

Long-distance rail prices in a competitive market. Evidences from head-on competition in Italy



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9580	TORINO P.N.	18:05
9935	NAPOLI C.LE	18:15
8926	VENEZIA S.L.	18:15
9592	MILANO C.LE	18:20
8552	MANTOVA	18:20
9690	MILANO C.LE	18:30
9437	NAPOLI C.LE	18:30
2328	ANCONA	18:30
9641	NAPOLI C.LE	18:40
9952	TORINO P.N.	18:40
8528	BERGAMO	18:40
9541	TARANTO	18:50
9450	VENEZIA S.L.	18:50
294	VIENNA-MONAC	18:50
9654	TORINO P.N.	19:00
9643	NAPOLI C.LE	19:10
9988	MILANO C.LE	19:10
8960	BRESCIA	19:10
9558	MILANO C.LE	19:20
9439	SALERNO	19:20

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Paolo BERIA, Samuel TOLENTINO, Alberto BERTOLIN, Gabriele FILIPPINI



POLITECNICO
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www.trapol.polimi.it

Dipartimento di
Architettura e Studi Urbani
Politecnico di Milano

New Mobility - High-Speed Transport Systems and Transport-Related Human Behaviour
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-  Data
-  Prices and competition
-  Prices and capacity



In a previous work we discussed in deep some **consequences of long-distance land transport liberalization in Italy**:

- The reach of a good level of intramodal and intermodal competition, but also the existence of overlaps between market, PSO and regional services;
- A first discussion about the fare systems, that will be further discussed here;
- The rise of an increasing specialization of long-distance products, both in terms of specialization and niche-focus.

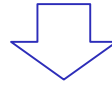
We also studied in detail the **prices of the coach sector**, finding the influence of seasons, single operators and limitedly but significantly, of rail competition.

Beria and Bertolin (2019), Evolving long-distance passenger services. Market concentration, fares and specialisation patterns in Italy. *Research in Transportation Economics*.

Beria, P., Nistri, D., & Laurino, A. (2018). Intercity coach liberalisation in Italy: Fares determinants in an evolving market. *Research in Transportation Economics*, 69, 260-269.



2-years long database of rail prices + 30 relevant OD pairs in Italy



We aim at providing a quantitative description of rail fares system, in presence or not of competition:

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

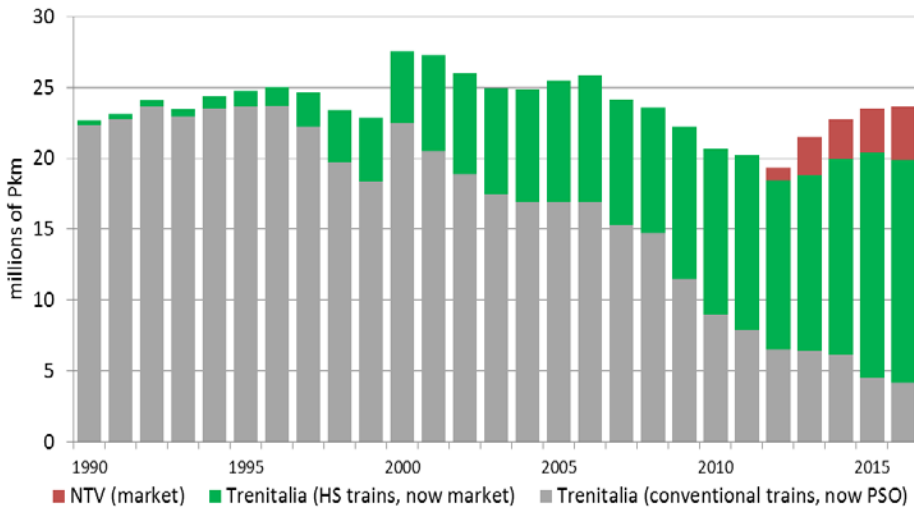


Introduction and aims

The state of liberalisation in Italy

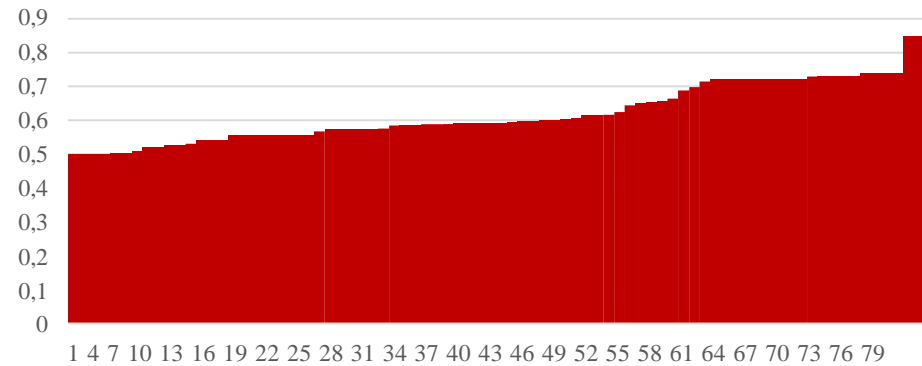
Italian market situation is quite peculiar:

- a. long-distance rail is liberalised and ITALO is the largest non-incumbent competitor in the EU.
- b. Coaches are fully liberalised since 2014 and market is rapidly evolving
- c. Alitalia is still there, but negligible.



Italo has now a non-irrelevant market share in routes where present.

