Section 6.

Nomenclature	
PSO	Public service obligations
HS	High-speed (tracks or trains)
OD	Origin-Destination

2. Data

The paper relies on a large dataset of observations collected directly from booking websites, including all rail prices (classes, levels) on a selection of OD pairs. This section describes more in detail such data.

2.1. OD pairs analysed

Italian territory is relatively homogeneously settled. In the North, population is mainly concentrated in the Po Valley, a wide plain home of nearly half of the total population. In the Centre and the South, cities are often distributed along the coast, being the interior mountainous. Rome is the largest city, with nearly 2.9 Million inhabitants, followed by Milan hosting nearly 1.4. However, considering metropolitan areas, Milan, Naples and Rome rise to 4, 4 and 3 Million inhabitants respectively.

Rail prices have been collected for 30 origin-destination pairs, chosen to be geographically representative, but also considering the level of supply of alternative modes (air and coach), the level of competition and different distance ranges. OD pairs considered are described in Table 1 (supply) and Table 2 (distance and travel time).

Table 1. Supply levels of the OD pairs analysed (long-distance only)

OD pair	Average Rail supply [trains/day per direction]*			Air supply**	Coach supply**
	Trenitalia	Of which PSO	NTV	[flights per day]	[coaches per day]
Bari - Ancona	15	5	-	-	3
Bologna - Ancona	20	6	-	-	7
Bologna - Bolzano	6	0	-	-	5
Bologna - Firenze	43	1	20	-	27
Bologna - Trieste	3	2	-	-	4
Bologna - Venezia	20	0	8	-	11
Milano - Pisa	6	5	-	-	2
Milano - Ancona	13	2	-	-	9
Milano - Bologna	41	5	10	-	26
Milano - Brescia	26	0	-	-	-
Milano - Firenze	19	1	10	-	18
Milano - Genova	12	11	-	-	6
Milano - Napoli	28	2	15	14	5
Milano - Rimini	13	2	-	-	5
Milano - Roma	39	0	17	34	19
Milano - Torino	20	0	12	-	22
Milano - Udine	2	0	-	2	3
Milano - Venezia	26	0	-	-	10
Roma - Bari	4	1	-	7	14
Roma - Bologna	57	2	20	4	18
Roma - Ferrara	5	2	2	4	2
Roma - Firenze	40	0	20	-	29
Roma - Genova	9	2	-	6	10
Roma - Reggio C.	7	4	-	6	5
Roma - Torino	13	0	12	9	7
Roma - Venezia	21	2	8	6	4
Roma - Verona	8	0	4	4	6
Torino - Brescia	10	0	-	-	2
Torino - Venezia	10	0	-	1	3
Venezia - Firenze	18	2	8	-	6

* Average number of train/day per direction based on the current offer in a sample of days in 2017.
** Number of flight or coach/day per direction based on the supply of Wednesday, 31st of October 2018.

Table 2. Distance and travel time and for OD pairs analysed

OD pair	Distance [km]	Rail		Air	Coach
		HS trains	Conventional		
Bari - Ancona	442	3h40'	4h10'	-	6h30'-7h30'
Bologna - Ancona	218	1h50'	2h0'	-	3h00'-3h30'
Bologna - Bolzano	261	2h30'	2h40'	-	4h00'
Bologna - Firenze	95	0h40'	1h10'	-	1h15'-1h30'
Bologna - Trieste	296	3h0'	3h50'	-	5h30'
Bologna - Venezia	151	1h10'	1h30'	-	2h00'-2h30'
Milano - Pisa	301	-	4h10'	-	4h30'-5h15'
Milano - Ancona	429	3h0'	4h10'	-	5h30'-6h15'
Milano - Bologna	213	1h10'	2h20'	-	3h00'-3h30'
Milano - Brescia	83	0h40'	0h50'	-	-
Milano - Firenze	306	1h50'	3h50'	-	4h00'-5h30'
Milano - Genova	140	1h30'	1h40'	-	2h00'-2h30'
Milano - Napoli	790	4h30'	8h50'	1h20'	10h00'-13h00'
Milano - Rimini	330	2h10'	3h20'	-	4h45'-5h15'
Milano - Roma	567	3h10'	6h50'	1h10'	8h00'-10h30'
Milano - Torino	143	0h50'	1h30'	-	2h00'-2h30'
Milano - Udine	365	4h0'	4h0'	0h55'	5h30'
Milano - Venezia	258	2h10'	2h20'	-	3h30'-4h00'
Roma - Bari	498	4h0'	6h20'	1h05'	5h30'-6h30'
Roma - Bologna	356	2h10'	4h10'	0h55'	5h00'-6h00'
Roma - Ferrara	400	2h40'	4h40'	0h55'	5h00'-5h30'
Roma - Firenze	261	1h30'	2h50'	-	3h30'-4h00'
Roma - Genova	494	4h0'	5h0'	1h 10'	6h30'-8h30'
Roma - Reggio C.	663	4h50'	7h10'	1h 10'	9h00'-10h00'
Roma - Torino	711	4h10'	-	1h 15'	10h00'-10h30'
Roma - Venezia	504	3h30'	5h40'	1h 05'	6h30'-7h00'
Roma - Verona	507	3h0'	-	1h 00'	7h00'-7h30'
Torino - Brescia	226	1h40'	2h30'	-	3h15'
Torino - Venezia	401	3h10'	4h10'	1h 25'	6h00'-6h30'
Venezia - Firenze	243	1h50'	-	-	3h30'-4h00'

