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Choosing a foreign high-speed train service for a domestic route: Early insights from France

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Abstract

This study replicates and extends in France an exploratory study run in Italy on travellers' choice for a high-speed train service for leisure. We specifically analysed the effect of the country of origin of two train operating companies, i.e. a domestic versus a foreign carrier, and ticket price on travellers' interest in a single high-speed train service. The results from an experimental study highlight that travellers seem not to consider either rail operator in their ticket preferences. On the other hand, ticket prices make a difference in assessing a ticket offer, but only up to a specific threshold. Above that limit, the ticket price becomes irrelevant in travellers' eyes.
***Keywords*:** *Train operating company, Country-of-Origin, National loyalty, High-speed passengers' rail services*

1. Background

The European Union (EU) recently implemented a regulation obliging member states to open their rail passenger services to competition at the end of 2020 (Guillen 2022). In such a new configuration, passengers can choose a train ticket for the same routes operated by competing players instead of former single-licensed operators. Italy anticipated this process in 2012 with Italo Treno, an Italian brand-new passenger rail company operating primarily on domestic high-speed routes. Italo Treno started challenging the historical and government-owned carrier, Trenitalia, and its high-speed brand, Frecciarossa (Catenazzo, 2022). Since then, competition has gradually become a reality also in other EU countries. *The introduction of competition has led to a drastic reduction in prices, increased frequency of services and, therefore, a significant increase in passenger volume* (Montero-Pascual, Finger, and Kupfer, 2016, p. 6). Yet, unlike the case of Italy described in Catenazzo (2022), where the newcomer has a strong Italian identity and operates only domestic services, various domestic and international players increasingly compete on the same routes in other EU countries. The case of France is particularly interesting as international competition applies to domestic services. Focusing on the Paris-Lyon route, the Italian Trenitalia challenges TGV inOui and Ouigo through its high-speed brand Frecciarossa. The Italian carrier also operates daily services from Milano Centrale (Milan Central station) to Paris Gare-de-Lyon station, calling in Turin (Italy) and the French stations of Modane, Chambéry-Challes-Les-Eaux and Lyon-Part-Dieu (Trenitalia, 2023). Furthermore, starting 13th July 2023, the Spanish Renfe started operating between Barcelona and Lyon and Madrid-Marseille from 28th July 2023, with calls in France and Spain (Renfe, 2023).

Moving from a monopolistic system to competition with a growing number of players will make travellers choose among numerous services. Hence, when purchasing a ticket, travellers not only have to select the departure and arrival day and times, the length of the trip or service speed, travel class and price (Sun et al. 2018) like in a single-player system. They must also choose the train operating company on the desired route. Yet, insights into European travellers' choice of travel options for trains are missing. This dearth of knowledge starkly contrasts with the abundant literature on travellers' choice of flight tickets, e.g. Harcar and Karadag, 2022; Munoz and Laniado, 2021. A preliminary study on travellers' choice of high-speed rail services in Italy exhibits that *travellers choose a high-speed rail ticket merely on price and the length of the trip* (p. 2), neglecting the train operating company (Catenazzo, 2022). In Italy, two Italian players have been competing for over ten years on domestic routes only; further *works should also examine the country-of-origin effect on cross-border*

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and international services (Catenazzo, 2022, p. 2). Accordingly, as EU countries rapidly open their rail passenger network to domestic and international newcomers, insights are needed to unravel travellers' perceptions of foreign train companies operating in their domestic market. Such input would guide train operating companies' expansion plans to new domestic and cross-border services in other EU countries.

The research at hand replicates and extends in France the work performed in Italy by Catenazzo (2022). As mentioned, in France, one rail operator operating between Paris and Lyon is French (TGV inOui), whilst its direct competitor is Italian (Frecciarossa). Furthermore, building on Harcar and Karadag (2022) on airline choice, the influence of individuals' national loyalty on ticket choice is included in the analyses. Additional analyses also provide further insights into the effects of ticket price on ticket choice for a leisure trip by assessing the impact of increased prices on individuals' ticket preferences.