HHI on OD routes where Italo is present





Introduction and aims

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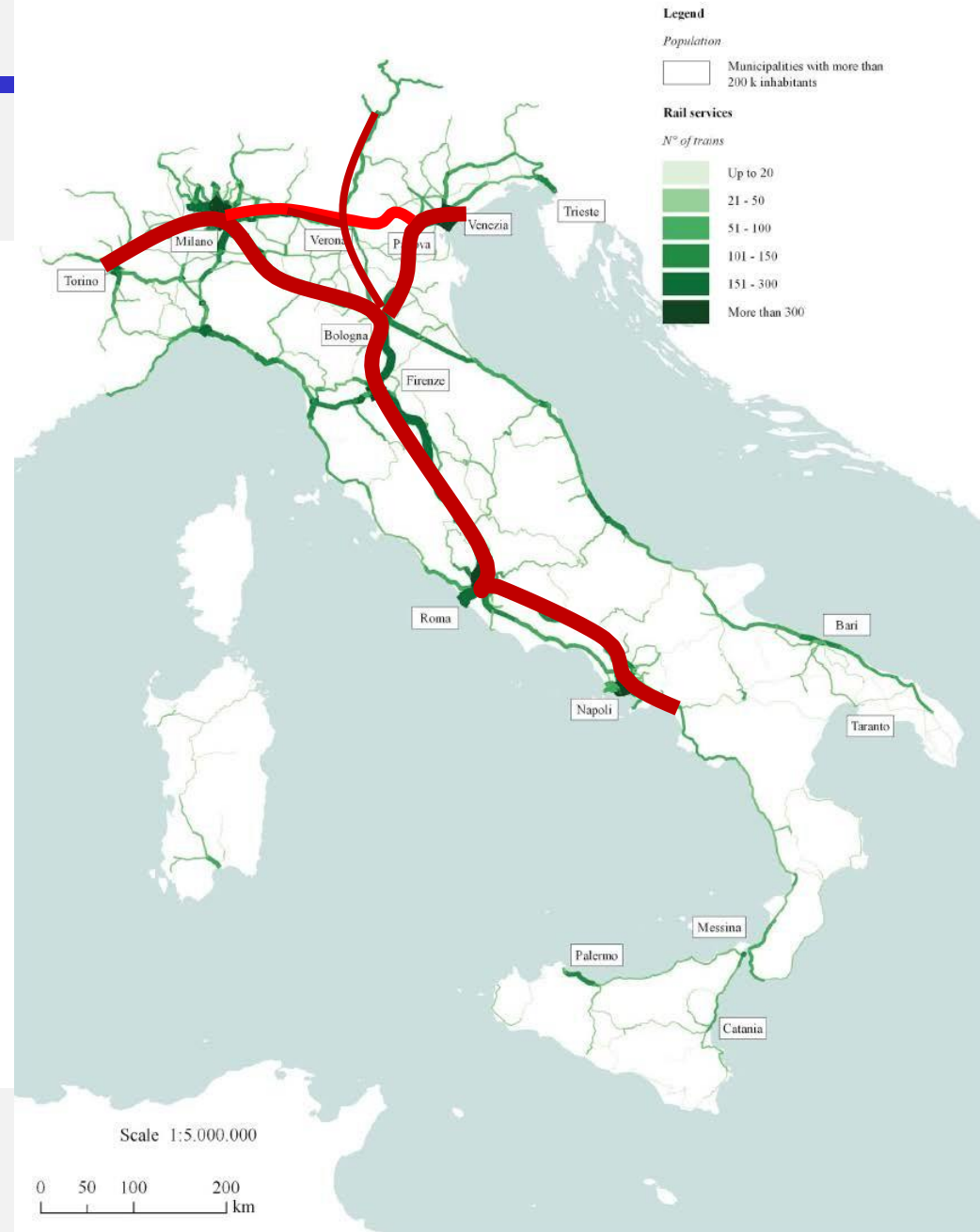
Italo is mainly operating on the HS infrastructure with HS rolling stock, but mixed services exist and are growing:

- a. Turin-Milan-Rome-Salerno
- b. Venice-Rome-Salerno
- c. Bolzano/Brescia-Verona-Salerno
- d. Turin-Milan-Venice (Dec 2017)

Clearly, Italo's turnarounds try to maximize speed, so out-of-HS services are limited and using the new 250kmh trains.