2.2. Dataset description

Our dataset includes data collected from June 2016 to April 2018, with an average sample of 15 days of survey per month, both in weekdays and weekends. We retrieved all fares for each train running on the chosen routes through the simulation of a reservation with departure date in 1, 2, 5, 10 and 20 days from the date of inquiry. Whenever a specific ticket combination (flexibility and level of service) was sold out, the corresponding fare amount was not shown, and we recorded such fact as a fully-booked combination.

We collected data only for long-distance trains and ignored regional trains. They are not of interest as their fare is fixed (only 1st and 2nd class) and regulated in the frame of Regional public service contracts. To the contrary, national PSO trains are included and surveyed, as their price is capped but not fixed and promotional fares are commonly used exactly as in the market segment. To sum up, the categories of trains surveyed are classified as in Table 3.

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Table 3. Train category and kind of service

Train category	Operator	Type of service
Italo	Nuovo Trasporto Viaggiatori	High-speed
Frecciarossa	Trenitalia	High-speed
Frecciargento	Trenitalia	High-speed
Frecciabianca	Trenitalia	Conventional
Intercity	Trenitalia	Conventional
Eurocity	Trenitalia (or partner operator)	Conventional

Surveyed data include, for each train and day:
- Day of travel;
- Category of train;
- Days of advance booking (1, 2, 5, 10 or 20 days);
- Departure and arrival time;
- Fare name and level of service;
- Price per fare and level of service (upon availability).

Through this data, considering the route length, we can calculate the average price per kilometer (€/km) for the 30 routes surveyed, in several different conditions of advance booking and type of fare.

Regarding the routes operated by Ntv (see Table 1), collected data limit to the following ones: Bologna-Firenze, Milano-Bologna, Milano-Firenze, Milano-Roma, Roma-Bologna, Roma-Firenze, Roma-Verona. The remaining ones are considered "in competition" for Trenitalia, even if we do not have the price observations applied by the competitor.

3. Price discrimination: classes, flexibility, time and much more

Traditional fare systems in public transport were based on distance-based fares, usually decreasing with distance. The only price discrimination existing since the beginning of rail is the division in classes, differentiated by comfort and crowding. The air market liberalisation has brought into long-distance transport a range of marketing techniques to further differentiate pricing, with the aim of maximizing load factors and revenues. The most known is advanced purchase-based prices, widespread in the air industry. However, advanced purchase pricing is not the only method adopted, and rail in particular has declined that approach mixing it with other tools, variously derived from the original class-based systems:
- Level of service (beside classical 1st and 2nd class);
- Combination tickets (e.g. discounted daily return tickets);
- Level of flexibility (refundable of modifiable tickets);
- Targeted discounts (e.g. young, elderly, associations, companies);
- Individual discounts (promotional codes);
- Season tickets or multiple tickets (e.g. 10 travels in 6 months);
- Bundle-tickets (e.g. discounted fares if purchased with hotel booking or art exhibitions);
- Subscription-based discounts (e.g. a fixed discount for card holders, like the BahnCard).

Rail prices in Italy have gone through a major evolution during the last decades, and now most of the above mentioned tools are applied. Until 2003, fares where substantially divided according to the commercial speed of the train: faster trains, of higher categories, had a "supplement" on the fare for standard trains. Between 2003 and 2006 were introduced special discounts on the long-distance, selling some seats at a fixed discounted price for many destinations. With the new national service timetable of December 2006, some new categories of long-distance trains were introduced, each with a different fare. Since then, the idea of a "national base fare" was abandoned in favor of a multitude of fares for different types of trains. The concept of "flexible" tickets, with less limitation on booking changes and refundability, was also introduced, sold at a higher price than the base fare.

The current situation sees a strong segmentation of fares, based on the user's willingness to pay for different levels of flexibility and for the quality of onboard service. In addition, many targeted or group-based discounts are used.

