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High-speed rail and regional development: the case of intermediate stations

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ABSTRACT

High-speed rail has developed both nationally and internationally in Europe as a successful alternative to both air and road over distances of 400–600 km. Inter-city traffic, especially between the major metropolitan areas in North-west Europe has benefitted greatly from the investment in this network. This paper explores two issues: the impact on the intermediate areas between these major metropolitan areas and the creation of potential cross-border inter-regional services. The evidence shows how both levels of service and potential economic impacts have been much less pronounced in these intermediate areas. Such areas have been affected both by a failure to see greatly improved direct access to major cities other than within their own countries and a lack of new cross-border inter-regional services. The paper argues that the creation of the high-speed rail TEN-T has not met the primary objectives of reducing regional disparities in accessibility or reducing the effect of national borders on regional integration. To achieve this requires not just infrastructure provision but an appropriate regulatory framework for service provision and accompanying measures at the local level.

1. Introduction

High-speed rail developed initially as a mode of inter-city travel, largely as an alternative to air travel over distances of 400–600 km. As the high speed network has grown, however, so too has the expectation of wider economic impacts. New high-speed rail stations in a number of cities have been used as the catalyst for urban redevelopment and there are some obvious successes.

In contrast, while intermediate stations have been provided on most routes, there has been little identifiable local economic development associated with many of these stations. In several cases, the choice of location away from the nearest urban area and poor connectivity into local transport network have gone hand in hand with modest levels of service and traffic. Train operators have been reluctant to serve intermediate stations more frequently because additional stops increase headline times and this is seen as unacceptable to inter-city passengers. Nevertheless, there is now emerging evidence that, once the infrastructure has been provided, high-speed rail can be used to provide shorter distance services of up to 200 km which can have a more significant impact on patterns of commuting and hence on regional development.

This paper develops an analysis of three inter-related issues. First, it examines the way in which the growth of high-speed rail in the London–Paris–Brussels–Amsterdam (referred to here as the North-west Europe HSR) network has had differential effects on the various intermediate places served. These regions are not amongst the best performing economically in their respective countries and could be argued to continue to suffer from border region effects despite the progress towards greater integration and generally high-standards of transport infrastructure. The general finding is that in the absence of clear accompanying policies on land use and improving local accessibility there will be little in the way of long-term impacts. However, the development of more local regional services on the high-speed lines is having an impact on patterns of commuting.

The paper then goes on to look at high-speed rail services in the cross-border context and whether services can be developed across borders which would serve to achieve greater integration between neighbouring regions. The hypothesis here is that this may be a more effective way of reducing disparities than greater integration with the neighbouring metropolitan region. The network under study is the only one in Europe (and probably in the world) which has been developed principally to provide cross-border services between national capital cities. Although the majority of these services operate within the Schengen Area and thus do not require border checks, the services to and from the UK do require

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mandatory passport checks and, due to the requirements of the Channel Tunnel, security screening of both passengers and baggage.

Most high-speed rail services have been developed with relatively homogeneous types of service. Japanese Shinkansen services do operate different levels of service according to stopping patterns, but with an essentially homogeneous fleet of trains. In Spain some shorter distance, essentially commuting, services have been introduced with different rolling stock, speed and fare structures. However, the developments discussed here imply the mixing of different types of service to exploit the capacity available. This raises the further question of how far the regulatory framework is best suited to achieving such objectives and how to develop partnerships with train operators to ensure the development of services which can assist regional development.

These three issues are inter-related for a number of reasons. First, and most obviously, they are related through the impact of a single piece of infrastructure. The support for high-speed rail development brings together a range of supporters with differing objectives. These range from the operational and business interests of the rail industry, through the desire of individual cities and regions to be on the new network, to the potential for greater European integration through a genuinely new European network. Secondly, high-speed rail changes the accessibility and connectivity of locations along the line in a discontinuous manner. The nature of high-speed rail services means that they change the relationship between Euclidean distance and accessibility, intermediate points lose out to end-points, smaller cities lose out to larger cities. Thirdly, the local policy response to high-speed rail will differ. Some cities (large or small) can embrace the new opportunities and seek to put in place policies which capitalise on these. Others may simply expect new advantages to emerge without any parallel intervention. Thus we may expect two cities in similar relative locations to experience very different long-term impacts.

Of course, the lack of connectivity is only one aspect of the barriers which face cross-border integration as differences in, for example, language, tax regimes, planning policies, industrial and labour market policies all play a role (Vickerman, 2008). These may affect the pattern of inward investment and cross-border activity by firms and household as both consumers and in the labour market. Our purpose here is simply to demonstrate how the failure to improve these links with new infrastructure reinforces these problems.

2. High-speed rail and intermediate stations

The original concept of high-speed rail (HSR) was essentially as rapid, city to city (usually major metropolitan cities), transport over distances of 400–600 km. At operating speeds of 250 km/h or above, this distance range would make high-speed rail significantly quicker than air for city centre to city centre travel with journeys taking less than 3 h. Over shorter distances of less than 400 km, high-speed rail can be competitive with car by avoiding congested routes around cities (see Givoni, 2006; de Rus, 2009; Albalate and Bel, 2012; Nash, 2013 for a fuller discussion of the development of, and economic arguments for and against, high-speed rail). The pressure for HSR development did not just arise from a desire for greater speed and shorter journey times; often more significant was the need to increase capacity on key routes. But increasing capacity on existing lines was often difficult due to topographical and urban development constraints. Thus new lines often took the line of least resistance, avoiding intermediate settlements and thus often providing shorter routes between the main cities. The Paris–Lyon line for example reduced the rail distance between the two cities by more than 100 km to 430 km, but in doing so avoided the major settlements.