Train services flows

Our elaborations on 2016 Train company timetables - average day





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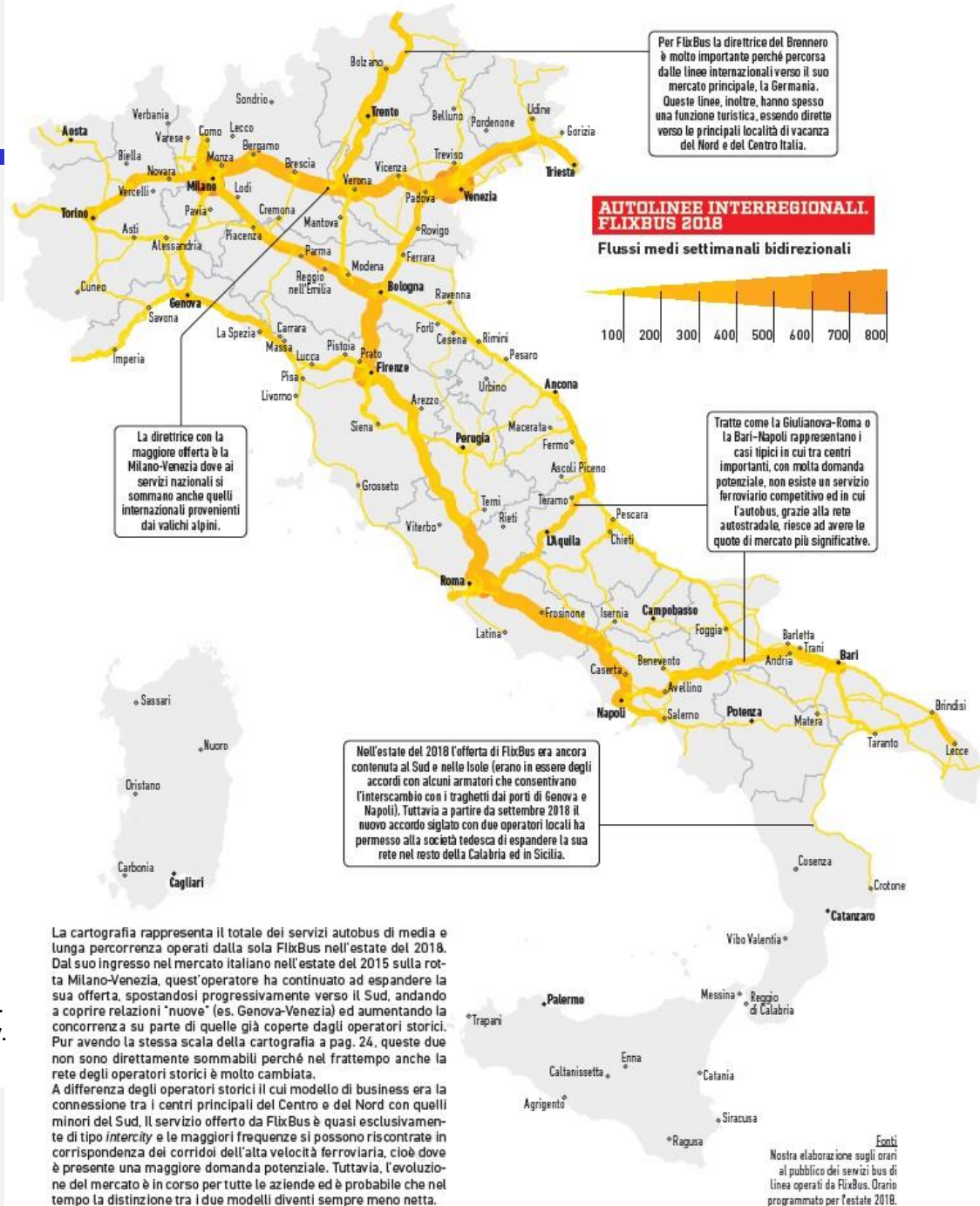
Introduction and aims

The state of liberalisation in Italy

A second element of discontinuity is the rise of the **coach sector**, well above the historical supply and now less and less South-centric.





In 2018 FlixBus alone counted nearly the supply of the entire sector in 2013, but upside-down.

Source: Beria P. (ed., 2018) *Atlante dei Trasporti Italiani*. Libreria Geografica, Novara, Italy.





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Data

Database contents

We collected prices for **Trenitalia** and **Italo**, 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.

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

OD pair	Average Rail supply [trains/day per direction]*			Air supply** [flights per day]	Coach supply** [coaches per day]
	Trenitalia	Of which PSO	NTV		
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



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We collected prices for **Trenitalia** and **Italo**, 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.

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'



Data cover **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** with an advanced purchase of **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.

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

Currently, database size is about 6Gb...



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Prices and competition

Classical price discrimination

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.

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**.

<i>technique</i>	<i>examples</i>	<i>IT</i>
Level of service	<i>Classes</i>	✓
Combination tickets	<i>discounted daily return tickets</i>	✓
Level of flexibility	<i>refundable or modifiable tickets</i>	✓
Targeted discounts	<i>young, elderly, companies...</i>	✓
Individual discounts	<i>promotional codes</i>	✓
Season or multiple tickets	<i>10 travels in 6 months</i>	✓
Bundle-tickets	<i>discounted fares if purchased with hotel</i>	~
Subscription-based discounts	<i>a fixed discount for card holders, like the BahnCard</i>	✗
Advanced purchase	<i>Prices increasing with time or load factor</i>	✓



Prices and competition

Fare structure in the Italian market

Today both players adopt a **very similar and complex fare system**, mostly based on the cross of three dimensions, and increasing with load factors:

- ✓ Class
- ✓ Flexibility
- ✓ Group

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



Prices and competition

An example

To clarify how the system works, let's make an example.

A certain (unknown) number of 9€ “supereconomy” (not refundable) and 19€ “economy” (refundable) tickets are sold. The “base” (flexible) fare is always available.

When they run out, a second block of 19 and 29 € tickets is sold.

Typically, “supereconomy” tickets end soon. Often also the “economy” ones end.

1 day before they are retired anyway and “base” is the only available option.

