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MARISA J. G. PEDRO, CESUR, DEPARTMENT OF CIVIL ENGINEERING, INSTITUTO SUPERIOR TÉCNICO, LISBON TECHNICAL UNIVERSITY, PORTUGAL. CONTACT: MARISA.PEDRO@IST.UTL.PT
JOÃO DE ABREU E SILVA, CESUR, DEPARTMENT OF CIVIL ENGINEERING, INSTITUTO UPERIOR TÉCNICO, LISBON TECHNICAL UNIVERSITY, PORTUGAL.

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A CONTEXTUAL ANALYSIS OF THE IMPACTS OF HIGH SPEED RAIL ON REGIONAL DEVELOPMENT AND MOBILITY

Marisa J. G. Pedro, *CESUR, Department of Civil Engineering, Instituto Superior Técnico, Lisbon Technical University, Lisbon, Portugal*. *Contact: marisa.pedro@ist.utl.pt*

João de Abreu e Silva, *CESUR, Department of Civil Engineering, Instituto Superior Técnico, Lisbon Technical University, Lisbon, Portugal*.

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ABSTRACT

High Speed Rail (HSR) has been promoted by its advocates as being able to change modal split in long distance travel and to induce regional growth in the regions it serves. Several reviews are present in the literature, relating both successes and failures of HSR to achieve these goals. Besides, *accessibility* is a necessary but insufficient condition to economic development. When analyzing the benefits brought by transportation projects it is important to study the environmental and policies existed that might help or thwart the impacts.

This paper aims to assess and identify the impacts of HSR in the present economic context. For that, the study explores the regional, social, and economic impacts resultant of the implementation of HSR network while analyses the urban, regional and economic policies that were implemented at the same period. This research will try to devise and give insights about the potential causal relationships related to public policies that may have contributed to an increase of positive impacts of HSR.

Although HSR is best designed as alternative to standard railway services where requires higher capacity and to reduce travel time, economic benefits could not justify its high investment once those are not always fully unfailing.

Keywords: High speed rail (HSR), urban and regional development, impacts, accessibility and mobility indicators, share market

1 INTRODUCTION

Japan was pioneer in establishing High Speed Rail (HSR) with the Shinkansen Tokaido line in 1964. It took almost twenty years for Europe follows its example: France opened the first TGV (*Train à Grande Vitesse*) line in 1981.

According to recent data, 17,547 Kilometres (Km) of HSR lines are in operation around the world. HSR lines under construction globally amount to 9,289 km and by 2025 there will be 42,312 km in 22 different countries. Currently, 38% of the total kilometres of HSR lines in operation (6,914 Km) are located in Europe and the network is still growing at a very fast pace: with 16%, 2,936 Km, under construction (UIC, 2012). This growth is explained by the fact that the HSR systems have been proven to have the ability of transporting large numbers of passengers more safely, comfortably and efficiently, due to its high capacity, short travel time and good quality of service. In the last 40 years, in Japan, 100 million passengers have been transported by year. In Europe, the average is of 50 million passengers per year, and they have been steadily growing since 1981 by an annual average rate of 2.6% (Campos et al., 2007).

In fact, an important outcome of this interconnectivity is the degree of which HSR as transformed the cities it links into an extended functional region. New infrastructure can change accessibility (in terms of time and distance between cities), affecting the attractiveness and the potential development of the regions (Lutter et al., 1992). Additionally, good connections in international networks are important for adequate distribution of economic activities inside Europe (Bruinsma and Rietveld, 1998). The accessibility of HSR has opened up new opportunities by revitalizing the role of railways stations and stimulating urban development, founding new inter-city relationships.

