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The Wider Spatial-Economic Impacts of High-Speed Trains: A Comparative Case Study of the Lille and Manchester Sub-Regions

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The Wider Spatial-Economic Impacts of High-Speed Trains: A Comparative Case Study of the Lille and Manchester Sub-Regions

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Introduction

This paper concerns the relationship between high-speed trains (HSTs) and wider spatial-economic patterns in aiding the transformation process of city-regions. It reports on a comparative case study of two regions in course of transformation from the industrial to the post-industrial knowledge-based economy: Nord-Pas-de-Calais (France) and North West England (UK). The arrival of the high-speed train in the two regions has provided the potential for their economic transformation, despite an unfavourable legacy of past industrialisation and subsequent deindustrialisation which has impeded their transition to the knowledge economy, and thus provides an apt basis for comparison.

Competitive economies everywhere have shifted from handing goods to services. Knowledge, a key production element, amid key forces of information technology, globalisation, and consumer demand (Brinkley, 2008), has brought about the explosive rise and dominance of high value-added services and the enormous diminution of manufacturing. The rapid growth of services, especially the most advanced and value-added knowledge economy sectors (Jones, Lee, Williams, Clayton, & Morris, 2008), is assisted both by pervasive information and communication technology (ICT), bringing “the death of distance” (Cairncross, 1997, 2001), and by infrastructure that assists face-to-face contacts in knowledge-generating processes (Andersson, 1985; Törnqvist, 1983) involving tacit knowledge (Polanyi, 1958) increasingly costly to transmit over long distances (Audretsch, 1998; Von Hippel, 1994).

Since the decline of Fordist manufacturing in major industrial countries in the 1960s, the relocation of economic activities has become the most dynamic process in urban and regional development. As the essence of economic change, “[s]patial realignment of such activity is tantamount to reshuffling of the ranks of cities” (Isard, 1956, p. 11). This unfavourable situation is profoundly serious for post-industrial regions hit by severe unemployment and

decline in contrast to the experience of more favoured regions possessing competitive advantages which have reinforced their development.

One crucial issue for this difference in regional performance is associated with the mobilization and production of knowledge assisted by transport connectivity. Inter-regionally, the arrival of high-speed trains has ushered in “the second railway age” (Banister & Hall, 1993), bringing an unprecedented shrinkage of time and space: “the shrinking continent” (K. Spiekermann & Wegener, 1994). High-speed rail appears more effective and competitive than other transport modes for medium-haul journeys because HST offers unrivalled advantage through interoperability on conventional lines into the cores of cities (concerning door-to-door journey time and distance, see SteerDaviesGleave, 2004). It has been generally anticipated that HST investment would bring the development and economic growth to the cities served by the new system. Lyon, as the pioneering European city linked to the capital by the TGV and actively extending its TGV connections with other European cities, seems to have succeeded in establishing itself as the leading Eurocity in France (Renaud, 2010). A statement by Lyon City Council makes the point: “Lyon had expertise and almost ten years’ experience of being the first major city in Europe to be linked to the capital... I don’t want to say that Lyon established its pedigree, but we did do a really painstaking piece of work” (Renaud, 2010, p. 275). But equally vital are the intra-regional connections between regional core cities and their neighbouring areas. In the Centre for Cities’ *City Links* study, London/Reading in the South East and Manchester/ Burnley in the North West are selected as a pair of opposite examples to illustrate this point. This research suggests that the inter-dependent and mutually supportive regional network result in the rapid growth of London and its neighbours, for which the Greater South East functions as a broader scene for employers and employees, for suppliers and customers and for innovation and specialisation, whereas in North West England the absence of well-developed regional links makes it impossible to generate developmental spillovers from core cities to the neighbouring smaller cities (Lucci & Hildreth, 2008).

With an unprecedented shrinkage of time and space, HST will inevitably have longer-term indirect impacts on the geography of economic activities, simultaneously both at regional (inter-regional) and urban (intra-regional) scales. Even if accessibility by HST has been widely promoted in the anticipation that it would benefit deprived regions and thus reduce regional uneven development, there has been a lack of empirical evidence on the

consequential restructuring and transformation process of a disadvantaged city-region. This research aims to fill the gap with empirical evidence of intra-regional impacts of HSTs, disentangling the complex forces and the developmental phases in the dynamic process of economic restructuring for city-region regeneration. It is a follow-up research to a previous empirical study at inter-regional level of British experience of Inter City 125- an upgraded HST system. The findings suggest that HST has had substantial and demonstrable effects in aiding economic transition within a 2-hour travel limit of London, thus helping to generate renewed economic growth, but that the effects have not been automatic or universal.

This paper is designed to follow up by providing a preliminary analysis, based on empirical evidence, of the wider spatial-economic impacts of High Speed Trains (HSTs) on the transformation process of city-regions at the intra-regional level. It addresses the research question: whether and to what extent the arrival of HSTs in a city-region can act as the agent of change for the transformation of the whole surrounding region, rather than creating “the increasing peripheralization of the periphery” (Hall, 2009; K. Spiekermann & Wegener, 2002). The paper has four sessions, incorporating the brief overview of the two cases, the research method, three main analyses of the HST effects on time-space shrinkages, economic strength and restructures, and the relationship between the effects of time-space shrinkages and economic restructuring, followed by discussion and conclusions.

Overview of the two cases: Nord-Pas-de-Calais region and North West England

The selection of cases

Nord-Pas-de-Calais and North West England were selected to understand the wider spatial-economic impacts of HSTs in the intra-regional level. These regions have three close similarities. The first is their recent industrial trajectory. In the Nord-Pas-de-Calais region, the Lille-Roubaix-Tourcoing conurbation was the cradle of the French industrial revolution (Colomb, 2007). In the second half of the 19th century, the textile industry here was the second largest in the world, second only to Manchester and south Lancashire (Fraser and Baert, 2003, as referred to in Colomb, 2007, p. 8). The second is the synergetic economic network which has developed between the core city and surrounding towns. Lille and Manchester, the regional metropolitan centres, have attracted a variety of economic activities which help to establish their economic dominance over the specialised neighbouring sub-regions which form part of the system. The third is the similar time-space range offered by HST for both routes, Lille-Paris and Manchester-London. Lille, 226 km from Paris, is within

a one-hour time range by TGV, which should eventually also be realised by Manchester (300 km from London) through a new dedicated 350km/hr line from the capital. Meanwhile Manchester is connected to London by a 200km/hr upgraded 19th-century line, with a 20-minute frequency service typically taking 2 hours 8 minutes for the journey.

Old industrial Regions: Legacy and Problems

The Nord-Pas-de-Calais region emerged as a rapid growth pole of the French industrial revolution over the 19th and early 20th century. The discovery of coal brought about not only the transformation of former textile manufacture from artisan activities to factory production but also the rapid development of derivative industries such as iron, steel and ancillary industries. As a result, the industrial complex crucially consolidated the industrial system and economic hegemony in the region. The well-established regional capital, Lille, especially strengthened its economic power in this process. However, the proudest industrial regions of the factory era rapidly became problematic through massive deindustrialisation from the 1960s onward. Between 1954 and 1968 employment in textiles fell by more than one third, from 169998 to 121000, and employment in the coal industry contracted from 143609 to 87380 (Clout, 1971:146). The economic fate of the Nord-Pas-de-Calais Region is closely associated with a range of national policies and associated developments designed to deal with these economic changes (George & Thompson, 1973, pp. 90-131). The “*Métropole d’Equilibre*”, an earlier attempt at city-region regeneration policy, came in the late 1960s, but seems to have been less successful in attracting of new growth compared with cities in southern France (Newman & Thornley, 1996, p. 189).