Such an approach led to intermediate regions claiming that they would suffer all the environmental costs of a new line, but receive none of the supposed economic benefits through greater accessibility. As a result new stations were developed along the new lines, although, particularly in France, these were frequently at some distance from the smaller settlements they were to serve. Three such stations were developed between Paris and Lyon on LGV (Ligne à Grande Vitesse) Sud-est, one between Paris and Lille on LGV-Nord and three on LGV-Est. The evidence from TGV-Sud-est is that the main centres benefited including some of those off the new line but served by direct trains (Bonnafous, 1987; Mannone, 1997). Whilst the settlements served between Paris and Lyon were smaller towns, much larger cities were involved on other routes. Thus on LGV-Nord the station TGV Haut Picardie was located to serve Amiens which had complained bitterly about not being served directly and St Quentin; on LGV-Est the station TGV-Lorraine was located midway between Metz and Nancy. TGV-Champagne was situated to serve Reims but outside the urban area and similarly on LGV-Atlantique the station for Tours, the main intermediate city was situated well outside the urban area; in both of these cases shuttle services of local trains provide the connection.

The original plan for Lille was for an extra-urban station at the point where the lines to Brussels and London diverge to avoid the expensive threading of the new route through the core of the city, but local pressure here insisted on a central city station (albeit separate from the historic main station) as part of a major urban redevelopment. Urban redevelopment also dictated the location of the main station for through trains in Lyon where Lyon La Part Dieu has become the centre of a new urban core and major transport hub. This pressure to ensure that HSR serves the urban core also affected the station locations at Ashford (Kent) and Antwerp (Belgium). In the latter case a historic terminal station was turned into a through station by extensive tunnelling.

In general, although larger and medium sized cities on high-speed rail links have benefited (Ureña et al., 2009), and even some smaller ones on national networks (Ureña et al., 2012), the performance of smaller intermediate stations has generally been poor (Preston and Wall, 2008). Most of the examples detailed above have delivered neither expected passenger numbers nor the economic impact that was claimed. This has a cumulative effect because train operators are reluctant to make extra stops on high-speed services, especially where the end to end timings are critical with respect to competition with air, so the level of service falls below a level which would be attractive to potential investors in a location. We shall explore this issue in more detail in the context of the North-west Europe HSR network in the following section. The possible exceptions are those cases where good interchange facilities with local rail services have been provided such as at Valance, south of Lyon on the southern extension of LGV Sud-est, or at Reims on LGV Est. At Valance a deliberate policy of using the new extra-urban station to create an integrated development appears to have had some success.

As has been argued in more detail elsewhere (Vickerman, 2012), the concept of HSR has also changed from the focus on city to city links. Two dimensions of this can be observed. One is the linking of HSR to airports reflecting the complementarity of rail and air rather than the initial focus on competition. The second is the recognition that over shorter distances, up to 200 km, HSR can change the shape of metropolitan labour markets and create new opportunities for commuting (Garmendia et al., 2012). This mixing of different types of traffic can create problems, but it also creates new opportunities.

The problems arise from the need to operate different types of rolling stock to suit the different types of traffic. In the UK for example the regional high-speed Javelin services on HS1 operate at a lower maximum speed (230 km/h) and have more intermediate

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stops than the international Eurostar services (300 km/h) using the same track. Service integrity on the line is maintained by virtue of the lighter Javelin trains having much faster acceleration which compensates for their lower top speed. Assuming these technical aspects of mixing traffic can be accommodated, dedicating specific services to specific types of traffic can overcome the objection from operators that, for example, intermediate stops impose unacceptable time penalties on the often 80% or more of passengers who simply want the fastest possible end to end speed between the major cities.

3. The North-west Europe HSR network

Fig. 1 depicts the North-west Europe HSR network which links London, Paris, Brussels, Amsterdam and Köln. These five large cities, together with Frankfurt am Main which is linked by a dedicated HSR line from Köln, form the metropolitan core of the European Union. Frankfurt is also served more directly from Paris via the French LGV Est line. They are at the ideal distance apart, 400–600 km, for HSR service. They are also in five different member states thus requiring coordination of both infrastructure planning and service provision across national boundaries. Differences in technologies have caused some problems, notably between French and German technologies on the line between Brussels and Köln where incompatibilities between the French TGV and German ICE trains on the same infrastructure have led to conflicts. There have also been major problems with the trains procured for the dedicated Brussels–Amsterdam service which led to a delay of nearly four years in their introduction and the new service was abandoned in January 2013 after just one month of chaotic operation.

Service compatibility has been largely achieved by founding a number of joint venture companies such as Eurostar between French, British and Belgian rail interests to operate the London to Paris or Brussels services and Thalys originally formed by French, Belgian and German rail companies and operated with the cooperation of Dutch railways, to operate the Paris to Brussels, Amsterdam or Köln services. Belgian and Dutch railways operate between Brussels and Amsterdam, although the attempt to provide a high-speed Fyra service to replace the traditional inter-city service failed due to failure of the rolling stock and the service is currently in a degree of turmoil. Thalys has increased the number of trains operating through to Amsterdam. German railways (Deutsche Bahn) have withdrawn from the Thalys consortium and compete with Thalys between Brussels and Köln (and onwards to Frankfurt) and French railways operate TGV services between Brussels and Paris Charles de Gaulle Airport (and onwards to Lyon and southern France). Thalys now provides a Lille–Brussels–Amsterdam service which competes with TGV and Eurostar services between Lille and Brussels.