*The same things happen **on every class**, with different timing.*

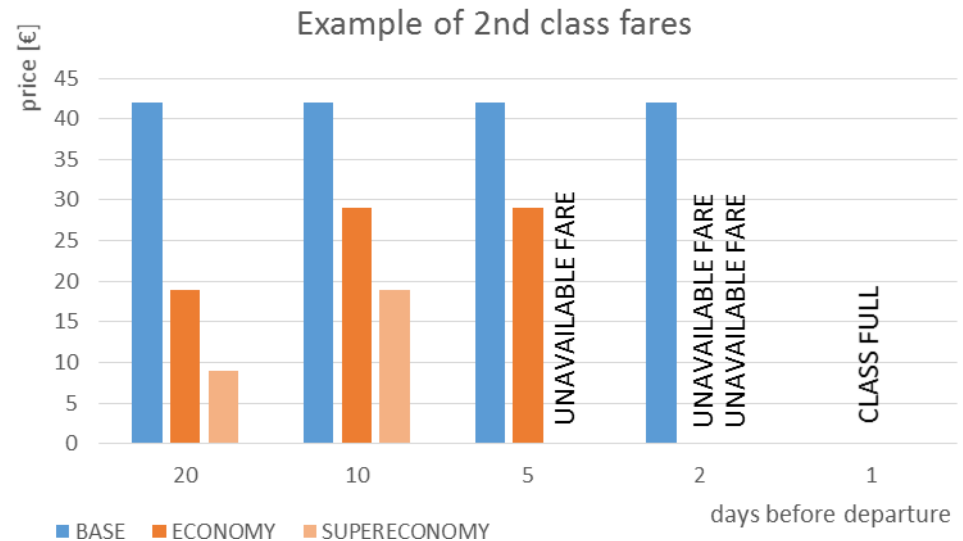
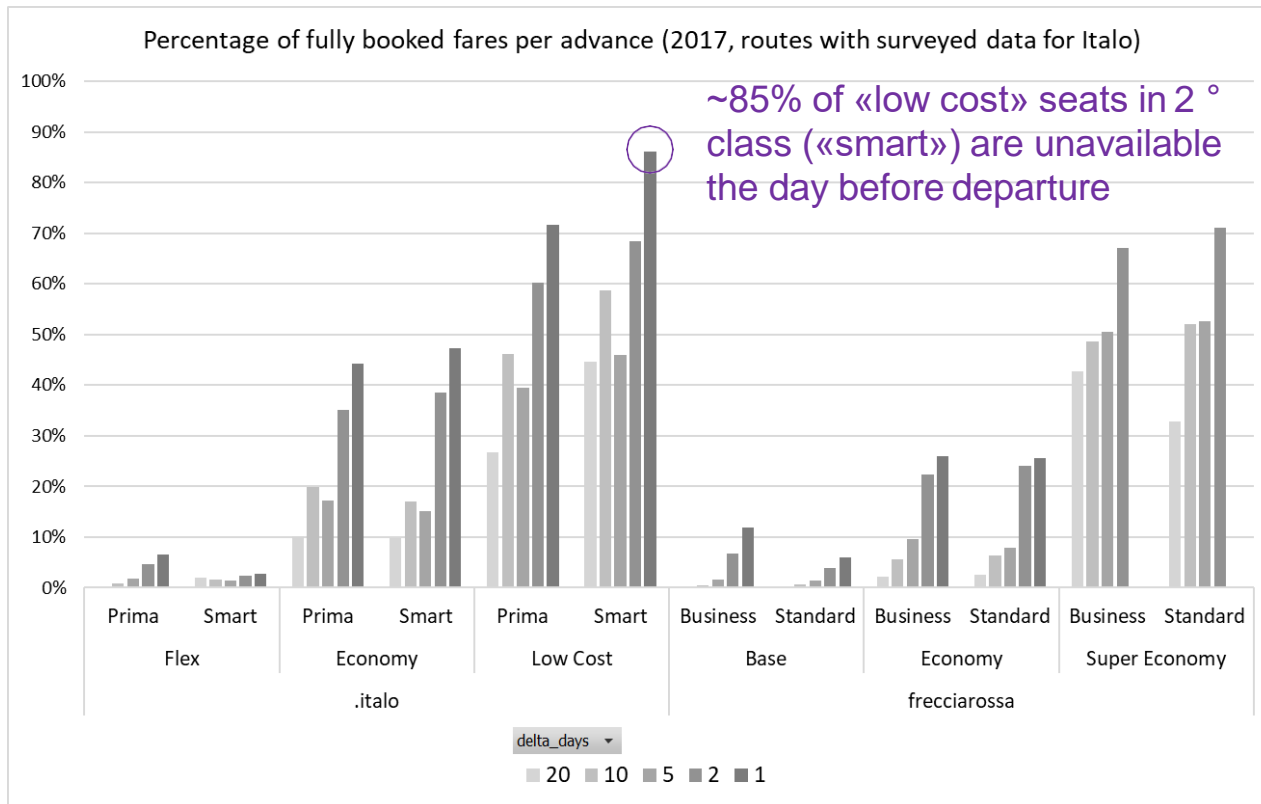


Figure . Example of discounted prices



Discounts are not forever... lower prices run out much earlier than normal tickets. Interestingly, 1st and 2nd class have similar rates of unavailable fares.





We look at **the cheapest fare still available on every train, whatever is the class and the flexibility level.**

We computed the **price-per-km** for the two operators, and tested the effect of three elements on them:

- OD pair distance
- Level of competition
- Commercial speed

One can expect that routes in competition cost less than routes in monopoly and that faster routes cost more...

...Rather the opposite...