Interestingly, fares based on commercial speed are blurring, as HS trains are not (as we will show in Fig. 1) systematically more expensive than the slower ones. Table 4 shows the fares structure as a combination of train type, level of service, flexibility and groups for both Italian operators.

Table 4. Overview of existing fares (Trenitalia and NTV)

Operator	Train	Seat class	Flexibility	Group
Trenitalia	Frecciarossa	Standard Premium Business Business area silenzio Business salottino Executive	Super economy Economy Base	(normal) Senior Young "Cartafreccia" owner
	Other trains	2 Class 1 Class	Super economy Economy Base	(normal) Senior Young "Cartafreccia" owner
	Eurocity	2 Class 1 Class	Adult/Standard Offerta speciale 1	
NTV	Italo	Smart Confort Prima Club executive	Low Cost Economy Flex	(normal) Senior Newsletter discounts

Furthermore, the two companies offer fidelity programs. Trenitalia's "Cartafreccia" entitle the holder to special discounts on specific days and hours of travel, plus generalized discounts for frequent travellers. Similarly, NTV provides newsletter subscribers of promotional codes for extra discounts on published promotional fares. Both Trenitalia and NTV also offers a Carnet that allow a significant discount through the purchase of a pass for a certain number of trips between two stops to be chosen freely during a specified period.

Concerning advanced-purchase pricing, both competitors broadly use it. In general, the fully flexible fares (called "Base", "Standard" or "Flex") are independent from the moment of purchase and consequently are distance-based fares. All other flexibility options are sold in packages of tickets at different price levels according to the load factor

Figure 1. Example of discounted prices

of the class. The load factor is not visible to the user and these discounted packages thus depend on the moment of purchase.

4. (How) competition is affecting prices?

After having described the fare structure of the Italian rail operators, we proceed analysing and comparing the main combinations, in order to understand how prices vary according to distance, advanced purchase and finally ultimately according to competition level of the route.

As the two operators and the different train types use different names for different fares, we must define equivalency tables (Table 5 and Table 6) in order to make correct comparisons.

Table 5. Equivalence of types of fare between operators

Type of fare	Trenitalia	Italo	Eurocity
Fully changeable and mostly refundable	Standard	Flex	-
Partly changeable and/or refundable	Economy	Economy	Adult/Standard
Not changeable nor refundable	Super economy	Low cost	Offerta speciale 1

Table 6. Equivalence of level of service between operators

Level of service	Trenitalia	Italo	Eurocity
First class	Business / Prima classe	Prima	Prima classe
Second class	Standard / Seconda classe	Smart	Seconda classe

We consider a route in competition if there is service by both by Trenitalia and Italo (including routes where we have no collected data for this operator). For the following analyses, we consider the cheapest fare still available at 1 day of advance purchase on every train, whatever is the class and the flexibility level.[†] The fare is divided by route distance obtaining the *price per km* plotted in charts.

The result shows how the price is affected by the length of the OD pair. Italo prices are systematically lower than Trenitalia's, but for the incumbent we find no significant distinction between routes in competition and monopolistic. This fact is in contradiction with expectations, as routes in competition are supposed to have lower prices than corresponding routes in monopoly.

A possible explanation is that in Italy competition takes place generally on the "top routes" in terms of demand and performance (mainly in the high-speed segment, see Fig. 2 and Fig. 3). The higher productivity per train unit on HS rail combined with the presence of competition tend to force each operator to sell the service at a lower price (at least with discounted fares at specific conditions), thus contrasting the tendency to a rise in price with higher commercial speed and greater demand. The result is that, based on our observations, the routes with competition have fares similar to the routes without and prices do not vary significantly with commercial speed, thanks to these two contrasting tendencies. At the end, the price per km is influenced for the most part just by the length of travel.

[†] Of course this fare is not chosen by all users (someone will pick the higher class or prefer a flexible ticket) and consequently is the lower bound of operators' revenues.