Similarly, North West England is the first region to be industrialised when the first industrial revolution occurred in England from the late 18th century. The wealth and strength of the regional capital, Manchester, was built on the cotton industry which operated through a closely-connected network and “a unique synergy” (Hall, 1998, p. 344) linking Manchester and its surrounding towns in the then-county of Lancashire¹. Manchester served as the commercial hub of this production system (Hall, 1998, p. 310; OneNorthEast, 2009, p. 12). “Manchester usurped the traditional position held by York as the capital of the North. More significantly, for much of the nineteenth century it appeared to eclipse London” (Smith, 1994,

¹ The boundary reform in 1974 based on Local Government Act 1992 leads to the dramatic reduction of the territory of Lancashire County since two largest cities, Liverpool and Manchester, along with their surrounding conurbations were removed to establish part of the metropolitan counties of Merseyside and Greater Manchester.

p. 13). At the zenith of the development of the cotton industry in Manchester and its surrounding towns, by 1830, cotton accounted for more than half the amount of British domestically-produced exports (Crafts, 1983, 1985; Deane, 1965, as referred to in Hall, 1998, p. 314). However, the worldwide Great Depression in the 1920s and 1930s hit the northern cotton industry hard, which situation was left unchanged when the economic upturn occurred in the late 1930s (Smith, 1994, pp. 20, 22). Moreover, when heavy deindustrialisation prevailed in many British cities in the 1970s, North West England was unavoidably worse-hit, especially for these mill towns north of Manchester (e.g. Oldham, Bury, Blackburn) in contrast to towns south of Manchester such as Warrington, Stockport, and Trafford which had developed more diversified economies (OneNorthEast, 2009, p. 12). This northern part of the Manchester city region, still struggling with economic restructuring, thus relies on the southern part for knowledge-intensive, high value employment (OneNorthEast, 2009, p. 3). In the relationship between Manchester and surrounding towns the core city came to dominate the whole region, and Manchester is more reliant than any other northern core cities on its surrounding areas for high skilled labour (OneNorthEast, 2009, p. 13).

Two HST approaches

Despite their similar economic fate, these two post-industrial regions have taken different approaches to HST development. The new dedicated TGV-Nord has dramatically altered the spatial structure of Nord-Pas-de-Calais, but its arrival has been far from straightforward. Planned originally in the early 1970s, the line critically depended for profitability on the construction of the Channel Tunnel and was abandoned for a time after the UK withdrew from the project in 1975 (RFF, 2005, p. 3). Then interest revived January 1986 after commercial companies became interested in the construction and operation of the Tunnel. Following a series of legal processes, the TGV-Nord was approved on 13 April 1988. Construction began in summer 1989 and TGV service was inaugurated into Lille-Flandres station on 26 September 1993, with service on to Calais on 6 May 1994, the day the tunnel opened. In contrast, the UK (which completed its part of the dedicated high-speed line to London only in November 2007) has preferred the solution of upgrading older conventional lines for HST operation. The modernisation of the West Coast Main Line (hereafter WCML) with Pendolino tilting-trains (British Railway Class 390) was completed in December 2008, forming the latest such upgraded HST system in the UK and operating at a maximum speed of 200 km/hr on the busiest route between London and Glasgow. Hence, in the circumstance of two similar economic trajectories but two different HST approaches, a comparative

empirical study between the Nord-Pas-de-Calais and North West Region can offer a crucial insight into the potential spatial-economic impacts of HST systems.

Method

Units of analysis

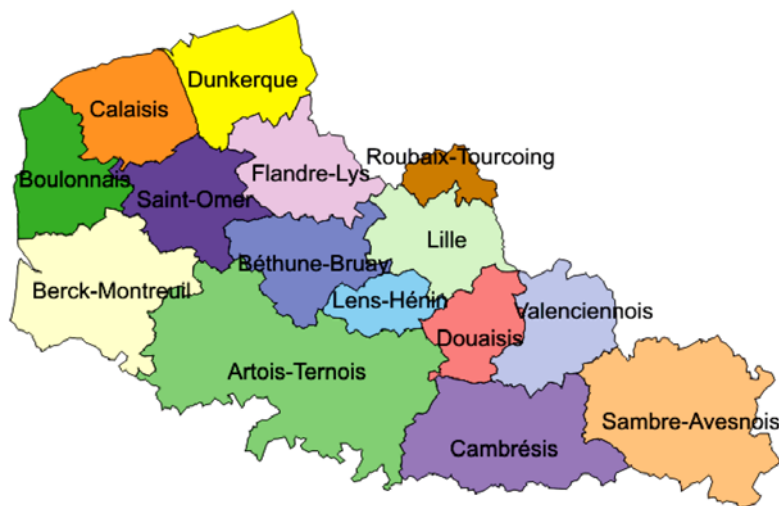
This paper utilises quantitative economic figures from various sources to analyse both cases. Units of analysis are chosen in accordance with the definition of sub-regions and the identification of key railway stations within the sub-regions. To undertake research covering a long period of time, the common difficulty is to find a comparable spatial unit throughout the observed period (before and after the arrival of the HST). The different administrative systems in the two regions underlie the selection of units of analysis.

In the Nord-Pas-de-Calais region, there are five major and well-established administrative units, which – proceeding from the largest to the smallest - are “region”, “department”, “arrondissement”, “canton”, and “commune”. In addition, a new form of inter-communal administrative bodies called “EPCI” (*Les établissements publics de coopération intercommunale*) was created by the *Loi Chevènement* of 1999 to enhance cooperation between major communes and neighbouring interdependent communes. The commune² is not only the smallest but also the oldest administrative geographical unit in France. Additionally, each commune is designated a code which would not be substituted whatever kind of modification subsequently occurred (e.g. the fusion of communes or the cession of territories between neighbouring communes). Hence, based on communes, data are available over a long enough period to trace the modification of communes for a long period of time. Also, the commune could be regrouped into two alternative classifications for the aim of understanding the evolution of territory. There are three such classifications devised to analyse the change of economic territory: *zone d’emploi*, *aires urbaines*, and *unités urbaines*. In this paper, the *zone d’emploi* is used as the unit of sub-regional analysis since it is the most suitable classification to represent key sub-regions with sub-regional main towns. Within these sub-regions, the main railway stations were identified according to railway timetables and maps. There are twenty main stations distributed in fifteen sub-regions, among which two new TGV stations (Lille Europe and Calais-Fréthun) were added.

² Originally, there were 670 communes in Nord Département and 909 communes in Pas-de-Calais Département.

In North West England, the smallest administrative unit is the local authority. Over time, some local district (second-tier) authorities have been promoted individually or through the combination of neighbouring local authorities to become unitary (all-function) authorities. The NUTS3 level European-standardised spatial unit, which groups several local authorities but distinguishes unitary authorities from the rest, was selected as unit of analysis for sub-regions in North West England. However, some NUTS3 units are too large and coarse to properly distinguish the impacts, notably Lancashire County Council which comprises no less than twelve local district authorities. Therefore, data collection of economic indicators at local authority level is added for Lancashire CC. Figure1 and Figure2 respectively present units of analysis of sub-regions in each case. Table 1 shows the list of units of analysis for main sub-regions and railway stations.

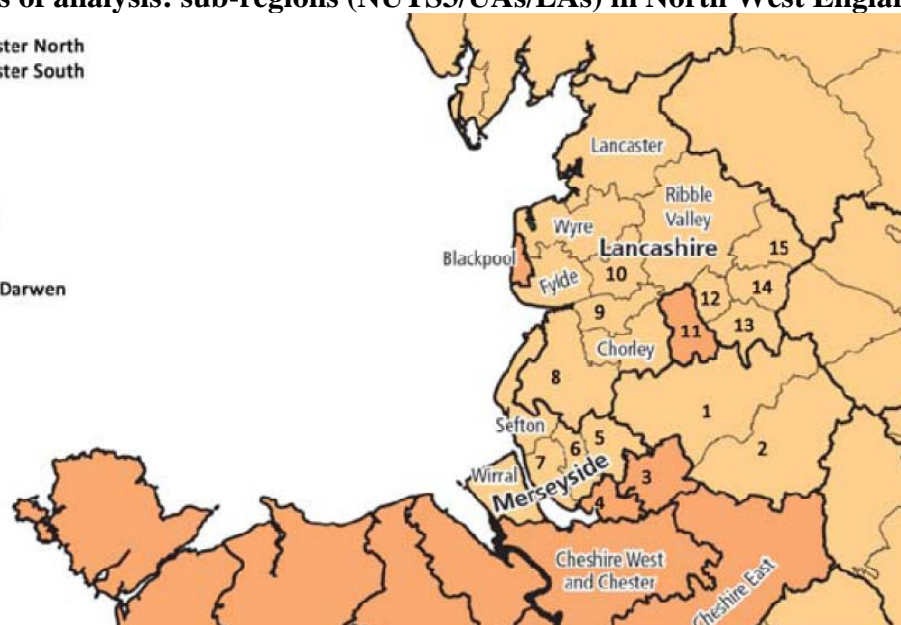
Figure 1 Units of analysis: sub-regions in Nord-Pas-de-Calais Region



Source: INSEE

Figure 2 Units of analysis: sub-regions (NUTS3/UAs/LAs) in North West England

- 1 Greater Manchester North
- 2 Greater Manchester South
- 3 Warrington
- 4 Halton
- 5 St.Helens
- 6 Knowsley
- 7 Liverpool
- 8 West Lancashire
- 9 South Ribble
- 10 Preston
- 11 Blackburn with Darwen
- 12 Hyndburn
- 13 Rossendale
- 14 Burnley
- 15 Pendle