The literature describes both successes and failures of HSR. Some HSR stations remain disconnected and uninspiring while other cities show few dimple effects from HSR developments. In most cases, national policies have an important role in determining initial development in HSR and these stations. Existing HSR lines with high passenger traffic, such as HSR London-Paris, have been understandable choices for HSR conversion. France has required HSR lines and these stations to generate economic transformation in former industrial areas. In Spain, the HSR network was conceived to shorten travel times from all major cities to Madrid to promote national economic integration (Nichols, 2011). Studies commonly admit that accessibility is a necessary but insufficient condition for economic development. When analysing the benefits of transportation projects, it is also important to study the environment where they have been applied and, in particular, the existence of other policies that might help or thwart those impacts.

Additionally, the features of each region pose challenges in its comparison and in overall analysis. By way of Pol. (2002), the effects due to HSR connectivity in different political and technical contexts and at several spatial levels allows a greater understanding of similarities and variations in its implications for urban and regional development.

This study will consider only the European HSR lines with operating speeds above 250km/h (HSR lines of Belgium, France, Germany, Italy, Netherlands, Spain and United Kingdom).

2 IMPACTS OF HSR ON LOCAL AND REGIONAL DEVELOPMENT

2.1 CITY'S IMAGE

The introduction of the HSR is also an opportunity for urban actors to renew or strengthen the economy and improve the image of the inner city and its urban region. Firstly, HSR can stimulate economic development and changes in land use patterns in cities and especially in the surrounding area of the stations (UIC, 2011). An example is the city of Fulda, in Germany, which was transformed into an important location for congresses. The same development could be observed in France (Le Mans), where the city successfully managed the structural change by achieving new opportunities through their connection to the high-speed system (UIC, 2011). Secondly, the city image can change by associating itself with values of modernity and innovation, which are in consonance with the image transmitted by HSR. For example, cities such as Nantes or Vendome in France, Segovia or Cordoba in Spain, as well as Montabaur or Fulda in Germany, are using their connection to HSR to present themselves as modern, innovative and open-minded places for tourists or enterprises. Lyon and Lille, in France, created completely new city districts, including hotels, offices, retail and residential areas (UIC, 2011).
The examples presented here reflect a voluntary attitude by the city authorities to develop projects that could create synergies with HSR. The Euralille project, for instance, aims to provide the region with a real dynamic urban centre leading the conversion process of traditional industries (Moulaert et al., 2001). Pro-growth politics were applied which included new commercial, leisure and office facilities, conference centres, several residential developments and a twin central railway station through renovation of the existing terminus (Ureña et al., 2009). The project has been growing up and it has been internationally recognized as a success (Newman and Thornley, 1995).
In Spain, the arrival of the HSR network coincided with the drafting and development of the Strategic Plan (Ebropolis-2006) and the Zaragoza Masterplan (2002), which have been used to propose a series of broad strategies aimed to promote urban, economic and social changes (Bellet, n.d.). Bellet (n.d.) says that the implementation of HSR involved a significant reform on the city's rail structure and facilities, which originated significant changes to urban structure of Zaragoza. In short, at local level, the arrival of the new HSR lines has been accompanied in several cities by major urban revitalization and planning projects, which could make HSR an efficient urban tool in redeveloping the physical and functional structure of the city. The redevelopment of the railway system has additionally provided an opportunity to better integrate rail into the urban framework.

2.2 REGIONAL IMPACTS OF THE HSR

Studies on the effect of HSR present mixed evidences and indicate that HSR alone does not steer socio-economic development. Such impacts depend on other prevailing conditions, and mainly "*the presence of a buoyant local economy that can take advantage of the new opportunities offered by the high-speed rail accessibility*" (Banister and Berechman, 2000, p. 318). Still, the potential for positive economic impacts is an important factor in planning and designing HSR lines.

Nakamura and Ueda (1989) found a high correlation between high growth rate of population and employment and the presence of HSR stations. Nonetheless, it still remains unclear what are the differential impacts between the regions served directly by HSR and the others and whether HSR could bring about wider spatial-economic impacts on less-developed places. The regions served by HSR services achieved higher population and employment growth rates than those without direct HSR services (Sands, 1993). Bonnafous (1987) argues that the arrival of the TGV in Lyon, France, strengthened the city's business base, which reflected later in the tourism, services and industrial sectors. The author assumes that improvement of accessibility will steer indirectly long term impacts. In addition, megalopolis creation can improve productivity by expanding labour markets, commercial markets and individual activity zones (Chen et al., 2012).