2. Methodology

The study was conducted online through an online survey in French. In only three days, i.e. precisely 72 hours, N=202 respondents living in France initially joined the poll. However, only N=157 responses (acceptance rate of 77.7%) fit all survey quality requirements and were retained for data analysis. Respondents were recruited from Prolific's panel, a leading European crowdsourcing platform targeting researchers whose respondents provide data of convincing quality for behavioural research, even better than professional panels (Pe'Er et al., 2021). Complying with Prolific's policies, all respondents were remunerated for participating in the study; the average hourly rate was £6.15. Out of N=157 respondents, most are male (54.8%), 31.2% live in Île de France, i.e. Paris' region, followed by 14% living in Auvergne-Rhône-Alpes, whose largest city and economic centre is Lyon. Participants living in both areas make up 45.2% of the entire sample. Participants in the poll are aged between 18 and 68 years old (average age: 32.3, standard deviation: 11.16). Further demographic statistics are reported in Table 1.

Table 1. Demographic Statistics

Gender	Male: 54.8% Female: 38.2% Non-binary: 5.7% Prefer not to answer this question:1.3%	**National loyalty**	High national loyalty: 10.2% Low national loyalty: 89.8%
Living in…region in mainland France	Auvergne-Rhône-Alpes: 14.0% Bourgogne-Franche-Comté: 1.9% Brittany: 4.5% Centre-Val de Loire: .6% Corsica: .6% Grand Est: 10.8% Hauts-de-France: 9.6% Île-de-France: 31.2 Normandy: 3.8% Nouvelle-Aquitaine: 7.0% Occitanie: 6.4% Pays de la Loire: 2.5% Provence-Alpes-Côte d'Azur: 7.0%	**Italian origin**	Yes: 4.5% No: 95.5%
Frequency of train trips between Paris and Lyon	Once a month: 1.3% Every two or three months: 6.4% Every six months: 7.6% Approximately once a year: 14% Less frequently: 24.2% Never: 46.5%	**Household net monthly revenue**	Up to 1,000 €: 13.4% Between 1,000 € and 1,500 €: 14.0% Between 1,500 € and 2,000 €: 14.0% Between 2,000 € and 2,500 €: 14.6% Between 2,500 € and 3,000 €: 11.5% Between 3,000 € and 3,500 €: 4.5% Between 3,500 € and 4,000 €: 4.5% Between 4,000 € and 4,500 €: 2.5% Between 4,500 € and 5,000 €: 5.1% Between 5,000 € and 5,500 €: 4.5% Between 5,500 € and 6,000 €: 1.9% Between 6,000 € and 6,500 €: 0% More than 6,500 €: 5.1% I do not know: 1.3% I prefer not to answer this question: 3.2%

Like in Catenazzo (2022, p.1), *a full-profile conjoint analysis study was run to investigate travellers' purchase intentions of a high-speed train ticket* in France. *Conjoint analysis is a stated preference approach to choose modelling in which respondents are asked to rate hypothetical products or services described by a single level of each of a number of attributes* (Reed & Levine, 1997, p. 25). Accordingly, respondents had to read a hypothetical travel scenario and evaluate their interest in several ticket offers. The provided scenario assumed that the respondent lived in the region of Paris and wanted to go to Lyon for a leisurely city trip; the two cities represent the first and second-largest French urban areas (INSEE, 2017). Respondents had to take a high-speed train from Paris-Gare-de-Lyon to Lyon Part-Dieu stations: The French high-speed TGV inOui brand from the government-owned SNCF train operating company and its competitor

Frecciarossa from Trenitalia, the Italian national operator serve both cities. TGV inOui offers over twenty daily services at the time of writing, while Frecciarossa has only five. The provided scenario did not include this difference: The selected trains were supposed to leave Paris and arrive in Lyon precisely at the same time, as the ride time for the two carriers is substantially the same. Respondents were told that two full-service train operating companies serve this route: TGV inOui from the French SNCF and Frecciarossa from the Italian Trenitalia. As a low-cost operator, Ouigo was not considered in the experiment as not comparable with full-service TGV inOui and Frecciarossa counterparts. Each ticket offer included two criteria: The train operating company, i.e. TGV inOui versus Frecciarossa, and the price for the ride, i.e. 64 €, 74 €, 84 €, 94 €, 104 €, and 114 €. Combining the options from the two train operating companies and six price options, respondents had to appraise their likelihood of purchasing each of the twelve suggested ticket options. These options were sorted and displayed randomly to the participants in the study. Then, respondents had to assess on a five-point scale, from a minimum of 1= Not likely at all to a maximum of 5=Very likely their likelihood to purchase each of the proposed offers.