Source: ONS

Table 1 Units of analysis: sub-regions vs. main railway stations for two case studies

Nord-Pas-de-Calais region			North West England		
Sub-regions (zone d'emploi)	LA s (or communes)	Main Rail Stations	Sub-regions (NUTS3, or UAs)	LA s	Main Rail stations
Roubaix-Tourcoing	La Communauté urbaine de Lille	Roubaix,Tourcoing	Great Manchester North	Bolton, Bury, Oldham, Rochdale, Wigan	Wigan North Western
Lille	La Communauté urbaine de Lille	Lille Flandres, Lille Europe*	Great Manchester South	Manchester, Salford, Stockport,Tameside, Trafford	Manchester Picadilly, Stockport
Dunkerque	La Communauté urbaine de Lille	Dunkerque	Merseyside	Liverpool, East Merseyside,Sefton, Wirral	Liverpool Lime Steet
Flandres-Lys		Hazebrouck	Halton & Warrington	Warrington,Halton	Warrington Bank Quay, Runcorn
Douaisis		Douai	Cheshire W & Chester	(formerly Chester, Ellesmere Port & Neston, Vale Royal)	Chester
Valenciennois		Valenciennes	Cheshire East	(formerly Crewe & Nantwich,Macclesfield,Id.Coneleton)	Crewe,Macclesfield,Wi Imslow
Cambresis		Cambrai	Blackpool		Blackpool
Sambre-Avesnois		Aulnoye-aymeries, Maubeuge	Blackburn & Darwen		Blackburn
Artois-Ternois	La Communauté urbaine de Lille	Arras, St.Pol	Lancashire CC	Burnley	Burnley central/ Picad. R.
Lens-Henin		Lens		Chorley	Chorley
Bethune-Bruay		Bethune		Fylde	St Annes-on-Sea
Saint-Omer		St.Omer		Hyndburn	Accrington
Calais		Calais, Calais-Frethun*		Lancaster	Lancaster
Boulonnais		Boulogne		Pendle	Nelson
Berck-Montreuil		Etaples		Preston	Preston
				Ribble Valley	Clitheroe
				South Ribble	Leyland
				West Lancashire	Ormskirk
				Wyre	Poulton-le-Fylde

Notes

- 1 UA: Unitary Authority
- 2 LA: Local Authority
- 3 *: new TGV stations

Variables and data collection

In order to assess the economic strength and structure change for sub-regions before and after HST service, independent and dependent variables were identified and acquired. As in the inter-regional study, the independent variables are the reductions in train times and train frequencies, based on national passenger timetables. Dependent variables measure the change of economic strength and economic structure, with a particular focus on knowledge-intensive activities.

Table 2 demonstrates the dependent variables, indicators, and data resources in the two cases. There is inevitably variance in data structure and availability between them. For the Nord-Pas-de-Calais region, to observe the change of economic strength and structure, data were drawn primarily from Census data supplied by INSEE because the economic indicator of

Table 2 Dependent variables, indicators, and data resources in two cases

Variables	Key indicators	Data sources (time-series)				Supplement indicators
		Nord-Pas-de-Calais		North West England		
		Before	After	Before	After	
1 Economic strength	GVA			(1995-2006)		*For Nord-Pas-de-Calais region
	Employment	Census (1968-1990)	Census (1990-2006)	ABI (1998-2007)		
2 Economic structure	Property values			PMR (1982-2008)	PMR (2009)	:Population change (1968-2006)
	1. Agriculture					
	2. Secondary industries,construction					*For North west
	3.Commerce/ transport	NES14 (1982-1990)	NES14 (1990-2006)	ABI (1998-2007)		England: population change (1981-2008)
	4.Public services					and GDHI (1995-2007)
	5.Knowledge intensive activities					

notes

- 1 ABI: Annual Business Inquiry
- 2 PMR: Property Market report
- 3 NES14: system code of economic activities
- 4 GVA: Gross-Value Added
GDHI: Gross Disposal Household income

Gross Value added at regional level is available only down to NUTS3 level, which in France equates to the administrative level of the entire department - i.e. Nord and Pas-de-Calais - which does not permit the comparison of local variations in performance. The French Census data covering the intercensal periods 1968-1975-1982-1990-1999 have been harmonised by INSEE. The arrival of the TGV-Nord in 1994 has been covered within these harmonised data from 1968 to 1999. However, in order to observe a longer period of change, some 2006

census data could not be directly used to make comparison without paying attention to changes in classification. For instance, age 17 was defined as the threshold of working age between 1968 and 1999, while the working age was placed as low as 15 in other datasets of 1999 and 2006. For North West England, data from the Office of National Statistics (including official labour market statistics in NOMIS) - Gross Value Added (GVA) per head and Gross Disposable Household Income (GDHI) - and property market reports from the Valuation Office Agency (VOA) were used to measure economic strength. For economic structural change, Annual Business Inquiry (ABI) data were analysed.

Analysis 1: Effects on time-space shrinkages

The two HSTs approaches reflect different effects of time-space shrinkage. To measure the intra-regional impacts of HSTs, shrinkage is analysed in two ways: observed sub-regions vs. the national capital, and vs. the regional capital.

The TGV and the Nord-Pas-de-Calais region

The TGV-Nord line has profoundly restructured the regional railway network. Before its arrival, there was no dominant transport hub in the railway network. The shortest railway journey between Paris and Lille had to pass through at least three stations (through Douai, Arras and Longueau or through Bethune, Arras, and Longueau). After the arrival of TGV Nord in Lille Flandres and Lille Europe stations, Lille has acquired a prestigious status as a dominant regional railway hub. Apart from the obvious advantages for Lille, TGV services in Nord-Pas-de-Calais have become available for most sub-regions. Only three out of fifteen zones of employment are not served by the TGV, namely Cambresis, Sambre-Avesnois, and Berck-Montreuil. Saint-Omer and Valenciennes are now served by the TGV compared with the former non-direct train services to Paris. Over time the TGV has become the main railway mode between Paris and most sub-regions.

Table 3 shows the evolution of train times and frequencies between Paris and the sub-regions in Nord-Pas-de-Calais between 1968 and 2006. The reduction of train times brought about by the TGV between Paris and the sub-regions is evident: times were roughly halved for most sub-regions served by TGV, and all sub-regions served by TGV could be reached within 2 hours from Paris. For three non-TGV sub-regions, there is no reduction in train times to and from Paris, but even they are accessible within 2 hours except for Berck-Montreuil (2 hours 15 minutes). Train frequencies have increased notably for most sub-regions served by TGV,

especially for Lille Metropolis. The only exceptions are Roubaix-Tourcoing and Boulonnais. Additionally, completion of two tramway renovation services between Lille and Roubaix-Tourcoing in 1994 has enforced the process of con-urbanisation of these three historical textile towns, which are pivoted on Lille as a main transport hub (gate) from and to Paris. This could be the explanation for the reduction of train frequencies between Paris and Roubaix-Tourcoing compared with other sub-regions. Boulonnais has only one TGV train per weekday from and to Paris, while the basic railway service still relies on conventional rail. In contrast, non-TGV sub-regions (e.g. Sambre-Avesnois and Beck-Montreuil) demonstrate not only no increase but an actual reduction in train frequencies from and to Paris.

Table 4 presents the intra-regional effects of time-space shrinkage between Lille and its sub-regions. As opposed to the dramatic shrinkage of time-space between Paris and the sub-regions of Nord-Pas-de-Calais, in general the arrival of the TGV has not brought closer the various sub-regions and their regional capital, Lille. For train times, only three sub-regions (Dunkerque, Calais and Boulonnais) have enjoyed a reduction of train times by TGV from and to Lille, since their TGV services use Lille as an intermediate station on their way to Paris. Otherwise, train times are not reduced but actually increased between Lille and the sub-regions. However, train frequencies between Lille and its sub-regions, which still largely depend on conventional rail, demonstrate a noticeable rise over time.

In summary, the arrival of the TGV in Nord-Pas-de-Calais definitely demonstrates a sharp distinction as between Lille (the regional capital), Paris (the national capital) and the sub-regions, especially its spatial-economic impacts.