Prices and competition

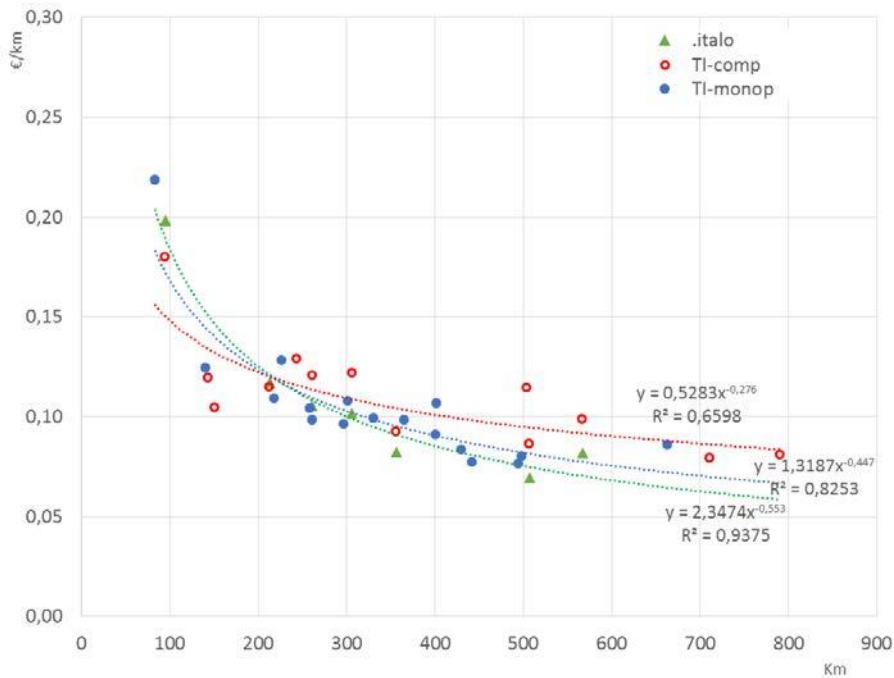
Price vs. distance and competition

F1. the price is affected by the length of the OD pair

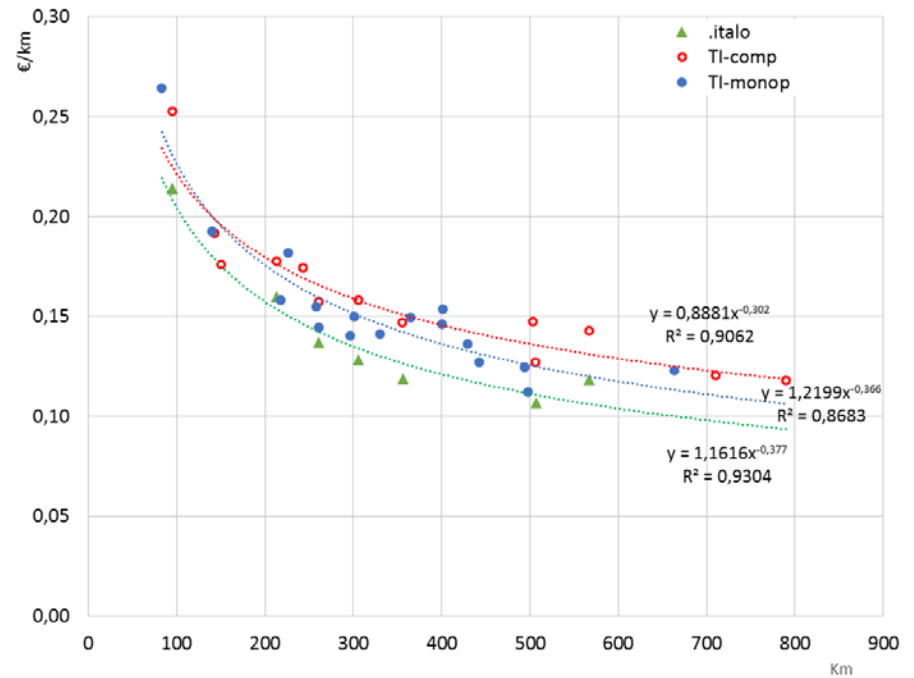
F2. Italo is 10-20% cheaper than Trenitalia

F3. Trenitalia's routes in competition cost more than the ones in monopoly!!

20 advance days - Price per km vs. dist (2017)



1 day - Price per km vs. dist (2017)