Fig. 2 demonstrates how the headline times between these major cities has changed as the result of the new HSR services with reductions of between 1 and 3 h. However, it will be noted that this diagram, taken from a European Commission publication championing the role of high-speed rail, ignores all the intermediate stations depicted in Fig. 1.

Levels of service are correspondingly lower at these intermediate stations. Table 1 shows how the services concentrate on the capital to capital flows, or within France and the UK on flows to and from the capital. Overall flows on the inter-capitals services provided by Eurostar and Thalys have grown (Fig. 3) but total flows on these services have not reached the levels predicted in the initial studies for the Paris–Brussels/London services (Table 2). Note

Fig. 1. North-west Europe HSR Network. *Source*: Conseil Régional, Nord Pas de Calais.

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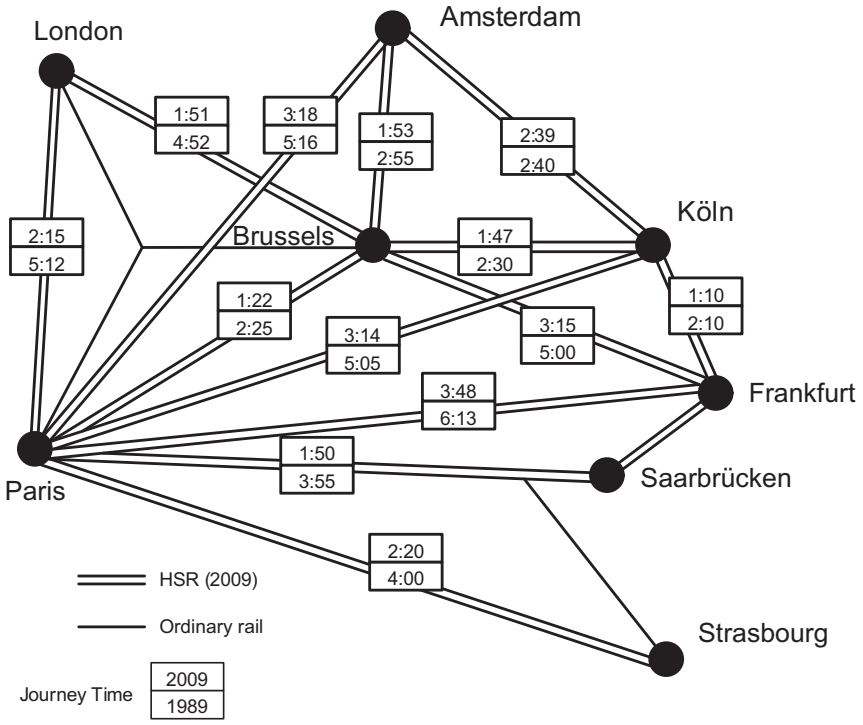

Fig. 2. Journey times between stations 1989–2009. *Source*: European Union (2010), high-speed europe.

Table 1
Daily direct services on North-west Europe HSR.[a]

	London	Ebbsfleet	Ashford	Calais	Lille	Paris	Brussels	Amsterdam	Köln
London	–	73[b]	37[b]	3	9	14	9	–	–
Ebbsfleet	76[b]	–	33[b]	2	4	5	4	–	–
Ashford	38[b]	34[b]	–	1	1	3	1	–	–
Calais	2	1	0	–	11[c]	8	3	–	–
Lille	9	4	1	11[c]	–	25	14	–	–
Paris	14	6	3	8	25	–	26	11	5
Brussels	9	4	1	3	14[d]	26	–	21[e]	9
Amsterdam	–	–	–	–	–	13	23[e]	–	–
Köln	–	–	–	–	–	5	9	–	–

Notes:
[a] Weekday services, winter timetable 2012–13 (excludes trains operating less than 5 days a week). Direct services only.
[b] Local services only; international services cannot carry local passengers within UK.
[c] Only Eurostar, TGV and TER-GV trains between Lille-Europe and Calais-Fréthun included.
[d] Due to UK border control problems tickets are not available from Brussels to Lille on all Eurostar trains.
[e] Published timetable including Fyra services currently suspended.

the extent to which it is the Channel Tunnel services and those between Paris and Northern France which have failed to match expectations whereas the cross-border services between Paris and Brussels and beyond have come nearer to the expected volume. Much of the shortfall on the French domestic services is in services to the smaller towns and cities in the Nord-Pas de Calais region rather than to Lille.

Particularly notable in Table 1 is the level of what is essentially a commuter service to London from the two intermediate stations on the high-speed line HS1, Ebbsfleet and Ashford. This contrasts with the much poorer levels of international service from each of these stations as the stopping pattern was effectively split between the two when the high-speed line was opened in 2007 leaving neither with a level of service attractive to the business user. Fig. 4, based on ticket sales, shows clearly how the introduction of HSR not only diverted traffic from the existing regional services, but also led to a significant increase in total passengers buying tickets allowing use of HSR services to London. Total rail passenger numbers from Ashford increased by 17% after the introduction of HSR services, with HSR accounting for over 70% of all journeys.