Table 3 The evolution of train times and frequencies between Paris and sub-regions in Nord-Pas-de-Calais region(1968-2006)

Sub-regions	Main Stations	TGV	Average shortest train times(shortest) /mins					Direct train frequencies (TGV) /counts					Time changes			Frequency changes		
			1968	1982	1990	1990	2006	1968	1982	1990	2006	2006	82-'90	90-'06	82-'90	90-'06	82-'90	90-'06
			1968	1982	1990	1990	2006	1968	1982	1990	2006	2006	82-'90	90-'06	82-'90	90-'06	82-'90	90-'06
Roubaix-Tourcoing	Roubaix-Tourcoing	▲	172 (131)	159 (137)	157 (142)	*89 (88)		18(0)	18(0)	22(0)	*8(8)		-2	-68		4	8	
Lille	Lille	▲	140 (115)	134 (119)	132 (121)	65 (49)		9(0)	16(0)	14(0)	64(64)		-2	-67		-2	64	
Dunkerque	Dunkerque	▲	217 (181)	190 (169)	181 (175)	123 (95)		7(0)	9(0)	3(0)	8(8)		-9	-58		-6	8	
Flandres-Lys	Hazebrouck	▲	194 (157)	163 (157)	159 (154)	104 (99)		7(0)	6(0)	3(0)	7(7)		-4	-55		-3	7	
Douais	Douai	▲	117 (94)	112 (100)	112 (102)	68 (56)		9(0)	15(0)	14(0)	19(19)		0	-44		-1	19	
Valenciennes	Valenciennes	▲	n.a.	n.a.	n.a.	105 (102)		n.a.	n.a.	n.a.	10(10)							
Cambresis	Cambrai	▲	n.a.	n.a.	n.a.	117 (117)		n.a.	n.a.	n.a.	1(0)							
Sambre-Avesnois	Aulnoye-aymeries, Maubeuge		130 (109)	130 (106)	134 (108)	119 (110)		14(0)	14(0)	20(0)	15(0)		4	-15		6	0	
Artois-Ternois	Arras, St.Pol	▲	104 (86)	95 (86)	95 (88)	52 (40)		8(0)	15(0)	14(0)	26(26)		0	-43		-1	26	
Lens-Henin	Lens	▲	140 (116)	118 (107)	119 (115)	70 (66)		8(0)	7(0)	3(0)	7(7)		1	-49		-4	7	
Bethune-Bruay	Bethune	▲	149 (114)	137 (128)	135 (132)	84 (79)		8(0)	6(0)	3(0)	7(7)		-2	-51		-3	7	
Saint-Omer	St.Omer	▲	n.a.	n.a.	n.a.	116 (116)		n.a.	n.a.	n.a.	1(1)						1	
Calais	Calais	▲	215 (191)	191 (158)	197 (176)	91 (87)		3(0)	8(0)	6(0)	6(6)		6	-106		-2	6	
Bouloonnais	Boulogne	▲	184 (150)	159 (138)	160 (148)	121 (121)		5(0)	7(0)	6(0)	6(1)		1	-39		-1	1	
Berck-Montreuil	Etaples		162 (142)	143 (122)	142 (131)	143 (134)		4(0)	7(0)	6(0)	5(0)		-1	1		-1	0	

Table 4 The evolution of train times and frequencies between Lille and sub-regions in Nord-Pas-de-Calais region (1968-2006)

Sub-regions	Main Stations	TGV	Average shortest train times(shortest) /mins					Direct train frequencies(TGV) /counts					Time changes			Frequency changes		
			1968	1982	1990	1990	2006	1968	1982	1990	2006	2006	82-'90	90-'06	82-'90	90-'06	82-'90	90-'06
			1968	1982	1990	1990	2006	1968	1982	1990	2006	2006	82-'90	90-'06	82-'90	90-'06	82-'90	90-'06
Roubaix-Tourcoing	Roubaix,Tourcoing	▲	20(11)	15(11)	16(10)	*19(16)		32(0)	42(0)	52(0)	*8(8)		1	3		10	8	
Dunkerque	Dunkerque	▲	95(67)	77(64)	68(60)	32(32)		10(0)	12(0)	6(0)	23(5)		-9	-36		-6	5	
Flandres-Lys	Hazebrouck	▲	45(30)	41(35)	36(28)	33(29)		15(0)	17(0)	16(0)	32(0)		-5	-3		-1	0	
Douais	Douai	▲	24(17)	21(18)	19(17)	20(18)		20(0)	18(0)	19(0)	30(5)		-2	1		1	5	
Valenciennes	Valenciennes		46(30)	39(31)	38(30)	40(30)		15(0)	17(0)	18(0)	28(0)		-1	2		1	0	
Cambresis	Cambrai		64(62)	58(56)	47(47)	63(55)		2(0)	2(0)	1(0)	7(0)		-11	16		-1	0	
Sambre-Avesnois	Aulnoye-aymeries, Maubeuge		84(62)	71(58)	73(53)	72(51)		6(0)	13(0)	18(0)	40(0)		2	-1		5	0	
Artois-Ternois	Arras, St.Pol	▲	43(31)	49(32)	35(31)	36(34)		17(0)	20(0)	23(0)	28(5)		-14	1		3	5	
Lens-Henin	Lens		n.a.	n.a.	n.a.	n.a.		n.a.	n.a.	n.a.	n.a.							
Bethune-Bruay	Bethune		47(33)	46(37)	40(34)	46(41)		7(0)	8(0)	6(0)	7(0)		-6	6		-2	0	
Saint-Omer	St.Omer		69(47)	62(42)	54(43)	48(43)		5(0)	6(0)	9(0)	16(0)		-8	-6		3	0	
Calais	Calais	▲	116(89)	94(69)	82(64)	30(27)		7(0)	5(0)	11(0)	32(8)		-12	-52		6	8	
Bouloonnais	Boulogne	▲	178(165)	163(148)	156(142)	56(56)		2(0)	2(0)	2(0)	10(1)		-7	-100		0	1	
Berck-Montreuil	Etaples		152(144)	137(128)	130(118)	138(136)		2(0)	2(0)	2(0)	2(0)		-7	8		0	0	

source: Thomas cook railway timetables

West Coast Main Line Upgrade and the North West England Region

Unlike the newly-built dedicated TGV line between Paris and Lille, the modernisation of the West Coast Main Line (WCML) involves Pendolino tilting trains running on an upgraded existing route with modernised equipment and a specification to achieve a maximum speed of 200 km per hour. Hence, understandably, the upgraded WCML HST system could not generate the dramatic reduction in train times as the TGV in Nord-Pas-de-Calais. The geographical design philosophy underlying the WCML network is worth noting, as it differs from the French approach. In order to speed up the main north-south rail link from London to Glasgow, the northern core cities are not located on the main line. Instead, they are connected by branches from the WCML. A few stations (and their sub-regions) on the WCML – Crewe (Cheshire East), Warrington Bank Quay, Wigan North Western (Greater Manchester North) and Preston - therefore occupy a key position since the line does not bypass them.

The evolution of train time and frequencies between London and North West England was analysed over the period from 1998 to 2009. Within this, two periods can be distinguished: between 1998 and 2007, before completion of the WCML project in December 2008, and after it, between 2007 and 2009. It should be noted that British Rail was privatised after 1994. Virgin Rail acquired the franchise of the WCML in 1996. The selection of the period between 1998 and 2007 thus allows analysis of the effect of the Virgin franchise operation before and after completion of the upgraded WCML.

Table 5 shows the evolution of train times and frequencies between London and sub-regions in North West England between 1998 and 2009. Train times were reduced about 15 minutes between 1998 and 2007, even before completion of the WCML modernisation. A further reduction of train times of up to 15 minutes came after completion of the upgrade. Thus in total, between 1998 and 2009 the reduction of train times was up to 30 minutes for most sub-regions. Most HST sub-regions are now connected within two hours (or slightly over two hours) to and from London, apart from Liverpool (133mins), Preston (133mins), and Lancaster (149mins).

In contrast, most non-HST sub-regions show continuing times of more than three hours from and to London, except Blackburn (163 mins), Chorley (165 mins) and South Ribble (162

mins). Train frequencies, which still depend on demand, increased most notably for certain sub-regions, such as Greater Manchester South, Cheshire West and Chester, Cheshire East, Chorley, and South Ribble.