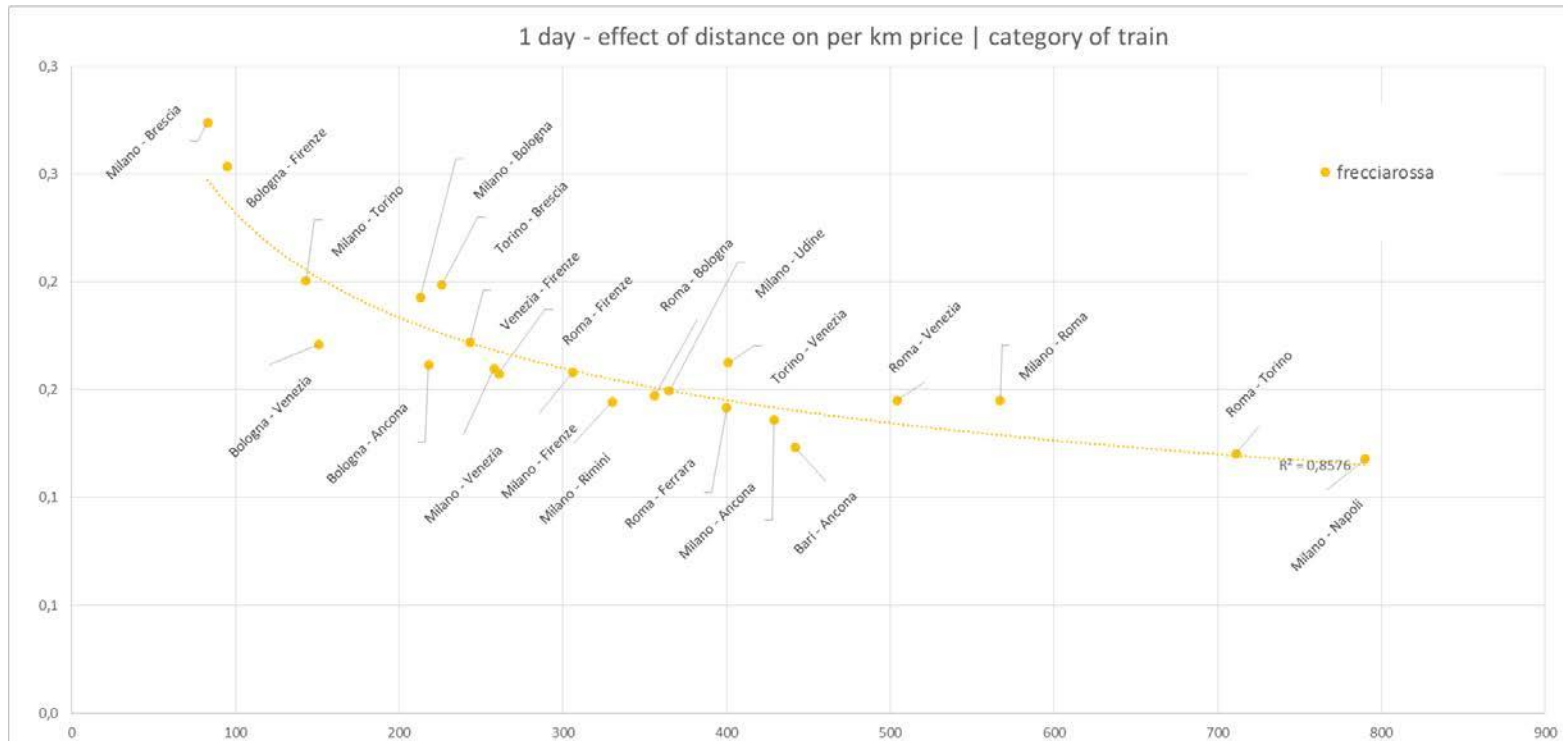




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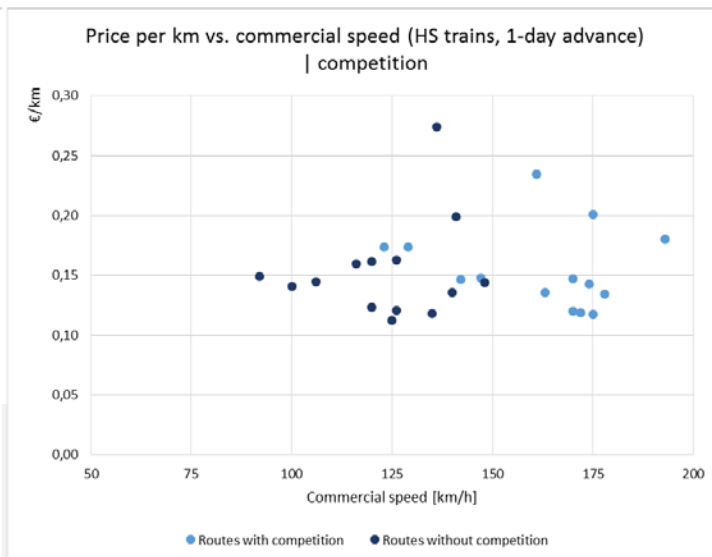
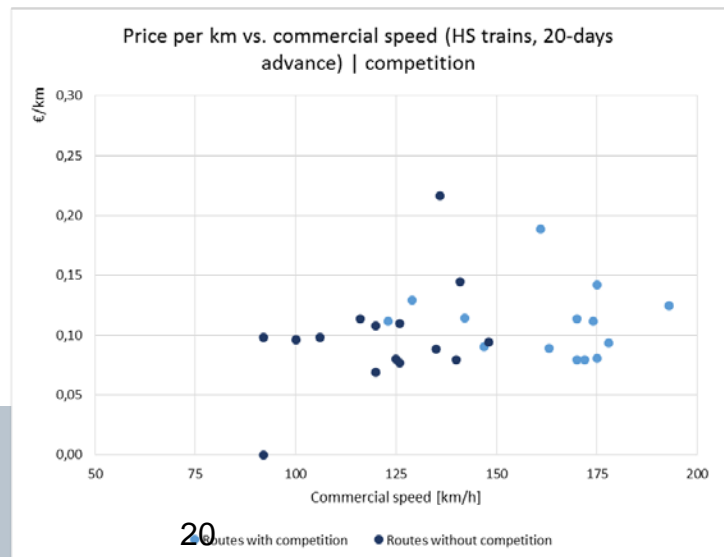
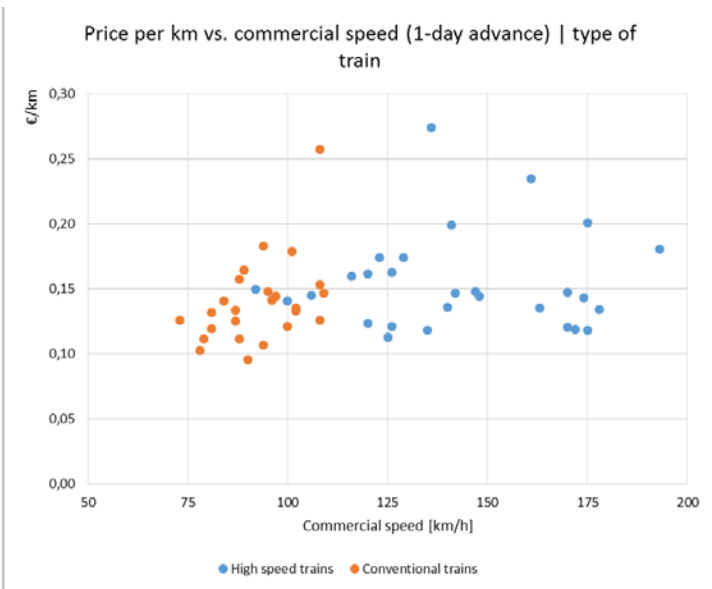
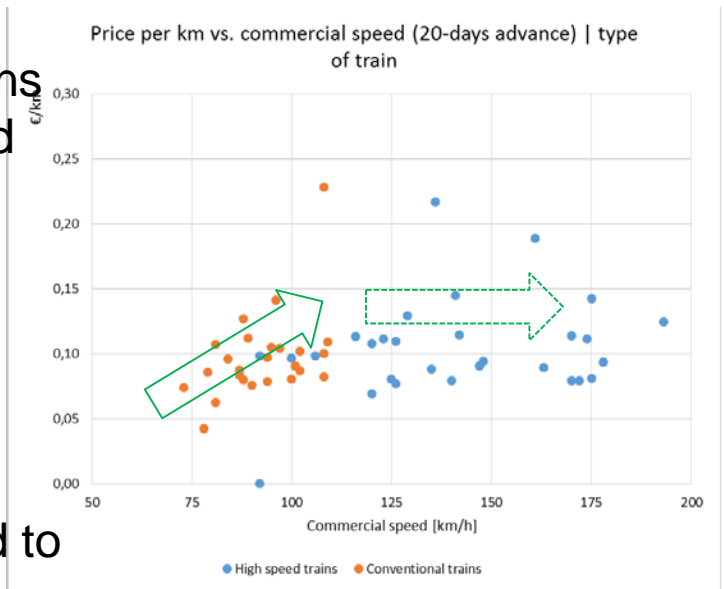
Prices and competition

Price vs. commercial speed and competition

F4. conventional trains cost more with speed

F5. HS trains no

F6. there is no significant difference with/without competition but competition is limited to top-speed routes!