The level of international service from the intermediate stations relates to the volume of traffic. Detailed flow data by station is not available from Eurostar for commercial reasons, but our best estimate is that over 90% of Eurostar passengers travel end to end between London and Paris or Brussels. Of the remainder the largest flow is between London and Lille, probably accounting for a little fewer than 5% of the 10 million trips. Relatively few passengers, probably less than 2%, actually make journeys between pairs of intermediate stations and some return journeys, such as Ashford–Calais, are actually impossible. The ranking of flows is plausible on the basis of captive populations around stations, but the absolute level is rather smaller compounded by the reduction in

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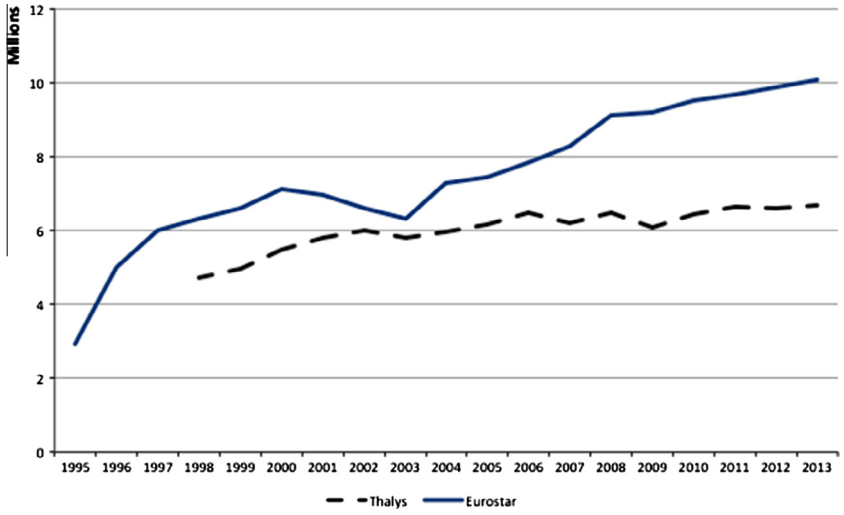

Fig. 3. Eurostar and Thalys passengers. *Source*: Eurostar and Thalys reports.

Table 2
Forecast and actual passenger flows on LGV-Nord.

	Forecast passengers (mn) 2002	Actual passengers (mn) 2002	Error as % forecast
Paris–Northern France	10.9	6.4	41.3
Paris–Brussels/ Amsterdam/ Köln	7.2	5.5	23.6
Paris/Brussels/ Lille–London	20.6	7.3	64.6

Source: Bilan LOTI de la LGV Nord, RFF, May 2005.

supply. This forces passengers to make journeys via London to and from destinations in Kent or via Lille from those in Nord-Pas de Calais given the absence of suitable services. Unpublished estimates of trip potentials are significantly greater than the actual numbers claimed by Eurostar, but none of this can be independently verified.

Similarly Fig. 5 shows how the introduction of TGV and TER-GV services over the LGV-Nord between Lille and Calais led to a significant rise in the number of passengers, particularly between Lille and Boulogne where the reduction in journey times was significant. This is an example of the way that services which run to destinations off the high-speed line can transform accessibility. Similar effects have also been noted in Kent with increases of around 40% in journeys from Dover, Canterbury and Thanet (HSR accounting for 65–70% of all journeys). The high-speed service in the UK does involve premium fares, but the dedicated line, especially on the approach to the London terminus, means that reliability is much greater than on conventional services and this together with the saving of around 35 min on typical journeys has made the new service attractive.

The situation in the Netherlands is rather different. The construction of the high-speed line HSL-Zuid avoided stops for major towns such as Den Haag and Breda focussing on the direct link from Amsterdam (via Schiphol Airport) and Rotterdam to Brussels and Paris. Whilst Thalys international services (and the ill-fated Fyra Amsterdam–Brussels service) would benefit from this, there

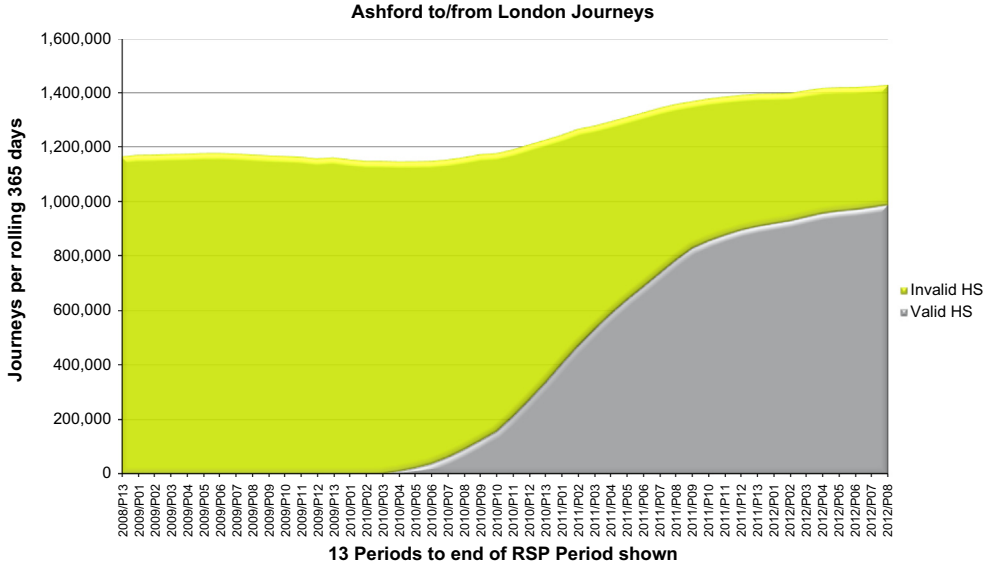

Fig. 4. Effect of introduction of regional HSR services, Kent. *Note*: data is based on ticket sales differentiating between those which are valid or invalid for use on high-speed services. *Source*: South-eastern Railway.