In addition, various studies reveal that both the accessibility of each city and its geographical position are two important factors of their potential accessibility benefits (Monzón et al., 2011). Indeed, Spanish results show that cities with a poorer initial situation concentrate the highest percentage of accessibility improvements. It is the case of the peripheral cities in the north and south of Spain, which improved considerably in excess of 60%, such as Santander (99%) and Malaga (84%). On the other hand, cities with good railway connections in their initial situation and which are near large population centres obtain limited benefits. This is the case of cities such as Madrid (24%) and Valencia (36%), whose accessibility levels are already acceptable before the HSR extension. Globally, the final situation is ultimately more equitable than before (Monzón et al., 2011). Another example is the UK case, where both HSR and non-HSR served towns within one hour of London showed huge increases in contrast to the reduction of population in the city: Swindon grew by 29.2% and Deane increased by nearly 50%, around eight times higher than the UK average of 5.8% (Lucci and Hildreth, 2008). By contrast, a town such Burnley, with no direct rail connection, reflect its weak economic performance. Nevertheless, improved access is only one factor among many to improve the economic prospects of deteriorated urban centres that have lost their old industrial roles (Lucci and Hildreth, 2008).

The impact is also mixed in France. While in Lyon there was a significant growth, also due to a high demand for office space and good local access to the station, in Le Creusot and Macon (other new stations on the Paris–Lyon line), little HSR related activity took place (Banister and Berechman, 2000). Banister (1995, p. 130) concludes that "*TGV towns do not benefit automatically from having a TGV station, but that a strategy has to be developed to take advantage of the opportunities offered by improved transport links".*

Though, HSR services are only attractive on high-demand routes, which explain why most of those services are between city centres. That is, cities with dense and dominant city centres (in terms of population and/or employment) are more attractive for HSR services, unlike large cities, which are more dispersed in nature (de Rus et al., 2009). On contrary, across Europe experiences to date suggest that economic development benefits of HSR systems have been felt mainly in large cities at the expense of small and intermediate ones (Invensys Rail, 2012). Indeed, there are many other factors prevailing in those regions that can support and influence such impact.

However, when it is analysed the weight of GDP per capita growth in each region (NUTS III) with HSR stations, in proportion of the national GDP per capita (Figure 1) it cannot be sustained that it is related to the implementation of HSR services. It is not possible to observe a trend pattern and/or gains and/or losses at the economic level when new HSR line starts. Possibly this scale is not the most suitable. In fact, in most of the case studies there is only one HSR station in a city in that

region. Thus, these effects can be verified by the city itself but at regional level this effect is probably softened and dissipated. So, it is not possible to conclude that HSR could be responsible to accelerate growth in regions served comparatively with the others.

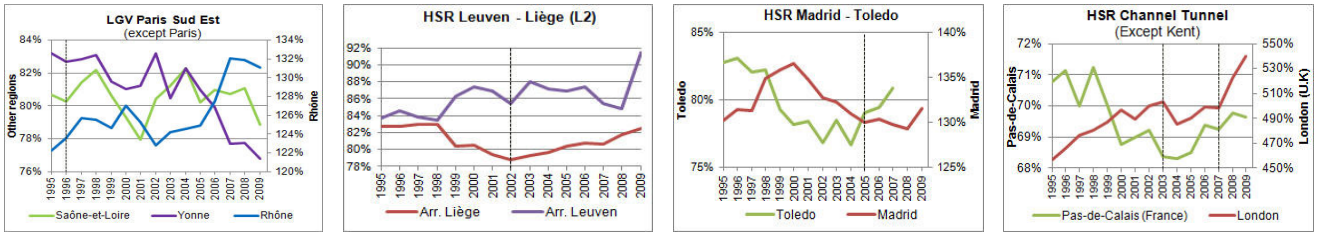


Figure 1 – Evolution of GDP in regions with HSR Stations.