Between Manchester and most of its sub-regions, Table 6 demonstrates a fluctuating picture over time, without any clear tendency to steady improvement in train services: however, there is a steady reduction in train times and increase of frequencies except for Burnley, Chorley, and Preston. In general, transport links between these sub-regions and Manchester show a rather disadvantaged picture in terms of train times. Effectively, three types of sub-regions can be distinguished. First, Warrington, Cheshire East, and Chorley, with direct train services within an approximate 30-minute range to and from Greater Manchester, are the three closest sub-regions by train. Secondly, Blackburn, Preston, and South Ribble with 50-minute direct services from and to Manchester. Preston and Blackburn, as interchange stations, are also within this time range to some other sub-regions. Thirdly, the remaining sub-regions, which are remotely located with more than one hour transit time by train from and to Manchester and also in some cases a need to change at some interchange hubs like Blackburn and Preston. People who live in Pendle (main station: Nelson) are nearly two hours from and to Manchester by train.

Table 5 The evolution of train times and frequencies between London and sub-regions in North West England (1998-2009)

Sub-regions/ UA s	LA s	Main railway stations	Average train times (mins)			Train Frequencies (counts)			Before		After		
			HST	1998	2007	2009	1998	2007	2009	Time Freq.	Change	Time Freq.	Change
Great M/C North	Bolton, Bury, Oldham, Rochdale, Wigan	Wigan North Western	▲	148	134	120	15	17	18	-14	2	-14	1
Great M/C South	Manchester, Salford, Stockport, Tameside, Trafford	Manchester Picadilly, Stockport	▲	147	132	123	34	64	91	-15	30	-9	27
Merseyside	Liverpool, East Merseyside, Sefton, Wirral	Liverpool Lime Street	▲	166	150	133	14	16	18	-16	2	-17	2
Halton & Warrington	Warrington	Warrington Bank Quay	▲	136	124	109	15	16	18	-12	1	-15	2
	Halton	Runcorn	▲	141	128	113	14	15	18	-13	1	-15	3
Cheshire W & Chester	(formerly Chester, Ellesmere Port & Neston, Vale Royal)	Chester	▲	146	134	122	5	5	14	-12	0	-12	9
Cheshire East	(formerly Crewe & Nantwich, Macclesfield, Congleton)	Crewe, Macclesfield, Wilmslow	▲	123	110	99	49	62	65	-13	13	-11	3
Blackpool		Blackpool	*	215	192	184	15	18	21	-23	3	-8	3
Blackburn & Darwen		Blackburn	*	214	188	163	14	15	13	-26	1	-25	-2
Lancashire CC		Burnley central/ Picad. R.	*	243	220	193	14	15	16	-23	1	-27	1
	Chorley	Chorley	*	193	175	165	13	16	30	-18	3	-10	14
	Fylde	St Annes-on-Sea	*	200	224	185	10	13	14	24	3	-39	1
	Hyndburn	Accrington	*	226	200	180	14	15	15	-26	1	-20	0
	Lancaster	Lancaster	▲	180	168	149	8	14	14	-12	6	-19	0
	Pendle	Nelson	*	251	227	228	14	13	12	-24	-1	1	-1
	Preston	Preston	▲	166	148	133	16	18	19	-18	2	-15	1
	Ribble Valley	Clitheroe	**	218	214	216	10	13	15	-4	3	2	2
	South Ribble	Leyland	*	184	175	162	9	16	25	-9	7	-13	9
	West Lancashire	Ormskirk	*	191	198	202	7	9	10	7	2	4	1
	Wyre	Poulton-le-Fylde	*	206	182	181	15	16	12	-24	1	-1	-4

Table 6 The evolution of train times and frequencies between Greater Manchester and sub-regions in North West England (1998-2009)

Sub-regions/ UA s	LA s	Main railway stations	Average train times			Train Frequencies			Before		After		
			1998	2007	2009	1998	2007	2009	Time Freq.	Change	Time Freq.	Change	
Merseyside	Liverpool, East Merseyside, Sefton, Wirral	Liverpool Lime Street	▲	57	56	58	73	58	76	-1	-15	2	18
Halton & Warrington	Warrington	Warrington Bank Quay	▲	27	27	28	71	79	77	0	8	1	-2
	Halton	Runcorn	*	84	74	74	29	28	28	-10	-1	0	0
Cheshire W & Chester	(formerly Chester, Ellesmere Port & Neston, Vale Royal)	Chester	▲	74	74	75	38	37	35	0	-1	1	-2
Cheshire East	(formerly Crewe & Nantwich, Macclesfield, Congleton)	Crewe, Macclesfield, Wilmslow	▲	30	30	31	167	171	171	0	4	1	0
Blackpool		Blackpool	▲	82	83	83	30	31	38	1	1	0	7
Blackburn & Darwen		Blackburn	▲	51	49	51	21	23	23	-2	2	2	0
Lancashire CC		Burnley central/ Manchester R.	*	88	86	80	13	15	30	-2	2	-6	15
	Chorley	Chorley	▲	37	37	35	33	48	61	0	15	-2	13
	Fylde	St Annes-on-Sea	*	94	90	94	16	17	16	-4	1	4	-1
	Hyndburn	Accrington	*	72	71	84	13	15	39	-1	2	13	24
	Lancaster	Lancaster	▲	74	63	60	20	23	17	-11	3	-3	-6
	Pendle	Nelson	*	96	95	115	13	15	16	-1	2	20	1
	Preston	Preston	▲	52	50	49	49	54	63	-2	5	-1	9
	Ribble Valley	Clitheroe	▲	75	74	77	12	17	18	-1	5	3	1
	South Ribble	Leyland	▲	46	47	49	21	24	31	1	3	2	7
	West Lancashire	Ormskirk	*	92	97	88	11	12	5	5	1	-9	-7
	Wyre	Poulton-le-Fylde	▲	71	74	72	30	31	36	3	1	-2	5

Source: GB national railway timetables (1998 & 2009)

Analysis 2: The impacts on economic strength and restructuring

Nord-Pas-de-Calais Region

A. Regional strength and structure

Before investigation of the intra-regional impacts of the wider spatial-economic impacts of the HST, it is essential to understand the overall picture of regional economic performance. The arrival of TGV in the Nord-Pas-de-Calais region seems not to have reduced the gap in regional uneven development between Paris and other French regions. In effect, over time Paris remains dominant in its economic power over other regions. Table 7 shows the regional wealth (GVA) of the three main French regions generated by major classes of economic activity from 1990 to 2006. Public services overtook secondary industries to contribute the most to Nord-Pas-de-Calais regional wealth in 2006, while secondary industries showed a massive decrease of around 8.3% over the period of 16 years between 1990 and 2006. Business services show the most significant increase of 4.8 % after the arrival of the TGV-Nord in this region. Overall, these figures suggest that the regional economy has very limited growth while the economic structure has shown large increase in the service economy, especially in knowledge-intensive activities.

Table 7 Regional GVA by economic activities (1990-2006)

Regions	Year	Agriculture, sylviculture, pêche	Industrie	Construction	Commerce	Transports	Activités financières, activités immobilières	Services aux entreprises	Services aux particuliers	Education, santé, action sociale, administration
Île-de-France	1990	0.3	17.0	6.4	10.9	4.2	18.4	20.3	7.3	15.2
	2006	0.1	10.4	3.0	9.5	4.7	22.7	24.5	3.2	16.1
	change	-0.2	-6.6	-2.7	-1.4	0.6	4.3	4.1	0.9	0.9
Rhône-Alpes	1990	2.1	25.4	7.1	10.8	4.0	15.8	13.6	3.9	17.4
	2006	1.3	18.6	6.8	10.5	4.5	18.0	16.3	4.6	19.5
	change	-0.9	-6.8	-0.2	-0.2	0.5	2.2	2.7	0.7	2.1
Nord - Pas-de-Calais	1990	2.6	26.4	6.5	12.3	4.2	12.9	10.6	2.8	21.7
	2006	1.6	18.1	5.7	10.6	4.5	15.3	15.5	3.6	25.3
	change	-1.0	-8.3	-0.8	-1.7	0.2	2.4	4.8	0.8	3.5
French Métropole	1990	3.8	20.6	6.7	11.1	4.2	15.8	13.8	4.8	19.2
	2006	2.1	14.6	6.0	10.2	4.3	18.9	17.0	5.6	21.3
	change	-1.7	-6.0	-0.7	-1.0	0.2	3.1	3.2	0.8	2.1

Source: INSEE

Notes

1 system code of economic activities: NES14

2 Secondaire includes Industries agricoles et alimentaires, Industries des biens de consommation, Industrie automobile, Industries des biens d'équipement Industries des biens intermédiaires, Energie, and construction

B. The change in sub-regional strength and economic structure

Employment

As mentioned earlier, Gross Value Added is not a useful measure of sub-regional strength in France, so the change of employment in the sub-regions is investigated as an alternative indicator.