After the experiment, the questionnaire also included additional items, such as the respondents' frequency of travel by high-speed trains on the Paris-Lyon route and their usual demographic. On top of a question about the respondent's nationality (one or more), an additional question aimed to measure whether the respondent was of Italian origin. Italians represent 4% of the population living in France (INSEE, 2023); over the past two centuries, Italians widely emigrated to France, making 4 million out of approximately 65 million (6%) inhabitants in France of Italian origin (CIRCE, n.d.). Not all these "Italian-rooted" French nationals also have Italian citizenship or still have ties with Italy. Finally, two items from Harcar and Karadag (2022) were also included in the questionnaire to estimate respondents' degree of national loyalty. These two items were measured on a 5-point Likert scale. Unfortunately, the correlation coefficient between these two items was only equal to .479 ($p<.001$). Factor analysis was performed for both questions, leading to one component, explaining 74% of the shared variance; Cronbach's alpha .639. The average score of the individual answers to these two questions was computed and recoded into "Low" when the average score was between 1 and 3, i.e. N=141 or 89.8% of the sample. When the average score was higher than 3, the respondents were considered to have high national loyalty. In our sample, only 10.2% (N=16) of the respondents belong to this second group.

3. Results

A linear regression (ordinary least squares regression, OLS) was performed to assess the effects of the Country-of-Origin of the train operating company, i.e. TGV inOui from France versus Frecciarossa from Italy and the ticket price on the likelihood of purchasing a ticket for a high-speed train from Paris to Lyon. Adjusted-R^2 was .987, the highest VIF= 1.667, displaying an excellent fit of the performed regression. The average score of the likelihood of purchasing each of the suggested tickets was used as a dependent variable. The train operating companies and prices have been dummy-coded and used as independent variables. Using binary data as independent variables implies that the unstandardised coefficients reported in Table 2 must be compared to a reference category, i.e. TGV inOui for the train operating company and 64 € for the ticket price. For instance, the average likelihood of purchasing a train ticket of 74 € decreases by 1.105 point-scale (out of a maximum of five) compared to a train ticket of 64 €. Table 2 reports the main results from the data analysis.

Table 2. Regression model

	Unstandardised coefficient	Standard Deviation
Intercept	4.035***	.082
Frecciarossa from Trenitalia (Italy)	-.110^{NS}	.062
Ticket price: 74 €	-1.105***	.108
Ticket price: 84 €	-1.645***	.108
Ticket price: 94 €	-2.085***	.108
Ticket price: 104 €	-2.485***	.108
Ticket price: 114 €	-2.570***	.108

^{NS} p>.05 * p<.05 ** p<.01 *** p<.001

Reference category for the Train operating company: TGV inOui from SNCF (France)
Reference category for Ticket Price: 64 €

These results show that the train operating company does not significantly (p>.05) influence the average likelihood of a train ticket purchase. Respondents travelling by train between Paris and Lyon at least once a year exhibit equivalent patterns. These results from France corroborate Catenazzo (2022, p. 3), whose study in Italy suggests that *train operating companies look interchangeable to travellers*. Even if one train operating company is French and the other a foreign, a country-of-origin effect does not apply. An additional regression performed only among respondents originally from Italy (N=7) leads to equivalent results. An "Italian root" does not make travellers lean for the Italian carrier.

A further regression was performed, restricting the analysis to respondents who scored high on national loyalty (N=16); the Adjusted R^2 was .971 and the highest VIF= 1.667. TGV InOui train operating company scores significantly higher than Frecciarossa (*b*: -.283, p<.05) in respondents' interest in the train ticket (Table 3).

Table 3. Regression model among respondents with high national loyalty

	Unstandardised coefficient	Standard Deviation
Intercept	4.392***	.132
Frecciarossa from Trenitalia (Italy)	-.283*	.100
Ticket price: 74 €	-.965**	.172
Ticket price: 84 €	-1.720***	.172
Ticket price: 94 €	-2.250***	.172
Ticket price: 104 €	-2.565***	.172
Ticket price: 114 €	-2.720***	.172

^{NS} p>.05 * p<.05 ** p<.01 *** p<.001

Reference category for the Train operating company: TGV inOui from SNCF (France)
Reference category for Ticket Price: 64 €

A final regression considered only respondents who scored low on national loyalty. Table 4 reports the results from this final regression; adjusted R^2 was .987, and the highest VIF= 1.667.