It should be highlighted some instances: the Nord, Rhône, Liège, Toledo and London regions seem have a leisurely relative GDP growth after the respective HSR lines coming into operation. Moreover, policymakers and urban designers have recognized the enormous potential of HSR to shape urban form and to stimulate economic development. Cities should take advantage of the opportunity to create excellent urban places, with new parks and open space as well as residential and commercial growth (Nichols, 2011). Since HSR began to operate in Lyon (France), the city has invested heavily in a new metro system, light rail trams, high-quality trolleybuses, bike sharing service and others. Numerous businesses chose to locate near the new HSR station. By 1990, the station area was attracting 60% of new development projects in the city, and the amount of office space in the area grew by 43%. Today, the HSR station area hosts 20,000 jobs and some 5.3 million square feet of office space (Nichols, 2011). HSR service also had a noted effect on urban areas near Madrid (Spain), particularly in Ciudad Real. When the first line opened, people were able to travel from Ciudad Real to Madrid in less than an hour, and the town grew about 15% over the past decade (Nichols, 2011). Paris-Lyon link (France) reduced travel times by 50%. In Lyon, business tourism strongly increased. This growth resulted from the HSR service and its infrastructure development, accompanied by an aggressive promotion and communication' strategy. Another example is the HSR Atlantique link (in France) that supported the tourism development in Le Mans (Masson and Petiot, 2009).

Despite above described advantages, international HSR services carry, so far, fewer passengers than expected. Menerault and Barré (2005) pointed out the border effect in the Paris–Brussels and Paris–London Eurostar services in the PBKAL line as an example. Davies Gleave (2004) suggests that for distances less than 150 km HSR provides no advantage over conventional trains. Between 400 km and 800 km, HSR offers the fastest mode for personal travel up to 4.5 h (270 min); further than 800 km, air travel is faster (Pepy and Leboeuf, 2005; Pepy and Perren, 2006). Therefore, Japanese and European experience suggests that HSR should obtain 80–90% of traffic up to about 500 km and about 50% up to about 800 km (Hall, 2009). And, at the maximum practicable present speed of 350 km/h, the competitive rail range could potentially extend to 1500 km, bringing journeys like Paris–Madrid or London–Zürich within the commercially feasible range (Hall, 2009).

3 MARKET SHARE AND HSR DEMAND: EVOLUTION AND PERSPECTIVES

3.1 TRAFFIC EVOLUTION

In many countries HSR has been a key factor for the revival of railways, which had lost its momentum due to fierce competition of road and air transport. Until 2005, the Japanese Shinkansen lines had more than 150 billion of passenger-kilometre transported. In Korea, HSR lines inaugurated in 2004 beat domestic air travel in just two years, gaining more than 40 million passengers per year (de Rus et al., 2009). In Europe, in 2005 it reached a record of 76 billion of passenger-km, and in 2010 98.75 billion passenger-km (UIC, 2011). In the 1994-2004 period traffic evolution has experienced an average annual growth of 15.6%, with two-digit figures in the initial years and a slight slowdown in more recent years (de Rus et al., 2009). The Figure 2 shows the evolution of HSR traffic in Europe between 1990 and 2008.

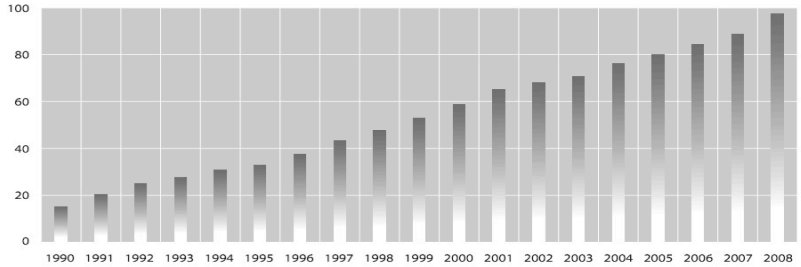


Figure 2 – Evolution of HSR traffic in number of passenger-kilometres (billion pKm) in Europe (1990-2008).
Sources: European Commission (2010).