Table 8 shows the change of employment in 1968-1990, 1990-1999, and 1999-2006. Even though the state plays a critical role in tackling economic restructuring, the massive deindustrialisation in the Nord-Pas-de-Calais region can itself explain why over the period from 1968 to 1990 the majority of sub-regions still suffered significant decline in jobs. During the subsequent period 1990-1999, the decline disappeared for the majority of sub-regions except Cambresis and Sambre-Avesnois. Between 1999 and 2006, an increase of employment occurred in all sub-regions. But Cambresis and Sambre-Avesnois still show the smallest rise in employment, failing to compensate for the job loss in the previous period.

Table 8 Employment change 1968-1990, 1990-1999, & 1999-2006

		1968	1990	1999	CHANGE		1999	2006	CHANGE 99-'06
					68-'90	90-'99			
						%			%
	French Metropolitans	19,919,480	22,070,330	22,800,731	10.80	3.31	22774306	25259785	10.91
	Nord-Pas-de-Calais	1335888	1288441	1344313	-3.55	4.34	1342580	1464498	9.08
3110	Roubaix Tourcoing	163,212	142,423	142,672	-12.74	0.17	142,509	149,138	4.65
3111	Lille	275,288	312,159	326,434	13.39	4.57	325,911	363,803	11.63
3112	Dunkerque	76,284	88,176	93,033	15.59	5.51	94,053	99,909	6.23
3113	Flandre-Lys	33,340	31,861	33,600	-4.44	5.46	34,274	35,923	4.81
3114	Douais	76,252	70,278	71,038	-7.83	1.08	71,374	78,110	9.44
3115	Valenciennois	121,848	96,124	103,784	-21.11	7.97	105,494	123,605	17.17
3116	Cambresis	68,300	56,194	53,329	-17.72	-5.10	55,508	58,128	4.72
3117	Sambre-Avesnois	84,096	68,824	67,455	-18.16	-1.99	67,904	69,344	2.12
3121	Artois-Ternois	80,192	79,912	83,653	-0.35	4.68	84,145	92,288	9.68
3122	Lens-Henin	114,716	90,264	96,185	-21.32	6.56	96,186	108,094	12.38
3123	Bethune-Bruay	78,640	81,489	84,131	3.62	3.24	84,989	91,105	7.20
3124	Saint-Omer	36,040	41,946	43,115	16.39	2.79	43,420	45,740	5.34
3125	Calais	45,668	47,027	50,551	2.98	7.49	50,808	54,386	7.04
3126	Boulonnais	50,268	49,828	51,336	-0.88	3.03	52,169	57,310	9.86
3127	Berck-Montreuil	31,564	31,936	33,336	1.18	4.38	33,836	37,615	11.17

source INSEE

Population (natural growth and migration)

In addition to employment, demographic change may also assist in explaining the different strength of sub-regions. Table 9 displays the population change in Nord-Pas-de-Calais sub-regions from 1968 to 2006. Over the period 1968-1990, before the arrival of HST, those sub-regions specialising in the coal and iron industries experienced the biggest population loss (migration exceeded natural growth), while some sub-regions had seen massive population increase, higher than national level, namely Dunkerque, Saint-Omer, and Calais. After the arrival of TGV in the region between 1990 and 2006, some ex-coalfield sub-regions managed to stem the decline of population, e.g. Douai, Bethune-Bruay, while Dunkerque had the highest percentage of out-migration in the whole region, causing a negative population change.

Owing to the massive deindustrialisation and economic restructuring in the region, a high out-migration rate is the common feature for most of the sub-regions except for some previous less-industrialised sub-regions: Flandre-Lys, Artois-Ternois, and Berck-Montreuil. For the dense central conurbation of Lille-Roubaix-Tourcoing, even though population change is still positive, the annual out-migration rate has increased over time. People in ex-coal and iron-fields and coastal areas continued to migrate to other places.

Table 9 The change of population within Nord-Pas-de-Calais Region (1968-2006)

	Population change		Natural growth		Migration		Migration rate/year	
	1968-1990	1990-2006	1968-1990	1990-2006	1968-1990	1990-2006	1990-1999	1999-2006
	%	%	%	%	%	%	%	%
French Metropolitans	13.9%	8.5%	10.8%	6.0%	3.1%	2.5%		
Nord-Pas-de-Calais	3.9%	1.4%	15.3%	7.9%	-11.4%	-6.6%		
Roubaix-Tourcoing	4.8%	1.9%	17.7%	12.2%	-12.9%	-10.3%	-4.37	-5.62
Lille	11.5%	5.4%	19.4%	11.7%	-7.9%	-6.3%	-2.93	-5.30
Dunkerque	21.7%	-2.3%	27.0%	9.6%	-5.3%	-11.8%	-5.78	-8.46
Flandre-Lys	10.3%	6.0%	11.6%	6.1%	-1.3%	-0.1%	0.81	0.49
Douaisis	-1.2%	0.2%	13.5%	5.8%	-14.7%	-5.6%	-2.96	-3.69
Valenciennois	-6.2%	-0.4%	12.3%	5.9%	-18.5%	-6.3%	-2.82	-4.25
Cambresis	-6.9%	-1.7%	6.2%	3.5%	-13.1%	-5.2%	-2.81	-2.79
Sambre-Avesnois	-0.5%	-4.4%	13.9%	6.2%	-14.4%	-10.6%	-6.64	-6.83
Artois-Ternois	8.5%	3.4%	12.4%	4.7%	-3.9%	-1.3%	-2.12	0.33
Lens-Henin	-6.4%	-2.8%	14.7%	6.9%	-21.1%	-9.6%	-5.17	-5.49
Bethune-Bruay	-2.5%	0.0%	8.8%	3.4%	-11.3%	-3.5%	-2.06	-0.51
Saint-Omer	18.3%	3.9%	20.6%	8.3%	-2.3%	-4.4%	-2.16	-3.93
Calais	14.4%	5.3%	19.2%	10.7%	-4.8%	-5.4%	-1.67	-4.31
Boulonnais	4.0%	2.5%	16.1%	7.7%	-12.1%	-5.3%	-1.49	-3.80
Berck-Montreuil	11.9%	6.2%	11.0%	2.7%	1.0%	3.5%	0.32	4.44

Source: INSEE / INSEE (2010) profils N.67

Notes: The figures were derived from two datasets, so the change of jobs between 1990 and 2006 is demonstrated in two sections i.e. 1990-1999 and 1999-2006.

Sub-regional economic structure

Figure 3 demonstrates the economic structure in 1990 and 2006. In 1990 (before the arrival of TGV in the region), the whole region was dominated by secondary industries except for Lille and Boulonnais. In contrast, by 2006 only five sub-regions remain industry-led, namely Bethune, Douai, Dunkerque, Sambre-Avesnois, and Valenciennes. Commercial employment has become the largest source of employment while secondary industries maintain second place for most sub-regions. The only exception is Lille. Employment in secondary industry in Lille in 2006 only accounted for 19% of the total, overtaken by public services (26%) and knowledge-intensive employment (24%).

The hypothesis underlying this study poses that the arrival of the high-speed train in this region could assist economic restructuring towards knowledge-economy activity. Three of fifteen sub-regions, not served by TGV or TER (regional fast train services), would be expected to show a weakness in developing knowledge economy. However, from the figures presented here, it cannot be simply summarised that non-TGV and TGV sub-regions present a decisively different picture: the pre-existing circumstances of sub-regions could dispel the attraction of investment and possible economic regeneration. Hence, the interpretation of economic performance here has to take these pre-existing characteristics into account in addition to the provision of TGV services.