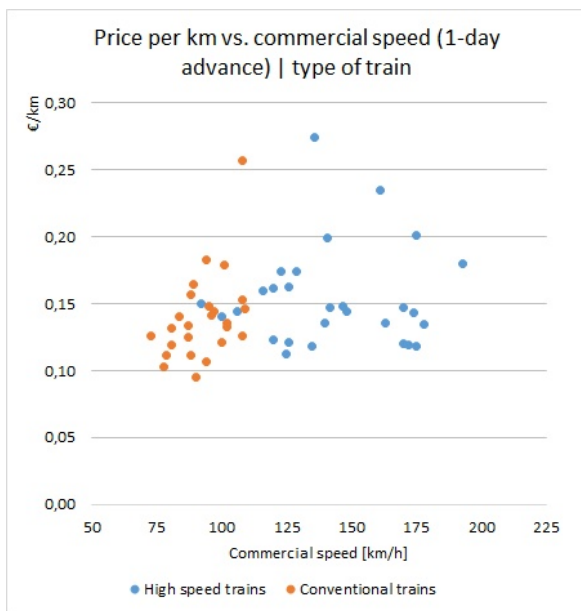Fig. 1 Price per km vs route length

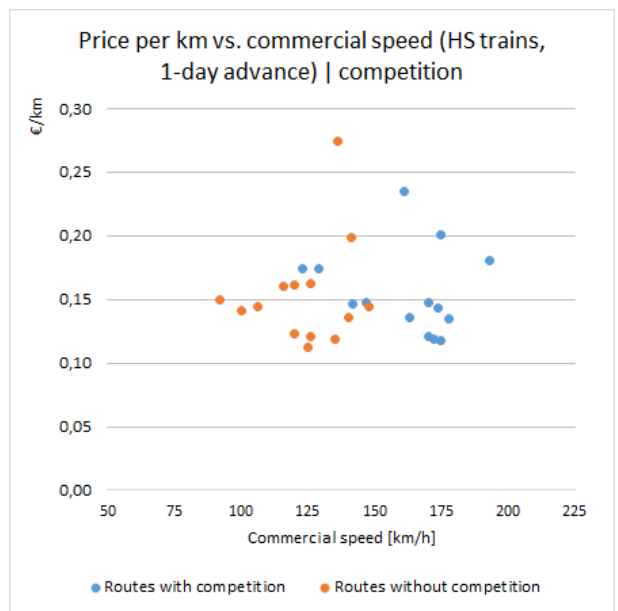Fig. 2 Price per km and commercial speed: type of train

Fig. 3 Price per km and commercial speed: competition

Through the data collected for the different advance booking simulations, we can compare the pricing strategies adopted by the two operators based on the load factor, using the variation in the price per km (determined again by the cheapest fare still available) as a proxy of the load factor.

Considering the average price per km over the year 2017, in all cases it rises with the approaching of the day of travel, as expected. We considered separately high-speed trains (Trenitalia and Italo) and conventional Trenitalia trains, finding the latter to follow the same trend of the HS ones, though on a lower fare rate.

20 days in advance, the two competitors are comparable, but Italo's prices behave differently and remain rather constant until 5 days in advance, when there is a local minimum and prices are similar to the conventional Trenitalia

trains. Italo later rises prices remaining parallel to Trenitalia and 1 days before departure the first costs 0.14 €/km and the latter 0.16.

The local minimum of Italo is of some interest. Through a specific focus on the average amount of trains with fully booked fares of each type (Figure 5), we found that Italo has been systematically adding more seats at cheaper fares between 10 and 5 days prior to departure date, while it is not clear whether Trenitalia followed a similar strategy or not. This led to an unexpected slight reduction in average price per km between 10 and 5 days of advance purchase for Italo trains, apparently not due to an insufficient load factor, as the average quantity of fully booked cheaper fares at 10 days prior to departure is not lower than Trenitalia's ones. It is anyway not possible to exclude that it could be due to a lower relative number of cheaper seats proposed in the first place by Italo.