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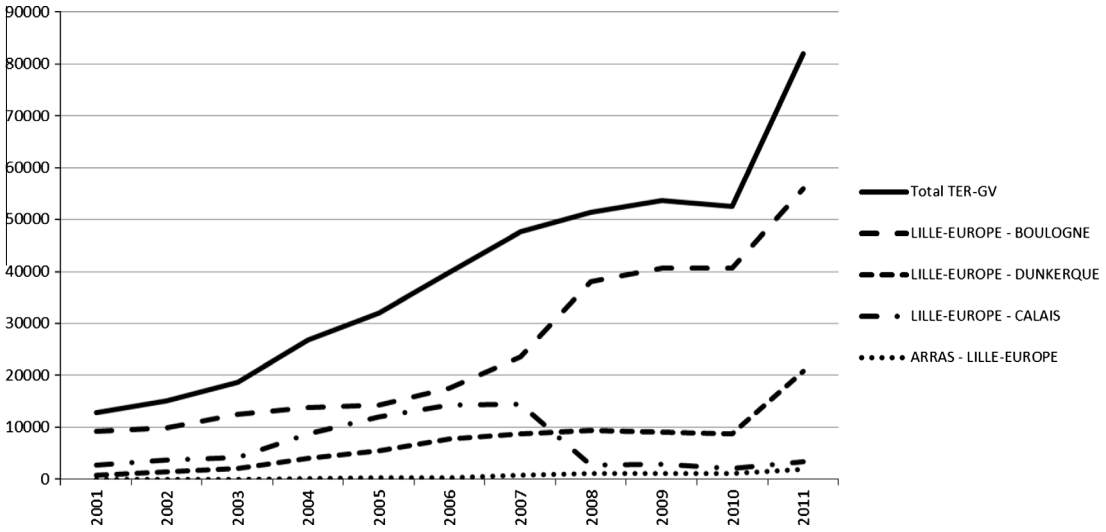

Fig. 5. Effect of introduction of regional HSR services in Nord-Pas de Calais. *Source*: Conseil Regional Nord-Pas de Calais.

was considerable protest at the absence of even an out of town stop for Den Haag. Within the Netherlands a provisional service between Amsterdam and Rotterdam using the new line, but not dedicated HSR rolling stock, was started and this was extended to serve Breda in 2011. Problems with the line and with the service have not led to the dramatic impact observed in Kent or Nord-Pas de Calais. After initial growth on introduction of the service passenger numbers levelled off (Fig. 6). One of the possible reasons for this is that frequent nonhigh-speed services are available and these may be more accessible by virtue of their frequency, their more frequent stops and the absence of the need for reservation and of premium fares. Although the rail operator used the Fyra name, which was associated with the new high-speed rolling stock, for the start-up service, but using traditional rolling stock, it did not provide the impact factor which new high-speed trains typically convey. In the event the new trains failed to perform and after a number of embarrassing train failures were all taken out of service and returned to the manufacturer. At the current time only the Thalys services can fully exploit the new line and Thalys took the opportunity to introduce extra trips between Amsterdam and Brussels. Access charges for HSL-Zuid are also considerably higher than on French and Belgian high-speed lines which may deter potential new entrants.

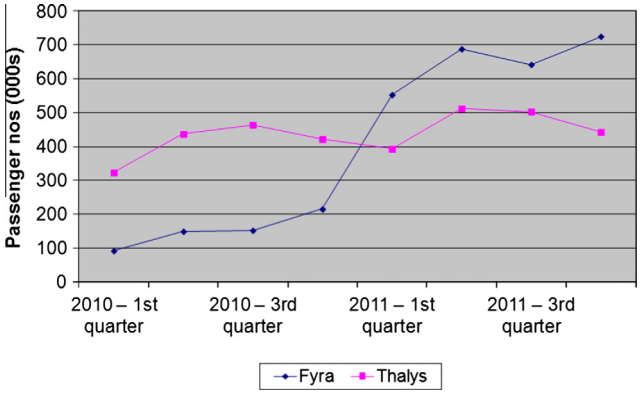

Fig. 6. Effect of introduction of regional HSR services in the Netherlands. *Source*: Nederlandse Spoorwegen.

4. International HSR services, border regions and intermediate stations

As we have shown, the development of the North-west Europe HSR has been largely driven by the objective of joining the major metropolitan areas. The network is an international one and as such has tended to ignore intermediate and border towns in favour of rapid, city to city, links. In some cases this is because the direct route by-passes towns on traditional rail routes. In other cases individual towns have lobbied to ensure that a town centre station is served. For example Lille lobbied hard to secure the development of a central station site at Lille Europe (Holliday and Vickerman, 1990; Chen and Hall, 2012). Ashford also lobbied to ensure that the existing station was served rather than an out of town site (Norman and Vickerman, 1999). The station at Calais-Fréthun is however an out of town site. In other cases median stations were created between urban areas such as TGV-Haute Picardie between Amiens and St Quentin. Another, and possibly unique, example is that of Ebbsfleet where a new parkway station was developed close to a major motorway intersection, but at a location where it was believed that there was considerable potential for new brownfield urban redevelopment; this has not yet been realised. The final example is that of Stratford International which was designed as a focus for urban regeneration. Its location has, however, been seen as too close to London St Pancras for international services to stop; it is only 7 min from St Pancras and the cost of the security and border control measures needed for international services in the UK would be prohibitive (see Garmendia et al., 2012, for a further discussion of the UK intermediate stations).