Currently, HSR accounts approximately for 40% of traffic over medium distances, and even more on specific routes, such as London–Paris, Paris–Brussels and Madrid–Seville (Campos and Rus, 2009). As mentioned earlier, HSR demand driving forces includes travel time, prices, quality services and income, which make it more competitive than other modes of transport, especially on journeys less than three hours.

It can be observed that the largest share of traffic corresponds to the HSR in France, which represented 78% of all European services in 1990 and 52% in 2009 (Table I).

The demand growth rates evolution is different from country to country. It is possible to observe that some HSR services are more “mature” than others. In countries where HSR is in operation for a longer period, like France (1981), Italy (1981) and Germany (1988), it can be observed a positive evolution in passenger-kilometres along these years. The routes between specific cities influence demand growth rates. French HSR traffic has been growing more intensively in the Paris junction that connects TGV Nord-Europe with TGV Sud-Est. The other corridors, particularly the older ones, have experienced a less impressive demand growth (Campos and Rus, 2009).

In Spain, the construction of new lines also boosted demand, from 5,483 million passenger-km, in 2008, to 11,505 million passenger-km one year later. In Germany, the construction of new lines also leads to important demand growth. The Hannover-Fulda line coincided with the increase of the number of passengers-km (which almost tripled) from one year to another. Other examples include: the Hannover-Berlim and the Cologne-Frankfurt All these links serve great metropolitan cities which could be a reason for its capacity in attracting important demand levels. In Italy, the Roma-Florence and Millan-Bologna links registered a traffic growth of 21% between 2008 and 2009. All those routes

had a high and continuous investment on rolling stock and operation systems, which could also help to explain this growing trend. It has been observed that when there is a continued investment in improving HSR network, it makes it more attractive to potential users.

Table I – Evolution of HSR traffic in some European countries (1990-2009).

	Belgium (BE)		Germany (DE)		Spain (ES)		France (FR)		Italy (IT)		Netherland (NL)		United Kingdom (UK)	
	pKm (mio)	Growth rate	pKm (mio)	Growth rate	pKm (mio)	Growth rate	pKm (mio)	Growth rate	pKm (mio)	Growth rate	pKm (mio)	Growth rate	pKm (mio)	Growth rate
1990							14920		300					
1991			2000				17870	19.8%	400	33.3%				
1992			5200	160.0%	400		18960	6.1%	400	0.0%				
1993			7000	34.6%	900	125.0%	18930	-0.2%	500	25.0%				
1994			8200	17.1%	900	0.0%	20510	8.3%	800	60.0%				
1995			8700	6.1%	1294	43.8%	21430	4.5%	1100	37.5%				
1996	320		8850	1.7%	1100	-15.0%	24790	15.7%	1300	18.2%	31			
1997	555	73.4%	10073	13.8%	1300	18.2%	27580	11.3%	2400	84.6%	73	135.5%		
1998	788	42.0%	10155	0.8%	1516	16.6%	29980	8.7%	3638	51.6%	90	23.3%		
1999	804	2.0%	11591	14.1%	1674	10.4%	32360	7.9%	4464	22.7%	100	11.1%		
2000	865	7.6%	13925	20.1%	1942	16.0%	34747	7.4%	5086	13.9%	113	13.0%		
2001	889	2.8%	15515	11.4%	2077	7.0%	37404	7.6%	6763	33.0%	191	69.0%		
2002	909	2.2%	15255	-1.7%	2181	5.0%	39856	6.6%	7078	4.7%	201	5.2%		
2003	878	-3.4%	17457	14.4%	2027	-7.1%	39604	-0.6%	7431	5.0%	664	230.3%		
2004	940	7.1%	19604	12.3%	2085	2.9%	41439	4.6%	7925	6.6%	657	-1.1%	440	
2005	982	4.5%	20853	6.4%	2324	11.5%	43130	4.1%	8550	7.9%	687	4.6%	450	2.3%
2006	1000	1.8%	21635	3.8%	2697	16.0%	44853	4.0%	8912	4.2%	733	6.7%	904	100.9%
2007	1018	1.8%	21919	1.3%	2592	-3.9%	47966	6.9%	8818	-1.1%	800	9.1%	1392	54.0%
2008	1079	6.0%	23333	6.5%	5483	111.5%	52564	9.6%	8878	0.7%	867	8.4%	993	-28.7%
2009	1061	-1.7%	22561	-3.3%	11505	109.8%	51864	-1.3%	10746	21.0%	915	5.5%	1014	2.1%