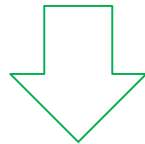
F3. Trenitalia's routes in competition cost more than the ones in monopoly

The fact is already found in literature in the air transport: Malighetti et al. (2014) see that low-demand routes show the lowest price level, whatever is the degree of competition. In other words, high-demand routes can sustain higher prices even if competition exists, which is exactly our for rail connections. Bilotkach et al. (2015) find that, excluding touristic routes, yield management is used by airlines whatever is the degree of competition on a route.

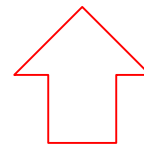
So, we can hypothesise that, being competition in Italy only on the “**top routes**” in terms of demand and performances, **price is the balance of 4 different forces** and not just of *competition*:



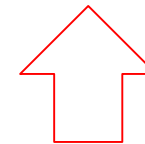
Higher train
productivity for speed



Competition



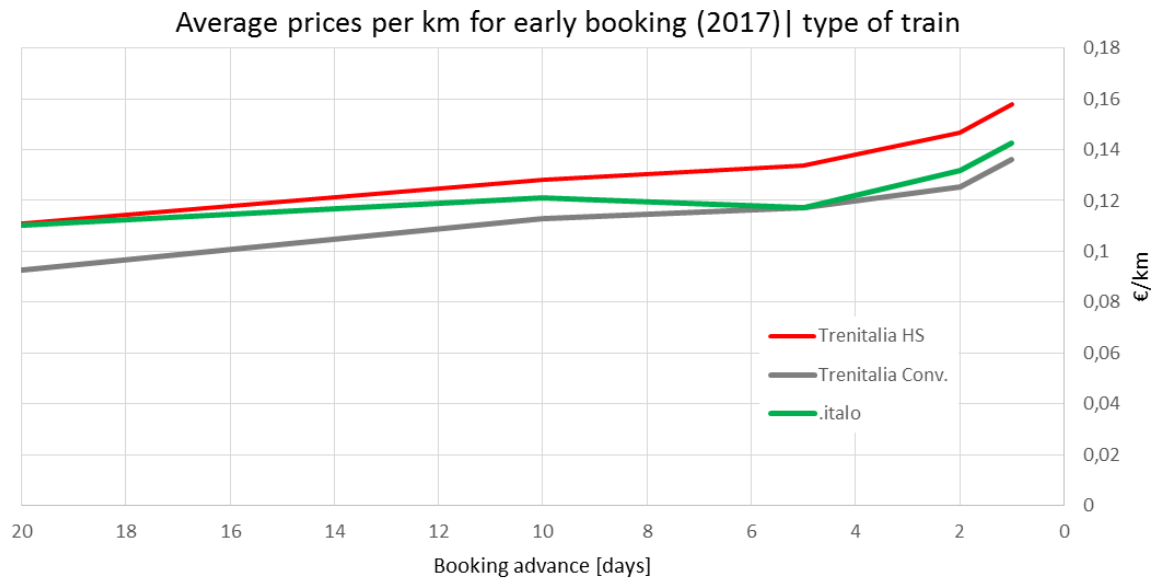
High demand
pairs



High WTP for
speed



With the database we can compute the function linking prices and advanced purchase, per operator and market context.



The decline of Italo 10-5 days before departure **is a systematic fact**. Most likely, NTV reintroduces discounted fares in this period to secure higher load factors.



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We define a **fully booked train** if at 1-day before departure the most flexible (and therefore expensive) first/second class fare (or equivalent) is sold out.

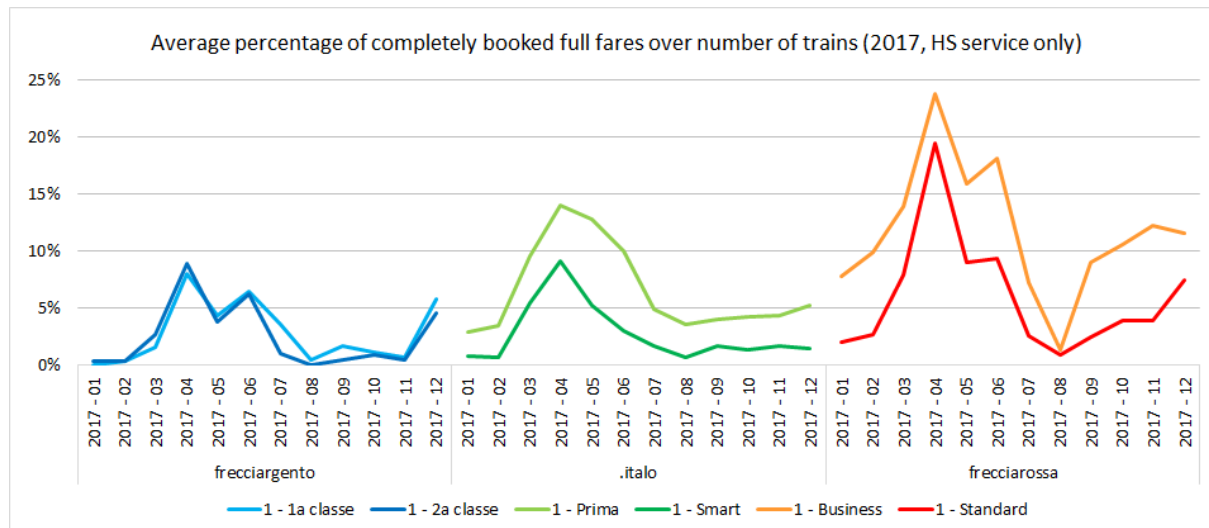
The average monthly percentage is calculated as the quantity of sold-out fares over the number of trains.