Figure 3 Employment of economic activities in 1990 and 2006

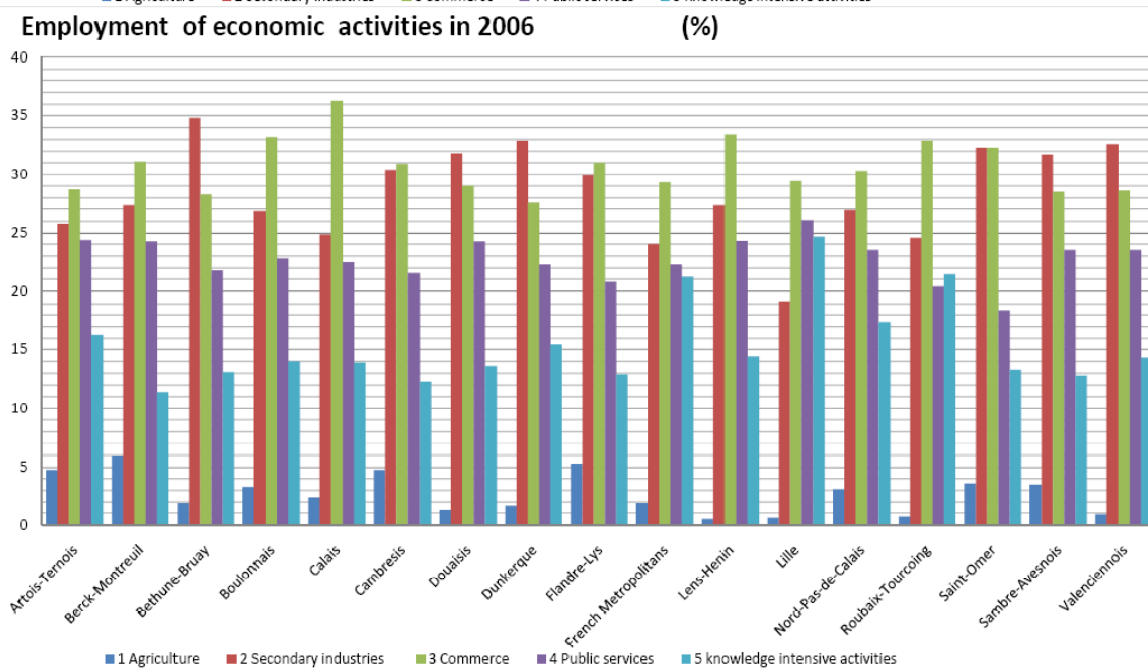
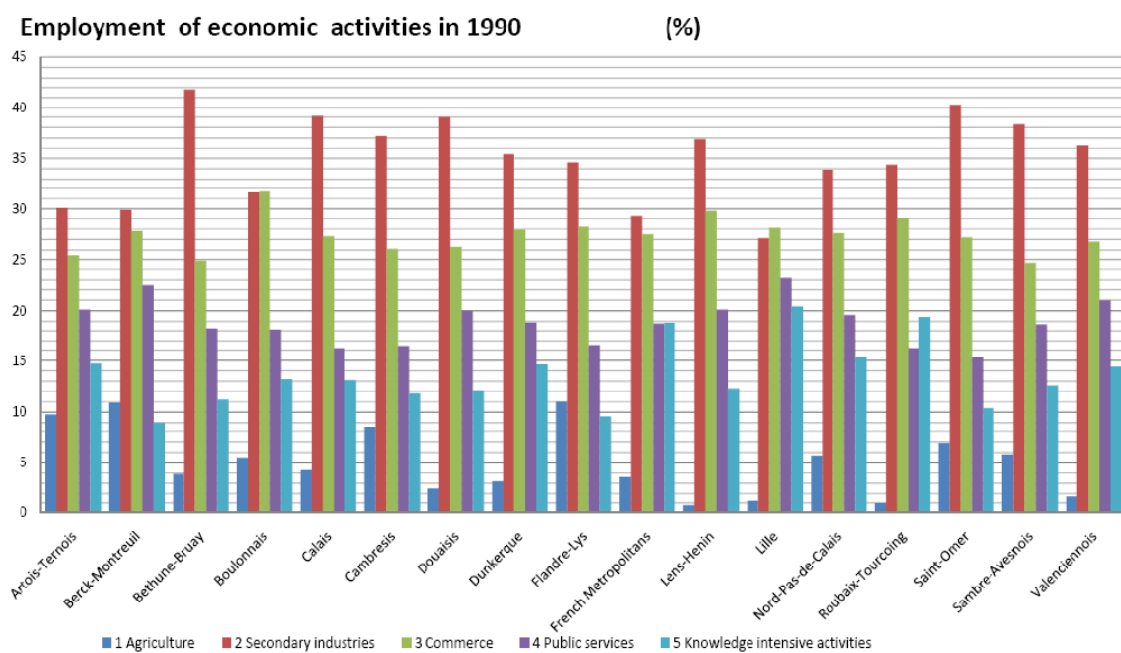


Table 10 Economic structure change

code	Regions	Before TGV (1982-1990 employment change)					After TGV (1990-2006 employment change)				
		Primary	Secondary industries/ construction/ energy supplies	Commerce, transport, and other services	Public services	Knowledge intensive activities	Primary	Secondary industries/ construction/ energy supplies	Commerce, transport, and other services	Public services	Knowledge intensive activities
	Nord-Pas-de-Calais	-1.3%	-3.9%	2.0%	2.7%	1.7%	-1.7%	-5.2%	1.8%	3.6%	2.4%
	French Metropolitan	2.5%	6.0%	1.4%	4.2%	1.6%	2.6%	7.0%	2.8%	3.8%	2.1%
3110	Roubaix Tourcoing	0.2%	6.9%	1.0%	3.9%	2.2%	0.3%	9.8%	3.9%	4.1%	2.1%
3111	Lille	-0.4%	-6.4%	1.0%	3.3%	2.5%	-0.5%	-7.9%	1.3%	2.9%	4.3%
3112	Dunkerque	-0.8%	-8.0%	0.5%	6.0%	2.3%	-1.5%	-2.5%	-0.3%	3.4%	0.9%
3113	Flandre-Lys	-3.3%	-2.1%	0.9%	3.4%	1.1%	-5.8%	-4.6%	2.8%	4.2%	3.4%
3114	Douais	-0.8%	-6.3%	2.0%	4.4%	0.7%	-1.2%	-7.2%	2.7%	4.2%	1.5%
3115	Valenciennes	-0.6%	-8.6%	1.6%	6.1%	1.6%	-0.7%	-3.6%	1.8%	2.5%	-0.1%
3116	Cambresis	1.5%	-4.7%	2.1%	3.7%	0.4%	-3.7%	-6.7%	4.8%	5.1%	0.5%
3117	Sambre-Avesnois	-1.9%	-6.0%	1.4%	5.8%	0.7%	-2.3%	-6.5%	3.7%	4.9%	0.2%
3121	Artois-Ternois	-4.4%	-2.4%	2.8%	2.8%	1.2%	-5.0%	-4.3%	3.3%	4.3%	1.7%
3122	Lens-Henin	-0.3%	-9.2%	3.3%	4.8%	1.5%	-0.3%	-9.5%	3.6%	4.2%	2.1%
3123	Bethune-Bruay	-1.7%	-4.1%	0.5%	4.2%	1.1%	-2.0%	-6.9%	3.4%	3.7%	1.9%
3124	Saint-Omer	-3.1%	-3.3%	3.6%	2.4%	0.3%	-3.3%	-7.9%	5.1%	3.1%	2.9%
3125	Calais	-3.3%	-0.3%	0.5%	2.1%	1.0%	-1.9%	-14.2%	9.0%	6.4%	0.8%
3126	Boulonnais	-1.6%	-4.0%	0.3%	4.1%	1.2%	-2.2%	-4.8%	1.5%	4.7%	0.8%
3127	Berck-Montreuil	-5.0%	-3.2%	2.0%	5.2%	1.0%	-4.9%	-2.5%	3.3%	1.7%	2.4%

Source: INSEE

Table 10 shows economic structural change over two periods of time, before and after the TGV: 1982-1990 and 1990-2006. For these sub-regions served by TGV, some notable changes are listed as follows: first, most TGV sub-regions did not show an increase in knowledge-intensive employment over time. Instead, they perform below the national and regional average. Only Lille (the regional capital) and two less industrialised sub-regions (Flandre-Lys and Saint-Omer) show higher-than-national and regional average figures. Secondly, Calais shows three outstanding changes in its economic structure, with the most significant increase in public services, commercial activities, and the most dramatic decrease in secondary industries. But its knowledge-intensive employment shows only a marginal increase over time. Thirdly, Dunkerque, Valenciennes, Calais, and Boulonnais have the lowest knowledge-intensive employment in the whole region; in particular, Valenciennes has negative growth.

For non-TGV sub-regions between 1990 and 2006, the notable changes are twofold. First, two former industrial sub-regions, Cambresis (coal mining) and Sambre-Avesnois (iron-finish industries), showed the biggest increases in knowledge-intensive employment. In addition, they also had the largest increases of public services, in second and the third place respectively following Calais. It could be argued that the contrast between the increase in public service employment and the smaller increase in knowledge-intensive employment demonstrated a weakness in attracting private investment, which condition would be even starker when other ex-coalfield sub-regions are connected by TGV services. Secondly,

Berck-Montreuil, even though not served by the TGV, does not display the same picture as these former industrial sub-regions. It joins Lille (the regional capital) and two less industrial sub-regions, Flandre-Lys and Saint-Omer, in fourth place with a marked increase in knowledge-intensive employment. Moreover, Berck-Montreuil, demonstrates the minimum increase in public services among the sub-regions.