Unit: million passenger-Kilometres (mio pKm)
Source: HSR Database. Elaborated from UIC (2012).

One can observe a possible "maturity effect" as suggested in some researches on HSR traffic (as Campos and Rus, 2009). HSR demand started growing at a very fast pace: over than 20% in most of countries during the 1990's. After a few years, there is a decline in demand growth rates as Table II shows. When it analyzes the average growth rate of inland transport (HSR, conventional rail, buses, coaches, tram and metro), it appears that the growth rate was higher in 1990-2000 than in 2000-2010. Also, it accompanies the population average growth rate in each country. While the average growth rates of HSR have declined in the past decade, they are still much higher than the global average growth rates of inland transport, implying that HSR is steadily gaining market share.

Table II – Evolution of HSR traffic (in million passenger-Km) and lines (in kilometres) in operation.

	Belgium (BE)				Germany (DE)				Spain (ES)				France (FR)				Italy (IT)			
Average Growth rate (%)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
[1990-2000]	28.2	n. d.	1.6	0.3	24.1	21.6	1.8	2.7	21.8	n. d.	5.2	0.3	8.8	6.1	1.7	0.4	32.7	1.0	2.8	0.0
[2000-2010]	2.1	11.2	0.9	0.6	5.6	7.3	0.6	0.0	19.7	15.9	1.1	1.4	4.1	4.0	0.8	0.7	8.6	14.0	-0.1	0.6
[1990-2010]	8.9	n. d.	1.2	0.4	13.9	10.3	1.2	1.3	20.6	8.5	3.1	0.9	6.4	5.0	1.3	0.5	20.1	7.3	1.4	0.3

Average Growth rate (%)	Total Countries* (1)	(2)	(3)	(4)
[1990-2000]	14.1	10.2	2.0	0.8
[2000-2010]	6.0	9.3	0.5	0.5
[1990-2010]	10.0	9.8	1.2	0.7

(1) HSR Passenger-Km (2) HSR length
(3) Inland mode Passenger-Km (4) Population
* With Netherland and U.K.

Source: HSR Database. Elaborated from UIC (2012).

Similarly, it can be observed that there is a strong correlation (over 0.70 in most countries) between the HSR market share from total railway market and the length of the high-speed lines in operation (Table III).

Table III - HSR transport market share (in passenger-km) in railways.

	Belgium (BE)		Germany (DE)		Spain (ES)		France (FR)		Italy (IT)		United Kingdom (UK)	
	Market share(%)	HSR (km)	Market share(%)	HSR (km)	Market share(%)	HSR (km)	Market share(%)	HSR (km)	Market share(%)	HSR (km)	Market share(%)	HSR (km)
1990			-	90			23.4%	710	0.7%	224		
(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)		
2000	11.2%	72	18.5%	636	9.6%	471	49.7%	1,281	10.3%	248		
(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)
2010	10.6%	209	28.8%	1,285	52.3%	2,056	60.4%	1,896	24.5%	923	1.8%	113
Correlation		0.005		0.966		0.791		0.954		0.723		0.687

Furthermore, HSR traffic increased when new HSR line comes into operation (Figure 3).