F7. there is a peak of full trains during the Spring and the beginning of Summer.

F8. Frecciarossa is generally more full than Italo. Frecciargento are rarely full and never in Summer.

F9. both for FR and Italo, sold out 1st class is systematically higher than the 2nd → **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.





Prices and capacity

Touristic routes

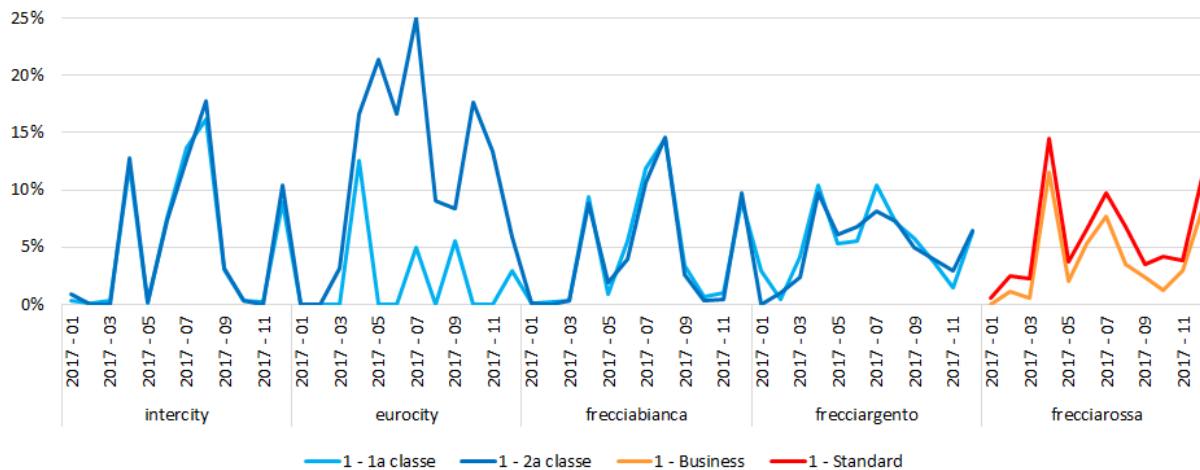
We empirically define “**touristic route**” if sold out full price 2nd class in July and August is more than in February and March.

F10. sold-out trains are more in touristic routes, except Frecciarossa

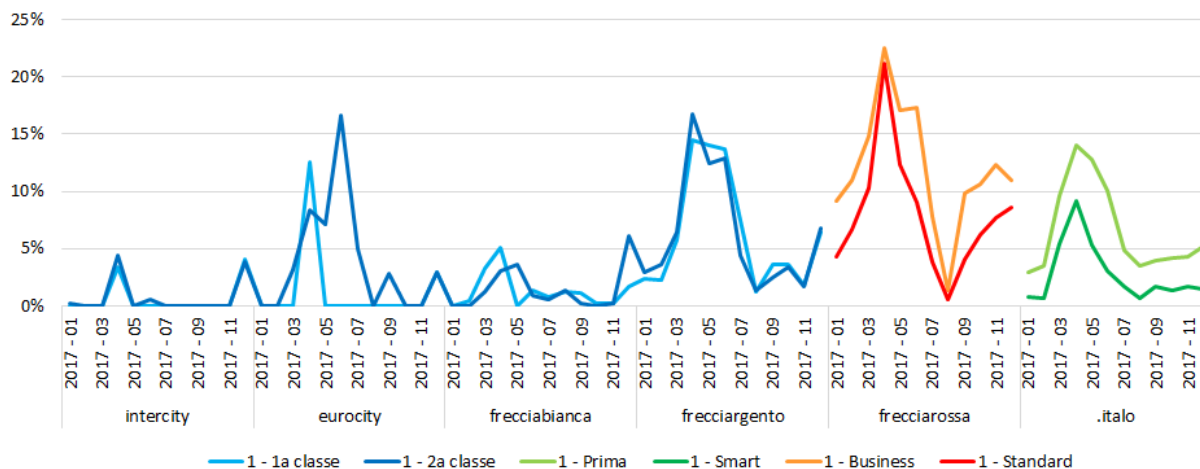
F11. 1st class sold-out is less on touristic routes than other

F12. on non-touristic routes conventional trains perform badly, while HS trains are often sold-out in Spring.

Average percentage of completely booked full fares over number of trains (2017, tourist routes)



Average percentage of completely booked full fares over number of trains (2017, non-tourist routes)





Thanks to a huge database of rail prices observations we evidenced some general trends:

- a. Competition in Italy is limited to top-demand routes and therefore prices of routes in competition are higher than routes in monopoly. Of course we do not have a counterfactual, and most likely in absence of competition prices would be much higher
- b. Italo is pricing 10-20% less than the competitor, has slightly lower sold-out rates and needs to “refill” the pool of discounted prices about 1 week before departure.
- c. Rate of Sold-out trains is very different between touristic routes and business routes. The peak of the latter is Spring and conventional trains are never full. For touristic routes, instead, also conventional trains get full often during the entire year.

Further research: 1) perform an econometric model to put everything together; 2) try a cross-country comparison on prices strategies and levels.



Beria et al.

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Thank you for your attention!!!

paolo.beria@polimi.it

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