The fact that also Trenitalia has a sort of stop in the rise of prices 5 days before departure, could be in line with Bergantino et al. (2015) who find a correlation between the two operators' prices: Trenitalia could be forced to adapt prices because Italo sells some discounted tickets shortly before departure.
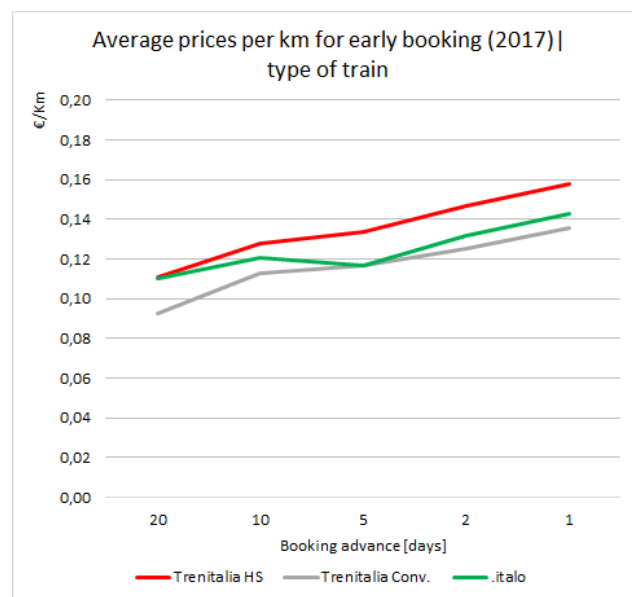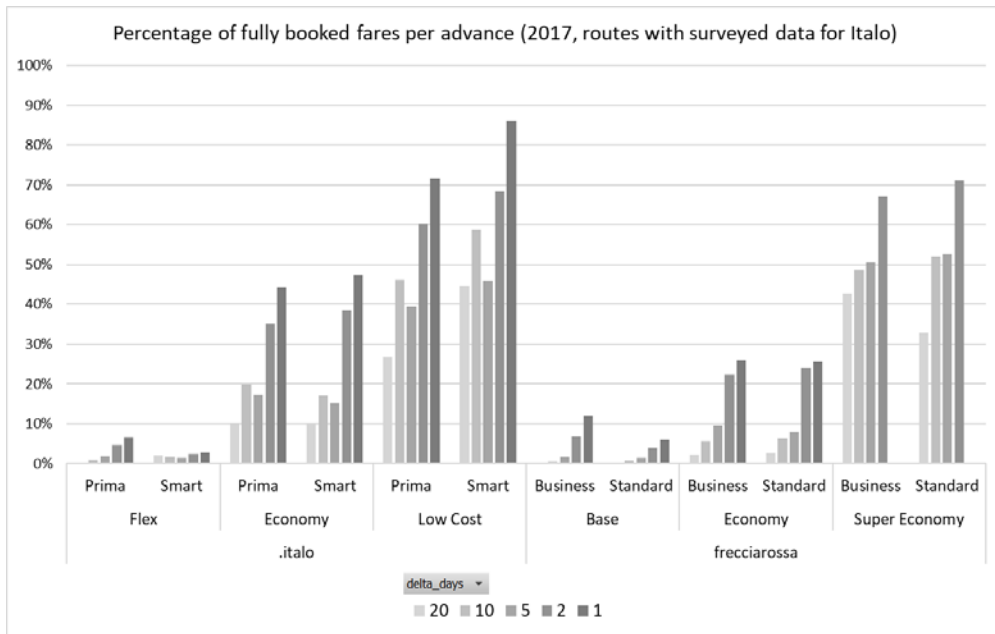
Fig. 4 Price per km and early booking

Fig. 5 Fully booked fares per advance purchases

5. Fares and capacity

Supply increased substantially between 2009/2010 and 2013 on the Roma-Milano and Roma-Venezia routes of about 46% and 56% (Bergantino et al, 2015). Trenitalia and Italo continued in the following to increase supply on these two routes as well as the others, along with the extension of the supplied network by Italo, with new destinations like Verona and the last entry Bolzano.

On the HS line "core area", defined as the trains of the Turin-Salerno axis (that include the Milano-Roma route) and the Bologna-Venice branch only (Dell'Alba and Velardi, 2015), the increase in passengers between 2010 and 2013 has been of 64-100% in the central section (Milano-Roma) and of 150-167% in the extremital sections, though this classification has recently lost meaning as high-speed services are progressively extended out of the high-speed network (Beria et al, 2018). Between 2013 and 2015 the average number of pax/train on those routes increased of 22% for Trenitalia and 3% for Italo trains (ibidem), thus suggesting that the increase in supply is well met by a similar increase in demand. This is a relevant theme, as an excess of supply due to the pressure of competition would lead to financial difficulties for the companies, which is a threat to the long-term sustainability of the market.

In this paper we approach this issue using a different indicator, aimed at studying the phenomenon not considering the average load factor, but the incidence of fully booked trains. This may be a useful complementary indicator, since it is not otherwise possible to study which trains are most heavily loaded and above all which type and on which routes, as the figures available from the company budgets do not have a sufficient level of disaggregation.

We define a fully booked train if at 1 day before departure the more flexible (and therefore expensive) second class fare (or equivalent) is sold out. The average monthly percentage is calculated as the quantity of sold-out fares over the number of trains. The analysis includes also the same indicator considering the analogous first-class fare.

5.1. Routes in competition

Considering the high-speed services on the routes with collected data for Italo, the results show that there is a peak of full trains during the spring months and the beginning of summer, while the lower ratio is registered in the central part of summer and in general during autumn months. The Frecciarossa trains present generally a higher incidence of

full trains than the one of Italo, reaching the considerable value of almost 20% during April. Overall, only Frecciargento trains do not have at least a few sold out trains during some months.