Part of the philosophy of the European Union's transport policy is to improve accessibility for regions across the EU, with a particular objective of reducing inequalities. One of the priorities of the Trans-European Networks for Transport (TEN-T) is to assist in reducing the remaining barriers caused by borders, particularly in rail networks due to their largely nineteenth century, nation-state origin (European Parliament and Council of the European Union, 2010; Vickerman, forthcoming). This is of particular importance to border regions which are often peripheral within their country and suffer from incomplete hinterlands. But, despite this policy objective, transport investment remains largely a competence of individual member states. Completing cross-border connections is frequently the last link in the network. Despite the completion of the Channel Tunnel in 1994, it took until 2007 before the high-speed line connecting it to London was finally completed.

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Similar delays have been experienced with the completion of the cross-border section of the Brussels–Amsterdam high-speed line.

Even where cross-border integration objectives are seen as a priority by the regions themselves, problems of jurisdictional segregation, competence and competition prevent the creation of new services which could transform regional performance (Vickerman, 2008). We can also observe this similar process happening between local areas within regions. Norman and Vickerman (1999) document how the choice of station sites on the UK's HS1 led to a form of tug of war between localities in which some wanted to secure a station site as a means of improving accessibility whilst others were intent on keeping the new line as far away as possible. In many cases these leads to a re-emergence of a core-periphery problem within regions.

The locality which secures the station, especially if that is already the location with the greatest agglomeration potential, sees a movement of activity towards it, not from outside the region, but from within it. Thus cities such as Lyon and Lille in France have both profited from being a major hub for HSR at the expense of smaller cities in their region. The development of TER-GV in Nord-Pas de Calais, which has improved accessibility from the coastal area, has led to a significant increase in commuting from towns on the coast to Lille. Lille has appeared to draw economic activity from the old industrial towns surrounding it (Chen and Hall, 2012). The main impact of the regional services on HS1 in the UK appears to have been an increase in commuting towards London, reinforcing existing patterns of activity rather than creating new business activity in towns such as Ashford. This is similar to some extent to the way that the creation of completely new links in Spain has led to new commuting patterns, although there is some evidence there that this has enabled a two-way development of commuting (Garmendia et al., 2012).

Much of how the advent of HSR affects regions, and especially, but not only, those away from major metropolitan areas depends critically on local access to the HSR network and how it integrates with local rail (or other public transport) services (see Martinez Sánchez-Mateos and Givoni, 2012). The creation of out of town parkway stations has typically not led to much local impact if the only means of access is by car. Once a potential passenger starts a journey by car driving out of the direct line of route to access an HSR station is less likely than staying in the car, especially if access to the station involves a long walk across an open air car park and a wait in what is typically a less welcoming station environment than those available at major stations. The relative lack of success of TGV-Haute Picardie and TGV-Lorraine falls into this category and Ebbsfleet in the UK potentially faces the same fate. Success is usually coupled with the HSR station becoming a main hub of the local or regional rail or urban transport system. This was achieved in Lyon and Lille where new metro lines serve the HSR stations at Lyon Part Dieu and Lille Europe. The move of the Eurostar terminal in London from Waterloo to St Pancras brought it to be part of the largest concentration of surface and Underground lines in London. The logic of creating an international station at Ashford was based on its being served by five conventional rail lines and Stratford was also presaged on its becoming a major inner urban rail hub. This opportunity is of course undermined if the level of HSR service at the station is inadequate. Hence local and regional accessibility to the high-speed network is seen as equally important to the greater accessibility to major metropolitan areas afforded by the high-speed line. High-speed lines should be part of the overall network, not a separate (and more exclusive) network, if they are to achieve their often stated goals of enhancing cohesion and inclusion.

A summary of the different local situations of the two stations in the UK, Ashford and Ebbsfleet, which have not been so successful in creating either traffic or local development, is given in Appendix A. These are contrasted with the much more successful example of urban regeneration found in the, albeit much larger, French cities of Lille and Lyon. This is despite there being no physical connection between the two stations in Lille and the new centre at Lyon La Part Dieu being a significant distance from the historic centre. It would seem to be the case that only in larger cities can the degree of associated redevelopment coupled with improved local transport connections ensure the success of a new station. However, Ureña et al. (2012) suggest, on the basis of evidence for Spain, that even in smaller cities careful planning and integration of the station into the urban space can have positive impacts. Opportunities to provide better integration of commercial and residential areas at Ashford have not been taken and the station area actually constitutes a barrier between two parts of the town. The plan to create a new urban settlement around Ebbsfleet was put on hold due to the onset of the financial crisis and subsequent recession at the time of the station opening in 2007.

French experience does suggest, however, that the greatest opportunity to grow traffic arises when the need to change trains is obviated. Thus running direct services off the high-speed line to other centres is an important part of creating a service pattern. These are designed to provide, in the main, direct services to Paris (Bonnafous, 1987). Thalys also provides a number of direct, mainly peak hour, services between Paris and Ostend and via Mons and Namur to Liège. Eurostar and Thalys provide seasonal direct services to the south of France and the French Alps from London and Brussels respectively. Eurostar has plans to develop services beyond Brussels to Amsterdam and via Lille to Geneva. Deutsche Bahn still hopes to provide through Frankfurt or Amsterdam to London services. But Eurostar has failed to be able to develop the originally planned through services from other UK cities to Paris and Brussels (Knowles and Farrington, 1998), although it remains a possibility with the development of HS2 to Birmingham and eventually Manchester and Leeds. Given the competition from low cost airlines and the cost burden of the security and border controls imposed in the UK this remains a difficult service to justify on economic grounds. The likely start date for these new services has slipped considerably.

