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Delusions of success: Costs and demand of high-speed rail in Italy and Spain

Paolo Beria[a,*], Raffaele Grimaldi[b], Daniel Albalate[c], Germà Bel[c]

[a] Department of Architecture and Urban Studies (DAStU), Politecnico di Milano, Italy
[b] Independent Researcher, Italy
[c] Dep. of Econometrics, Statistics and Applied Economics, Universitat de Barcelona, Spain

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ABSTRACT

Mismatches between forecasted and actual costs and traffic figures are common in transport investments, especially in large scale ones, and so are delusions of the future demand. High-speed rail projects are often among the worst practices for cost overruns and demand overestimation, even where traffic figures may tell a history of apparent success.

In the paper, we analyse two significant cases of *delusions of success*, namely the Italian and Spanish HSR programmes. The Italian one shows excellent demand performances, but is among the continent's worst cases for construction costs. The Spanish one, recognised worldwide as one of the most successful outcomes of HS policy, is the one where potential demand estimations were systematically neglected, and the planned network appears largely out-of-scale compared to actual traffic. In both cases, the forecasts were not simply biased, as well-known literature on megaproject failures has clearly shown: Italian lines were deliberately designed to increase the cost, and the Spanish network was deliberately planned out-of-scale. By means of the two cases, the paper will show that the core of the problem does not lie in the wrong estimations, but in deliberate choices of overinvestment, overdesign and overquality.

1. Introduction: delusions of success?

Many European countries have undergone, since the end of the XX Century, huge High-Speed Rail (HSR) programmes, following the tracks opened by the the Japanese Shinkansen and French TGV. The former models were adapted in each country, and now the definition of HSR includes quite different models in terms of speed, network integration, type of services and regulatory characteristics (Campos and De Rus, 2009; Perl and Goetz, 2015). Notwithstanding the differences, what looks similar is the fact that, decades after these programmes started, HSR megaprojects appear, often, among the worst practices for cost overruns and demand overestimation, even where traffic figures and network extensions may tell a history of apparent success. A *success*, which is, ultimately, just a *delusion*.

In fact, the appreciation of customers and of local authorities for high-speed rail services hides, even in the best practices, a number of problems. Large networks may actually change the mobility of regions, but the construction of hundreds, and in some cases thousands, of kilometres of new lines have placed a burden on the budget of many countries. The high costs are, sometimes, amplified by the framework conditions, consisting of environmental mitigations, interconnections, passage through densely built areas, etc., and also by the scarce competition in civil works and by legal frameworks.

A second issue lays in the demand. The success of a HSR system is often measured in terms of induced modal change from air and car. But modal change is not the only goal, and many of these lines remain largely underused. In a few cases, Cost-Benefit Analyses (CBAs) (Preston, 2013; Nash, 2015; Betancor and Llobet, 2015) have been produced ex-ante to make explicit the surplus gains, and to compare them with additional costs with respect to reference solutions, typically conventional rail and air transport. Even rarer are assessments comparing lower-performing solutions, such as improvements of conventional rail, new rolling stock, better signalling and technological management systems, selective doublings, etc.

In this paper, we will address the problems of HSR and megaprojects in general, by studying the Italian and Spanish cases of HSR. The Italian one shows, eight years after completion, excellent demand performances, but is among the continent's worst cases for construction costs. The Spanish one, recognised worldwide as one of the most successful outcomes of HS policy for its huge extension, is the one where potential demand estimations were systematically neglected, and the planned network appears largely out-of-scale compared to actual traffic.

The point we aim to discuss is that, in both cases, the forecasts were not simply *biased*, as literature on megaprojects has clearly shown as usual outcomes (see section 6). Italian lines were *designed* in a way that

* Corresponding author.
E-mail addresses: paolo.beria@polimi.it (P. Beria), graffagraffa@gmail.com (R. Grimaldi), albalate@ub.edu (D. Albalate), gbel@ub.edu (G. Bel).

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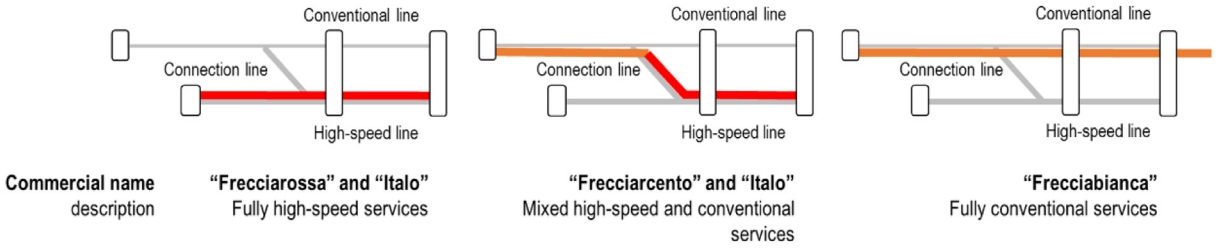

Fig. 1. Schematisation of the mixed high-speed model used in Italy.

increases the cost with respect to European benchmarking. The Spanish network was *planned* out-of-scale with respect to the country's mobility. By means of the two cases, the paper will stress that the core of the problem does not lay in wrong estimations, but in deliberate planning and design choices, which we have summarised into three categories: *overinvestment*, *overdesign* and *overquality*. If choices were such, and not the irrational outcome of a "garbage-can decision-making process" (Cohen et al., 1972; Dente, 2014), it is of some interest to also discuss which are the causes driving the governments to implement them in this way, namely to spend more and to build more than economic rationale would suggest.