Interesting, for both top services the incidence of sold out first-class full fares is systematically higher than the second-class one, suggesting that the number of first-class seats onboard may be increased by operators to take advantage of the greater willingness to pay of the users, probably impersonated by business users.
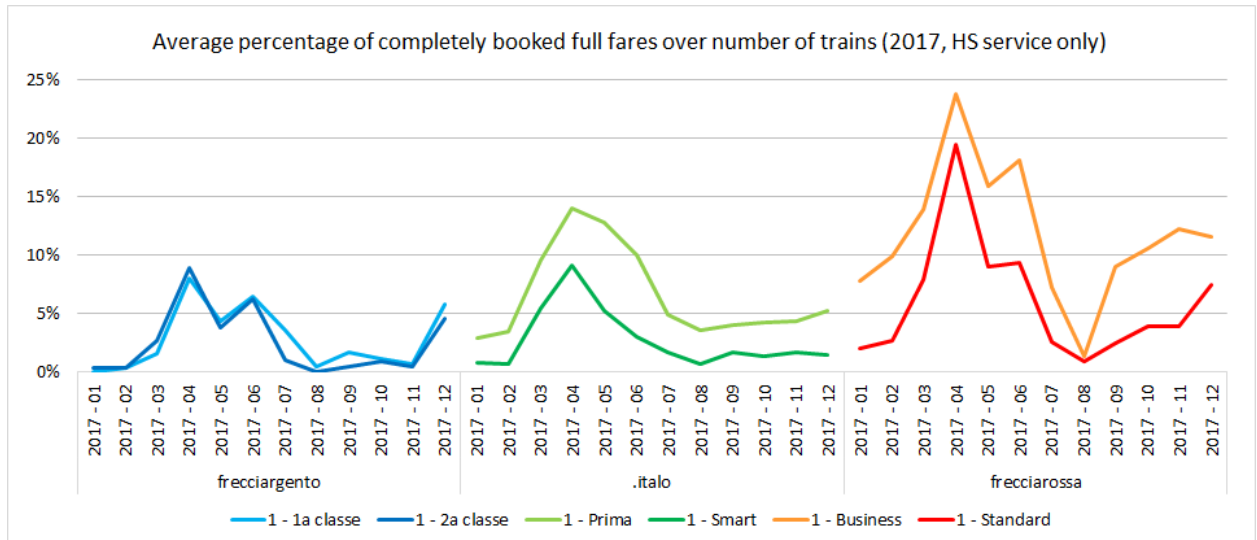

Fig. 6 Fully booked full fares incidence on supply for HS services

5.2. Tourist routes

One of the components that concur to form transport demand is tourism, both international and local (e.g. from cities to the seaside during summer weekends). This is particularly true on long-distance journeys, where systematic trips represent a smaller portion of the total. It is therefore interesting to study whether there are relevant differences in intra-annual trends between tourist and non-tourist routes.

We define empirically "tourist" routes where the average incidence of trains presenting sold out full price second class fares (without considering any distinction by train type) in July and August is major than the one in February and March, i.e. the ratio between the two quantities is > 1 (Table 5). This very simple criterion is actually quite effective in separating routes where non-seasonal demand is prevalent (e.g. Milan – Rome has tourists of course, but the traffic on working days is higher) from routes with peak periods in summer and emptier trains in the rest of the year (e.g. Milan – Pisa, covering many sea destinations of Liguria).

Table 7. Touristic routes

Route	Ratio	Classification
Bari - Ancona	*	Tourist
Bologna - Trieste	*	Tourist
Milano - Pisa	*	Tourist
Milano - Genova	*	Tourist
Bologna - Ancona	218,97	Tourist
Milano - Ancona	33,89	Tourist
Roma - Reggio C.	26,55	Tourist
Milano - Rimini	16,18	Tourist
Roma - Genova	8,73	Tourist

Milano - Venezia	2,79	Tourist
Bologna - Bolzano	1,95	Tourist
Bologna - Venezia	1,41	Tourist
Venezia - Firenze	1,38	Tourist
Torino - Venezia	0,90	Non-tourist
Roma - Venezia	0,87	Non-tourist
Torino - Brescia	0,74	Non-tourist
Roma - Firenze	0,66	Non-tourist
Roma - Verona	0,60	Non-tourist
Roma - Ferrara	0,59	Non-tourist
Milano - Brescia	0,57	Non-tourist
Roma - Bari	0,56	Non-tourist
Bologna - Firenze	0,48	Non-tourist
Milano - Torino	0,46	Non-tourist
Milano - Bologna	0,36	Non-tourist
Roma - Bologna	0,33	Non-tourist
Milano - Roma	0,32	Non-tourist
Milano - Firenze	0,28	Non-tourist
Milano - Napoli	0,17	Non-tourist
Milano - Udine	0,17	Non-tourist
Roma - Torino	0,14	Non-tourist

* These routes do not have any fully booked trains in the winter month considered

Tourist routes reach a significant rate of sold-out trains (>10%) at least two month per year regardless of the type of train. The incidence of sold-out first-class fares for HS services is generally lower in respect to the second-class ones, indicating that the quality of the onboard service is less interesting than in the case of the overall HS service (that is concentrated on non-tourist routes).