5. Problems of the regulatory framework

Whilst infrastructure investment remains largely a national competence within the broad outlines of the TEN-T, the provision of services on that network has also been subject to a variety of regional, national and international regulatory structures. Although the various railway packages of the EU have sought to open up the provision of rail services at all levels to competition, progress in securing genuine competition on the networks has been slow (Nash, 2011). Detailed differences in technical specification, despite the concept of inter-operability, require long periods for the technical approval of new rolling stock. Separate regulatory provisions, defined by international treaty, for the privately owned Channel Tunnel have precluded the development of a simple inter-regional service to complement the capital to capital service of Eurostar and have delayed the introduction of the competing service proposed by Deutsche Bahn (House of Lords, 2011).

Perhaps the greatest problem militating against the development of inter-regional cross-border services is the differing models of funding rail services. Not only does the basic philosophy of the proportion of costs which should be covered by fares vary between countries, but the costs themselves differ markedly. For example, estimates of the infrastructure usage costs between Lille and London suggest that trains pay about €7.5/km on the French LGV against just over €43/km on the UK HS1 and a massive almost €210/km for use of Eurotunnel infrastructure. Infrastructure

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charges thus amount to around 20% of the total costs of running a train on the French LGV against 60% in the UK and nearly 90% in the tunnel. Whilst other international services do not face this degree of difference and the use of the Channel Tunnel is clearly a separate case, the huge difference between the charges for the use of high-speed infrastructure in the UK and France does raise concerns. Similarly the high costs of using HSL-Zuid have already been identified as one of the difficulties in developing services on that line.

As high-speed lines become more heavily used, slot competition for different types of service will increase just as it does with airports. Thus longer and more heavily used trains will have an advantage just as larger wide-bodied jets on inter-continental flights can dominate regional services using smaller aircraft at major airports. This will militate against the development of more flexible local and inter-regional services. Regional authorities will find it difficult to argue for making rail service providers sensitive to local needs when service levels are driven from outside a region and the costs of providing less profitable local services appear greater. Local and regional governments have a clear role in securing better service levels for their region, but this may result in more competition between regions to secure their share of what may be perceived as a zero-sum game rather than better service levels overall. In this the objective of greater equality in accessibility may be squeezed by commercial pressure from operators.

But the failure of HSR to make a difference at intermediate stations where demand is not assured just by population is often the result of failure to ensure complementary developments around the station. The lack of service development at Ashford and Ebbsfleet is due primarily to a lack of locally generated demand for that service which is in turn associated with the lack of new business opportunities. As Holliday and Vickerman (1990) and Chen and Hall (2012) have noted in the case of Lille, firm and committed local policy leading to significant regeneration development supported by the local government can serve to kick start that generation. A guaranteed base level of demand leads to improved service which encourages further development and a virtuous circle ensues.

6. Conclusions

This paper has raised a number of issues concerning the problems which the development of HSR has posed for intermediate cities, whether or not they achieve direct access to the network. In part this is caused by the dominance of the inter-metropolitan flows, in part by the economics of HSR operation and in part by the failure of local government authorities to recognise that the provision of access to new infrastructure does not bring automatic benefits. We may wish to conclude from this that HSR is actually only about the high-level inter-metropolitan traffic where it acts as an alternative to air and that HSR is inappropriate for shorter distance or inter-regional flows over distances up to 200 km. The evidence for Spain and from the regional Javelin services in the UK tends to contradict this when the services are part of a commuting network around a major metropolitan area. But what is clear is that the development of HSR has not led to the reduction in inequalities in accessibility and any associated economic consequences claimed for in EU policies. Thus it is not distance which is the major obstacle, but rather the cross-border nature of the problem facing intermediate regions. New infrastructure and new types of service do not seem to have been able to effect change. This outcome is consistent with the expectations outlined by Vickerman et al. (1999) where it was shown that relative accessibilities would change very little as a result of the implementation of the TEN-T and that the main gainers would be those regions which already demonstrated the highest levels of accessibility.

So what remains for policy? Clearly the direct engagement of local and regional authorities in the development of new transport infrastructure is critical to ensure the right type of complementary development. This complementary development is both providing access to the high-level network and making the station interchange a destination in its own right as a business centre. But local government is often powerless to deal with the consequences of higher level decisions on the regulatory structure of the provision of rail infrastructure and services. The desire to promote competition and accountability within the rail sector through successive rail packages at the EU level and their differing implementation at national level has contributed to an increasing fragmentation of the rail industry. Rail operators, especially those operating at an international level, are not incentivised to recognise the different levels of market.

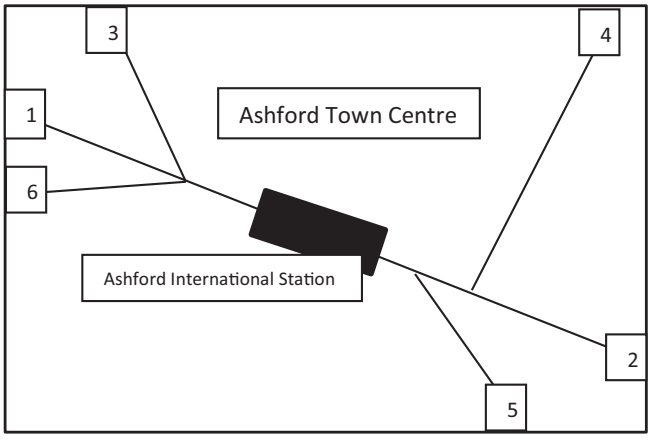

Fig. A1. Ashford. The railway splits the traditional town centre from newer residential and commercial areas to the south. As well as the high speed line which bisects the picture from north west (towards London at 1) to south east (towards the Continent, at 2) the picture shows the five classic rail lines which run to Maidstone (3), Canterbury (4), Dover (parallel to the high-speed line at 2), Rye and Hastings (5) and Tonbridge and London (6).