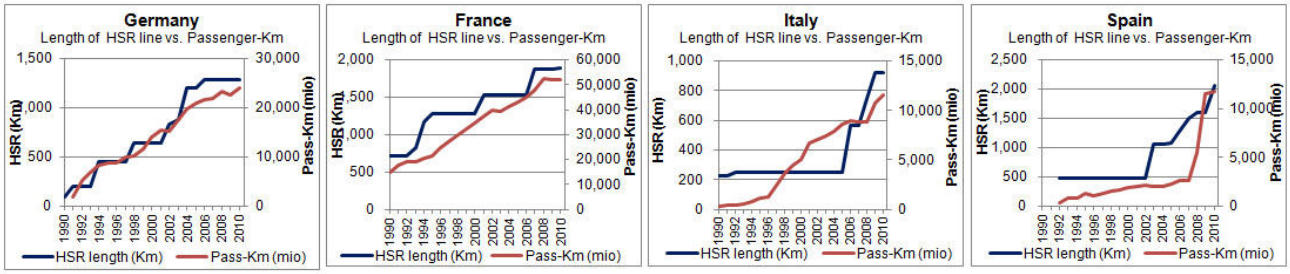
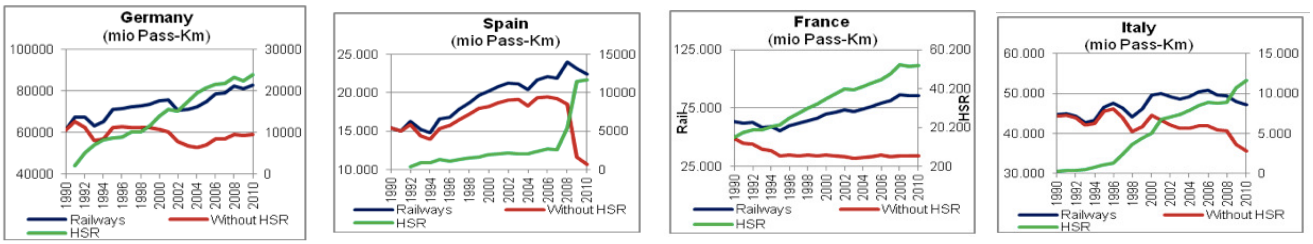


Figure 3 – Evolution of HSR traffic (in million passenger-Km) and lines (in kilometres) in operation.

Indeed, looking at both high speed and conventional railways market share it is possible to devise several emerging patterns like Figure 4 illustrates. In most countries there is a decrease or, at least, a stagnation of the number passenger-km in conventional rail. On the other hand, there is a traffic increase in HSR. Thus HSR has been steadily increasing its weight in the total railway market share. The most relevant case is France where by the end of 2010, HSR reached 60.4% of the total rail passenger-km. In Italy, especially after 2000, the conventional rail has been losing passengers, but HSR demand has been growing progressively in that period. It represents 25% of the total rail traffic in 2010. In Germany, conventional rail demand has almost stagnated and HSR has been steadily growing, representing 29% of the total rail passenger-km in 2010. In 2010, the Spanish HSR demand recorded more than 52% of total passengers in railways.



Note: The high-speed rail transport covers all traffic with high-speed rolling stock (incl. tilting trains able to run 200km/h).
Unit: million passenger-Kilometres (mio Pass-Km).

Figure 4 – Railways and high speed rail transport, passenger carried.

Since 2008 (when the Barcelona HSR line was inaugurated) the demand of HSR rose very steeply whereas the demand for conventional rail decreased dramatically. This is a clear example of demand transferences from conventional rail. Thus, although HSR is able to capture demand from other transport modes, an important part of its passengers result from transferences from conventional rail. These results could be due to two components. The first one is related to HSR lines still representing a small part of the total rail infrastructure in each country and, as a result, it has a limited capability to influence rail market share. Secondly the HSR captures mainly conventional railway demand. Therefore, the HSR growth is, at least, partially compensated by the reductions in conventional railways demand. Moreover it could be argued that HSR could contribute

to the degradation of conventional rail services, due to crowd-out investment from conventional rail or because there is a reduction in the supply of conventional rail.