Non-tourist routes present a similar rate of sold-out trains only for Trenitalia HS services. Conventional services perform generally worse, moreover Intercity services, despite being the only with a number of trains subject to PSO and therefore subsidized, present the lowest percentage of fully booked trains during the year.
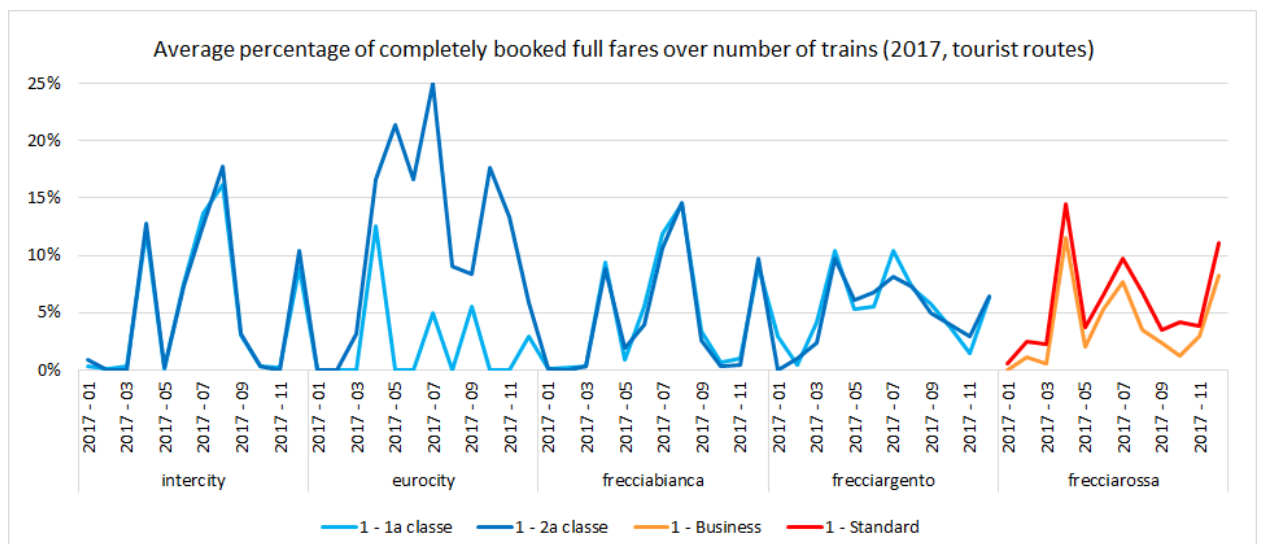

Fig. 7 Fully booked full fares incidence on supply for tourist routes
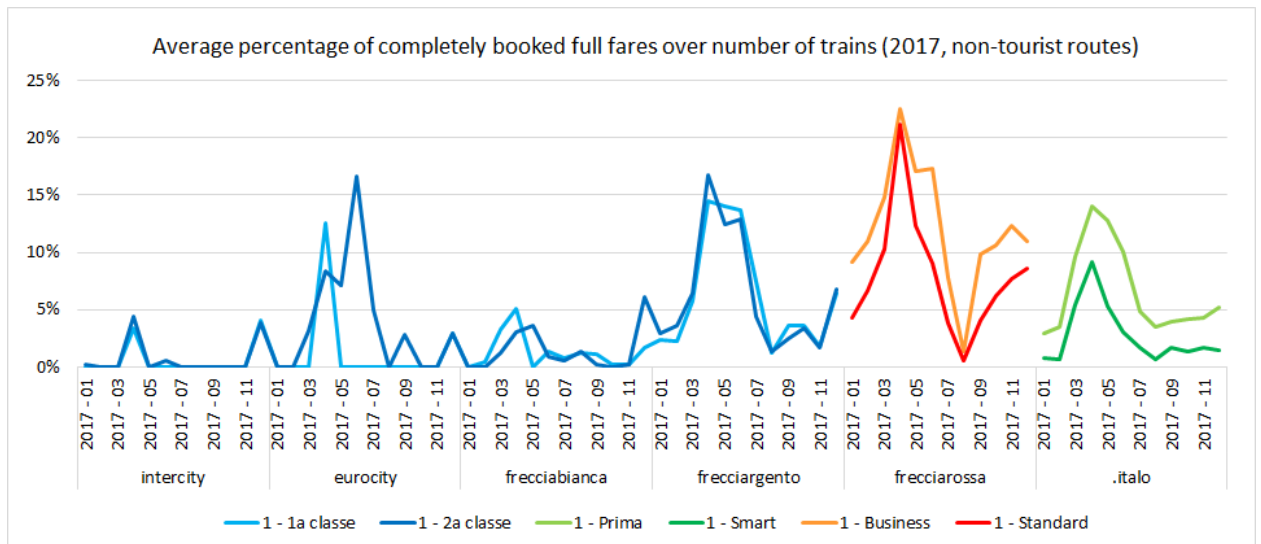
Fig. 8 Fully booked full fares incidence on supply for non-tourist routes

6. Conclusions

Long-distance rail passenger service in Italy has undergone a major evolution in the last decade, following the full availability of the new high-speed line from Torino to Salerno opened in December 2009. Train supply along the backbone line of the country has increased considerably since then, thanks also to the entry in the market of a newcomer in 2012, NTV, with a consistent number of trains. High-speed service began also to spill on conventional tracks, assuming the structure of a mixed service on an increasing number of OD pairs.