Table 4. Regression model among respondents with low national loyalty

	Unstandardised coefficient	Standard Deviation
Intercept	3.994***	.080
Frecciarossa from Trenitalia (Italy)	-.088^{NS}	.060
Ticket price: 74 €	-1.120***	.105
Ticket price: 84 €	-1.640***	.105
Ticket price: 94 €	-2.065***	.105
Ticket price: 104 €	-2.475***	.105
Ticket price: 114 €	-2.555***	.105

^{NS} p>.05 * p<.05 ** p<.01 *** p<.001

Reference category for the Train operating company: TGV inOui from SNCF (France)
Reference category for Ticket Price: 64 €

The results exhibited in Tables 3 and 4 show that the country of origin of the train operating company and French travellers' choice of a high-speed rail ticket for a domestic trip, i.e. Paris-Lyon, likely differs according to travellers' national loyalty. Yet, at this early stage of the research, without adequate statistical testing, it is not possible to establish whether there is moderation of the national loyalty to travellers' ticket choices.

Focusing on ticket price, not surprisingly, the higher the price, the less respondents are likely to purchase the proposed ticket offer. The relationship between the price and the interest in the ticket is not linear. Table 5 on the entire sample reports these results. A ticket costing 74 €, i.e. ten euros more than the baseline category of 64 €, decreases travellers' interest by 1.105 scale points on a 5-point scale spanning from a minimum of 1=Not likely at all and a maximum of 5=Very likely. A ticket costing ten additional euros, i.e. 84 €, decreases respondents' average interest in the offer by .540 extra scale points, i.e. the difference between the two β coefficients -1.645 and -1.105, compared to a 74 € ticket. Table 5 reports all differences in the average interest to purchase the ticket for every 10 € increase in the ticket price (see column difference P_2-P_1). Cumming (2009)'s confidence interval overlapping criterion tests show that not all price increases exert a significant change in respondents' interest in the suggested offer.

Table 5: Price differentials using regression coefficients from Table 2

Price$_1$	Unstandardised coefficient	Price$_2$	Unstandardised coefficient	Difference P_2-P_1	Significant difference? p<.05 or lower
Price: 64 €	0	Price: 74 €	-1.105	-1.105	YES
Price: 74 €	-1.105	Price: 84 €	-1.645	-0.540	YES
Price: 84 €	-1.645	Price: 94 €	-2.085	-0.440	YES
Price: 94 €	-2.085	Price: 104 €	-2.485	-0.400	YES
Price: 104 €	-2.485	Price: 114 €	-2.570	-0.085	NO

The above results display that increasing a ticket price decreases non-linearly travellers' interest in the service offer. Above the threshold price of 104 €, a price increase of ten additional euros does not significantly change the respondents' interest in the suggested travel offer. Unfortunately, we did not include higher prices to avoid increasing the number of combinations respondents had to assess, leading to more fatigue and lower quality of the collected data.

Discussion and conclusion

The high-speed rail service industry in the European Union is rapidly changing, making it competitive with domestic and international players. Travellers have increasing service choices, including several train operating companies, prices, service frequency, length of the trip and comfort levels. The empirical study presented in the present work focused specifically on the influence of a domestic versus a foreign train operating company and a price on a ticket preference.

The selected train operating companies are two flagship government-owned carriers from two countries. Therefore, one of the goals of this research was to examine the effect of the country of origin of the train operating company on travellers' interest in a train ticket. Like in Catenazzo (2022), travellers do not seem to have specific preferences for either operator. Only the ticket price makes a difference: This relationship between the ticket price and interest in a ticket offer is not linear. Above the threshold of 104 €, an increase of ten euros in ticket price does not exert further adverse effects on individuals' interest in a transport offer for a leisure trip.

Further analyses at the subgroup level let us hypothesise that the travellers' national loyalty could influence the choice of train operating companies in their ticket selection criteria. A moderating role of national loyalty should be tested in future studies. Furthermore, an individual's nationality or origin, like an "Italian root" in our case, does not lead to a preference for the Italian carrier. Train operating companies should consider these results in their brand management strategy and operations.

Like all studies, several limitations hamper the generalisability of this work's results. First, the study was run on a sample of only N=157 individuals. Despite being a sufficient sample size for the used methodological approach, it is unlikely representative of the preferences of all travellers living in France and taking a high-speed train between Paris and Lyon. Next, as suggested by Sun et al. (2018, p. 112), *since only one origin-destination pair (one market) is considered in this study, it is desirable to explore multiple passenger market in the future*. Respondents were recruited on Prolific, an online platform: Like several crowdsource services or professional panels, respondents have not been recruited or selected randomly. The fact that Prolific is entirely in English further represents a sampling limitation in a country where only 34.3% speak English as their mother tongue or as a foreign language (Gerhards, 2014, p. 59). Yet, this work represents a further advance in shedding light on travellers' preferences and choices for high-speed train services, *a timely and promising field* (Catenazzo, 2022, p. 2).

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