The paper is structured as follows. First, we describe the history of Italian and Spanish programmes in sections 2 and 3. In Sections 4 and 5, using available data, we collect traffic and cost figures of the two cases, evidencing where the most relevant failures are. Section 6 discusses the general planning and design choices behind the failures, namely overinvestment, overdesign and overquality. Finally, Section 7 tries to find explanations of such choices, mainly in the decision-making process and its actors, rather than in unpredictable pitfalls. Section 8 concludes.

2. The Italian "TAV - Treno Alta Velocità"

2.1. The history of the programme

When it was first conceived, in 1990, the Italian HSR (in Italia "Alta Velocità", or *AV*) was to be a new system, substantially independent from the rest of the network. It aimed at providing faster connections among the cities of Turin, Milan, Bologna, Florence, Rome and Naples (RFI, 2007), which can be considered the "backbone" line of the country. This network should have been built through Project Financing by a new mixed society, called *TAV SpA*, with a 60% portion of private capital to be completely repaid, and the rest owned by the Italian state.

This initial model was soon changed in 1996 and renamed as "Alta Velocità/Alta Capacità" (*High Speed/High Capacity* in Italian, or *AV/AC*). Lines maintained a different voltage[1] from the rest of the network and the same speed, but the introduction of many interconnections with the existing conventional network and the design with lower slopes would allow lines to also host heavy freight trains.

Also, the financial plans changed, and already in 1998, the State had to buy back the entire stock of shares of TAV SpA (13 billion Euros), due to the unavailability of private shareholders to provide entitled capitals (RFI, 2007; Beria and Ponti, 2009).

2.2. Realised and planned network

The construction of the first phase took a decade and was completed in 2009 (See Table 11 in Appendix). The Turin-Salerno axis allows trains to run at 300 km/h, excluding the older Florence-Rome section, the Naples-Salerno (both at 250 km/h) and the urban sections.

Also, the two extremity sections of the Milan – Venice axis were completed (Milan-Brescia and Padua-Venice) and in operation at 200–300 km/h. An upgrade of the Verona-Bologna line opened in 2009, raising its speed to 200 km/h, and a new urban section in Bologna (underground, including a new station under the existing one) opened in June 2013.[2]

While now only the central section of the Milan – Venice is still missing (under construction) to complete the original HS programme, other high-speed lines were added later and their projects are still under discussion (see section 5.1 for more details).

2.3. The supply model adopted

Italian rail infrastructure is, thanks to liberalisation in 2003, open to on-track competition. Different from the other few EU cases, Italian on-track competition is mainly concentrated in the high-speed segment, where a specialised rail company, NTV (Bergantino, 2015; Beria and Grimaldi, 2017), competes with Trenitalia high-speed branded services.

The model adopted in Italy so far is a *mixed high-speed* model, as defined by Campos and De Rus (2009), or a *hybrid network,* as defined by Perl and Goetz (2015). Both companies operate mixed services (conventional and high-speed) using high-speed rolling stock, as schematised in Fig. 1. In particular, some high-speed trains (initially branded *Frecciargento* by Trenitalia and operating at 250 km/h max) run on high-speed lines where available and pass to the conventional infrastructure to serve more origin-destination pairs than those directly connected to HSR infrastructure (e.g., Venice-Rome, Brescia-Rome or Bari-Rome). *Frecciarossa* and *Italo* trains, instead, generally operate on dedicated tracks only (except nodes) and can reach 300 km/h. In addition, conventional services also exist, branded *Frecciabianca* by the incumbent. Fig. 2 and Fig. 3 show daily frequencies of, respectively, Trenitalia and NTV trains using the high-speed infrastructure.

As we will see in the following sections, this model proved to fit the mobility on the North-South axis quite well, where long distance trips between Milan and Rome constitute the larger share. In other contexts, such as the planned Milan – Venice line, a German-like *fully mixed* model would better fit the demand dynamics (Beria and Grimaldi, 2011). In this context, the mobility needs of a wide metropolitan region with middle-sized towns and shorter mobility patterns (less than 200 km), does not rely on the "need for speed" typical of 400–800 km routes.[3]

As already mentioned, interconnections and line characteristics would theoretically allow the use of the high-speed lines by dedicated high-speed freight trains, as foreseen by decision-makers at the moment of planning. However, to date, not a single freight train has used the new lines, and no operator seems to be willing to invest in it.[4]

[1] High-speed lines operate at 25 kV AC, while the traditional network, including the urban terminals of high-speed lines into cities, operate at 3 kV CC.

[2] The new section allowed a time savings of about 5 min for non-stop services, but its main purpose was to free up capacity in the existing station and urban section for sub-urban and regional services.

[3] Despite its very important touristic role, the *Larger Urban Zone* of Venice had only 493 k inhabitants in 2012, to be compared with the 500 k of Padua, 504 k of Verona and 462 k of Brescia (Eurostat, 2015). In addition, stops are separated by about a 1 h ride or less.

[4] In 2019 a first cargo service should run on the line, using converted old passengers trains to deliver parcels and post.