3.2 COMPETITION WITH OTHER MODES

Since HSR entered in operation, its effects on market shares of other transport modes were studied. De Rus et al. (2009) have found out that HSR has managed to capture a soaring volume of the market share mainly from conventional rail services (Table IV). This drastic loss of market share for conventional rail services can be due to the fact that most of the corridors that they serve are now served by new HSR services providing a faster and more convenient journey for passengers (de Rus et al., 2009). But, in general, other modes have been losing market share after the introduction of HSR. Paris-Lyon, Madrid-Seville and Hamburg-Frankfurt routes have a HSR market share higher than 50% and, other hand, air transport decreased to below 10%.

Table IV – Modal market share before and after introduction of the HSR.

Paris-Lyon	**Before HSR (1980)**	**After HSR (1997)**
Road	29%	21%
Rail	40%	3%
HSR	0%	70%
Air	31%	6%
Madrid-Seville	**Before HSR (1991)**	**After HSR (2002)**
Road	44%	30%
Rail	16%	1%
HSR	0%	61%
Air	40%	8%
Hamburg-Frankfurt	**Before HSR (1985)**	**After HSR (2000)**
Road	57%	45%
Rail	23%	3%
HSR	0%	48%
Air	10%	4%

Sources: de Rus et al. (2009)

Most of the demand that shifted to the rail mode following the introduction of HSR services is from the air transport and, to a lesser extent, from the car (excluding the conventional rail), as the case of Paris–Lyon and Madrid–Seville links (Table IV). However, most of the new HSR demand is shifted from the conventional railway, leading to negative consequences for the conventional rail network.
In short, the introduction of HSR lines boosts competition and may lead to changes regarding to modal shares, depending on travel time, cost and conditions of travel. The experience of French and Spanish HSR networks shows that these services can easily compete with the air and road modes. On the contrary, González-Savignat (2004) observes that on relatively short routes the car has the highest modal share on the route before the introduction of HSR, e.g. 71% and 82% on Madrid–Zaragoza and Zaragoza–Barcelona routes, respectively. Furthermore, the author notes that the social benefits from the diversion of passengers from the car to the HSR are larger than the diversion of passengers from the aircraft to the HSR. However, the introduction of HSR also creates an opportunity for cooperation among modes by increasing the number of routes in addition to those.

CONCLUSIONS AND FUTURE DEVELOPMENTS

HSR has proven to be successful in Europe. However, challenges and questions remain unsettled either in relation to the expansion of its network or to the evolution of its operation model. There are both territorial and local issues, which are framing scholars' attention. The first – territorial issues - includes those related to inter-city relationships, either short-distance or very long-distance services, as wider spatial implications, such as impacts beyond HSR cities. The latter - local issues - are mainly related to the setting and level of service of HSR stations.

HSR can play an important role by improving simultaneously the quality of urban life and the accessibility to the city centre, stimulating the development of districts surrounding HSR stations. Actually, an increased accessibility and a flux of commuters support bigger changes than foreseen in previous studies. This is because HSR changes the connections and the travel times, thereby transforming the balance and hierarchy of the established city system. HSR can stimulate the modernization of cities centres with an appropriate mix of residential, office, commercial and leisure areas.

Transport infrastructure investment can, for sure, contribute to regional economic development in different ways. It increases the accessibility to resources, goods and markets, and thus could contribute to improving the competitiveness of a region. It reduces distance impedance, enlarges the potential market area and thus removes the bottlenecks in production and trade, and enhances the economic integration. Moreover, the competiveness of the modern HSR against other modes is an irrefutable fact.

However, the requirements to justify the high investment in HSR are high demand, which is not properly served by available railway transport services and long distances between cities. A HSR line is considered to be commercially viable between major urban agglomerations, with over one million people (Hall, 1999). Vickerman (1997) ads it is required a demand of among 12 million and 15 million railway passengers per year between two urban centres to justify HSR investment. Nevertheless, There is no doubt that the HSR can deliver socio-economic benefits through mainly improvement of accessibility of the cities it serves.

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