The fare system adopted by Italian railways started an evolution toward the modern techniques of yield management already since 2006, when the idea of a "national base fare" was abandoned in favor of a multitude of fares for different types of trains and the concept of "flexible" tickets was introduced. Nowadays advanced purchase pricing is not the only method adopted, and rail in particular has declined that approach mixing it with other tools, variously derived from the original class-based systems.

In this paper we firstly provide a detailed description of the current fare system, trying to systematize the characteristic that are in common between the incumbent operator and the newcomer. Then, through a unique dataset of real-world observations of Italian train fares, we investigate the relationship between competition and prices considering OD pair distance, type of trains and advance booking. Furthermore, we define an indicator for a fare-based supply analysis to address the issue of capacity.

Rail prices have been collected for 30 origin-destination pairs, chosen to be geographically representative, but also considering the level of supply of alternative modes (air and coach), the level of competition and different distance ranges. The dataset includes fares collected from June 2016 to April 2018, with an average sample of 15 days of survey per month, both in weekdays and weekends, through the simulation of bookings with different advances.

One of the main findings is that there is not a clear distinction of prices between competing routes and monopolistic ones. This fact is in contradiction with expectations, as routes in competition are supposed to have lower prices than corresponding routes in monopoly. A possible explanation is that in Italy competition takes place mainly on the "top routes" in terms of demand and performance, for the most part in the high-speed segment, where the tendency to a rise in the price with higher commercial speed and greater demand is counterbalanced by the combination of effects of lower production costs (thanks to a higher productivity per train unit) and competition pressure. The price per km is therefore influenced predominantly by the length of travel, regardless of the type of service.

We can confirm that the pricing strategy of the incumbent cannot be classified as a predatory one (Bergantino et al, 2015); furthermore, NTV booking management model seems different from the incumbent's, with a systematic

addition of seats sold at discounted fares between 10 and 5 days of advance purchase, that, if ever used, appears to be vague by the incumbent. The newcomer is on average approx. 15% cheaper than the incumbent since 5 days before departure.

Another finding is that on the high-speed routes first-class full fares sell out generally more than second-class ones, suggesting that the willingness to pay of the users may be further exploited offering some more seats in the upper class. Overall, the incidence of fully booked trains on the tourist OD pairs proves to be more than 10% of the supply during at least two month per year regardless of the type of train.

Finally, on non-tourist OD pairs conventional services suffer the intra-modal competition of high-speed ones (where available, also in mixed-mode): the incidence of sold out trains proves substantially lower during the whole year, except for Eurocity services (but they run on a very few routes). The worst performance is registered by Intercity trains, despite them being the only ones subject mostly to PSO. This has a clear explanation: as non-tourist routes are incidentally the ones with the most concentrated high-speed services, that, as we have shown, has a similar price per km though being considerably faster, users tend to buy better and faster services if the price does do not differ significantly.

References

Bergantino, A. S., Capozza, C., & Capurso, M. (2015). The impact of open access on intra-and inter-modal rail competition. A national level analysis in Italy. Transport Policy, 39, 77-86.

Bergantino, A. S., Capozza, C., & Capurso, M. (2018). Pricing strategies: who leads and who follows in the air and rail passenger   markets in Italy, Applied Economics, DOI: 10.1080/00036846.2018.1459039.

Beria, P., Grimaldi, R., Albalate D., Bel G. (2018). Delusions of success: Costs and demand of high-speed rail in Italy and Spain. Transport Policy, 68, 63-79.

Beria P., Bertolin A. (2019). Evolving long-distance passenger services. From planned monopolies to deregulated competition. World Conference on Transport Research - WCTR 2019 Mumbai 26-31 May 2019.

Dell'Alba R., Velardi V. (2015). Forecast of passengers demand on HS rail services: a system of models. Railw. Eng. [Ingegneria Ferroviaria], 70 (3) pp. 215-263

Desmaris, C., & Croccolo, F. (2018). The HSR competition in Italy: how are the regulatory design and practices concerned? Research in Transportation Economics, in press.