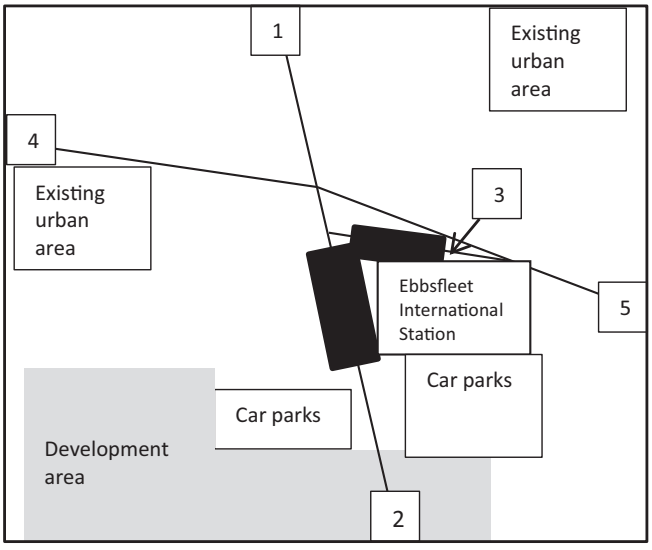

Fig. A2. Ebbsfleet. Ebbsfleet station is on a brownfield site around which the planned development, shown as the shaded development area, has not yet happened. Note the significant space given over to car parks around the station. The high-speed line runs from London (1) towards Ashford and the Continent (2) with a spur at (3) which links with the traditional local rail line between London (4) and Gravesend (5). There is however no direct connection for passengers between the classic rail line and Ebbsfleet International.

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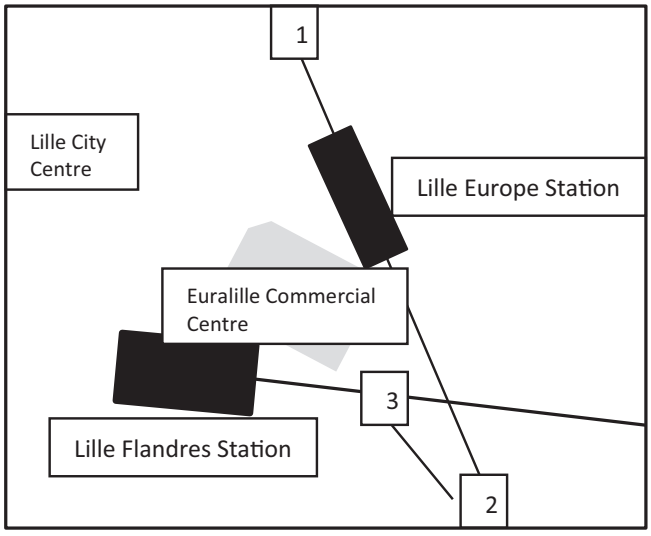

Fig. A3. Lille. Lille Europe station is built as part of a major urban redevelopment called Euralille with office blocks constructed above the rail station and a major commercial centre between Lille Europe and the traditional terminal station Lille Flandres. The high-speed line runs in tunnel from north west (1) towards Calais and London to south east (2) towards Paris and Brussels. The traditional rail lines from Lille Flandres (3) leave towards the south east but diverge to serve a range of destinations. The lines from Lille Flandres link with the high-speed line for Lille–Paris trains.

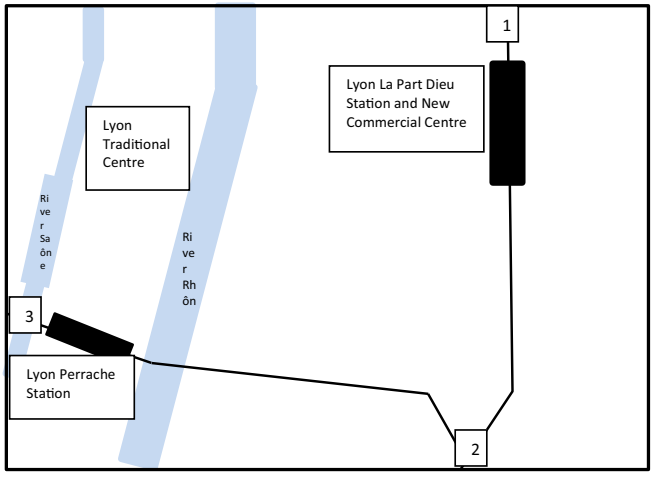

Fig. A4. Lyon. Lyon La Part Dieu station was built to serve a major redevelopment away from the traditional city centre which lies between the two rivers Saône and Rhône. La Part Dieu is not actually on a high-speed line but the lines towards Paris (1) and the Mediterranean (2) connect onto high-speed lines to the north and south of the conurbation. For through trains not stopping in Lyon there is a by-pass high-speed line which serves Lyon St Exupéry airport. Trains between Paris and Lyon usually proceed to terminate at the traditional station Lyon Perrache which is closer to the traditional city centre. A network of metro and tramway lines link the various locations.

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Appendix A

See Figs. A1–A4.

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