North West England Region

A. Regional and sub-regional strength (GVA/ GDHI)

Comparing aggregate regional performance, as in France, the capital city region outplayed other British regions between 1995 and 2006. According to the GVA figures in Table 11, although North West England is not the weakest region in terms of GVA per head, it did not gain economic strength. Instead, GVA/head in the region actually fell between 1995 and 2006.

Table 11 Headline Gross Value Added (GVA) vs Gross Disposable Household income (GDHI) indices by NUTS3 area at current basic prices

UK less Extra-Region=100

Spatial levels: NUTS1,2,3	Spatial level: LA	GVA/head		GDHI/head	
		1995	2006	1995	2007
UNITED KINGDOM		100	100	100	100
London		153	165	121	125
South East		102	106	112	112
East of England		95	94	107	105
South West		92	92	100	99
West Midlands		93	86	92	90
East Midlands		93	89	93	93
Yorkshire & The Humber		89	85	92	90
North East		83	79	87	85
North West		90	87	92	91
Greater Manchester		93	93	91	89
Greater Manchester North	Bolton, Bury, Oldham, Rochdale, Wigan	77	70	90	88
Greater Manchester South	Manchester, Salford, Stockport, Tameside, Trafford	106	112	92	90
Merseyside		71	72	91	88
East Merseyside		62	64	79	82
Liverpool		86	92	84	84
Sefton		68	64	109	94
Wirral		60	59	96	96
Cheshire		113	110	100	105
Halton and Warrington		112	115	92	95
Cheshire CC	Chester, Congleton, Crewe & Nantwich, Ellesmere Port & Neston, Macclesfield, Vale Royal	113	108	104	109
Lancashire (all)		89	80	90	87
Blackburn with Darwen		94	76	87	75
Blackpool		75	64	89	78
Lancashire CC (part)	Burnley, Chorley, Fylde, Hyndburn, Lancaster, Pendle, Preston, Ribble Valley, Rossendale, South Ribble, West Lancashire, & Wyre	90	82	91	89

source: ONS

Like Nord-Pas-de-Calais, North West England displays an uneven sub-regional performance. Greater Manchester South, Cheshire CC, and Halton and Warrington are the only three sub-regions with greater economic strength than the national average. Their economic performance is also echoed by their large increase in employment, as shown in Table 12. However, population change for the three sub-regions presents two different types of sub-region: on one hand, the well-established metropolitan sub-region (Greater Manchester South centred around the Manchester city core), on the other the sub-regions with a critical position as intermediate railway hubs between London and sub-regions in NW England such as Warrington, and Cheshire CC (Crewe, Wilmslow, and Macclesfield). The former type of sub-region is losing population associated with the expansion of the city into neighbouring sub-regions, while the latter is effectively acting as the receiver of population inflow from these core city centres through a process of decentralisation process, and seems to be benefitting exceptionally from their key transport locations on the WCML.

Table 12 Population and economic changes

Sub-regions/ UA /LA s	The percentage of employment (1998 & 2007)										1998-2007 employment change									
	Population change 1981- 2008	Primary		Secondary industries/ construction/ energy supplies		Commerce, transport, and other services		Public services		Knowledge intensive activities		All Employ- ment	Secondary industries/ construction/ energy		Commerce, transport, and other services		Public services		Knowledge intensive activities	
													Primary							
		1998	2007	1998	2007	1998	2007	1998	2007	1998	2007		Primary							
England	9%	1	1	22	16	30	29	26	29	21	25	9%	0%	-6%	-1%	3%	4%			
North West	-1%											9%	0%	-6%	-1%	4%	4%			
Great Manchester North	0%	0	0	31	22	31	31	26	29	12	17	5%	0%	-8%	0%	3%	5%			
Bolton	0%	0	0	27	22	30	30	27	29	15	19	-1%	0%	-5%	-1%	2%	4%			
Bury	3%	0	0	27	17	30	31	29	37	13	15	8%	0%	-10%	0%	8%	2%			
Oldham	-1%	0	0	37	25	31	31	22	30	10	15	2%	0%	-12%	0%	7%	5%			
Rochdale	-1%	0	0	31	23	32	33	26	26	11	18	11%	0%	-7%	0%	0%	7%			
Wigan	0%	0	0	31	23	31	31	26	27	12	18	8%	0%	-8%	0%	1%	7%			
Great Manchester South	-3%	0	0	20	13	31	20	26	28	24	20	12%	0%	-6%	-2%	3%	5%			
Manchester	1%	0	0	12	7	33	29	28	31	28	33	16%	0%	-5%	-4%	3%	6%			
Salford	-11%	0	0	22	14	26	25	29	32	23	29	15%	0%	-7%	-1%	3%	6%			
Stockport	-4%	0	0	23	18	31	29	26	28	19	25	9%	0%	-5%	-2%	2%	5%			
Tameside	-1%	0	0	38	27	26	29	25	30	11	14	4%	0%	-11%	3%	6%	2%			
Trafford	-5%	0	0	22	16	32	31	17	18	28	34	11%	0%	-6%	-1%	1%	6%			
Merseyside	-11%											9%	0%	-5%	-3%	4%	5%			
Liverpool	-16%	0	0	13	8	29	26	38	41	21	25	12%	0%	-4%	-3%	3%	4%			
Halton and Warrington	8%																			
Warrington	15%	0	0	19	17	36	33	17	22	28	28	10%	0%	-2%	-3%	6%	0%			
Halton	-3%	0	0	28	18	29	36	23	22	19	24	-1%	0%	-10%	6%	-1%	5%		5%	
Cheshire West & Chester	6%	2	1	24	16	30	31	21	26	24	25	8%	-1%	-8%	1%	5%	1%			
Cheshire East	10%	2	2	27	21	30	29	19	24	22	24	13%	0%	6%	1%	6%	2%			
Blackburn with Darwen	-1%	0	0	34	25	25	24	29	33	12	18	1%	0%	-9%	-1%	4%	6%			
Blackpool	-5%	0	0	12	10	36	36	37	38	14	16	-6%	0%	-2%	0%	1%	3%			
Lancashire CC (Part)	7%											10%	0%	-7%	-2%	5%	3%			
Burnley	-6%	0	0	38	25	25	29	27	31	10	16	-7%	0%	-13%	4%	3%	6%			
Chorley	14%	1	1	22	14	36	28	27	29	14	27	34%	0%	-8%	-8%	2%	14%			
Fylde	11%	1	1	42	35	20	21	24	23	12	20	5%	0%	-7%	1%	-2%	8%			
Hyndburn	3%	0	0	35	25	35	34	23	30	7	11	-5%	0%	-10%	-1%	7%	4%			
Lancaster	15%	2	2	18	13	28	30	42	40	10	15	4%	0%	-4%	2%	-2%	5%			
Pendle	4%	0	0	45	39	23	22	21	25	10	14	5%	0%	6%	1%	4%	4%			
Preston	4%	0	0	15	14	34	27	32	37	18	22	21%	0%	-1%	-7%	4%	4%			
Ribble Valley	9%	3	2	39	32	27	29	23	27	7	10	15%	-1%	-7%	1%	4%	3%			
Rossendale	4%	1	1	39	32	36	28	16	23	8	16	-16%	0%	-7%	-8%	7%	7%			
South Ribble	11%	2	1	36	26	28	29	23	29	11	15	25%	-1%	-10%	1%	6%	4%			
West Lancashire	2%	6	5	29	21	28	30	24	29	13	16	12%	-1%	-8%	1%	5%	3%			
Wyre	12%	3	2	21	18	35	33	31	35	10	13	16%	-1%	-3%	-2%	4%	3%			

Source: ABI, NOMIS

Apart from the three sub-regions mentioned above, some local authorities also present strength in attracting people and jobs over time. For example, in the territory of Lancashire County Council, the aggregate GVA figure cannot distinguish more promising areas from blighted ones. Table 12 shows Chorley, Preston, and South Ribble added more than 20 percent in employment from 1998 to 2007. Also their increase in employment exceeds the rise in population, suggesting that they are different from some sub-regions with weaker economic attraction which tend to become preferred places of residence for high-income workers rather than locations for economic activity. The contrast between GVA and GDHI in Table 11 demonstrates this point, especially through the marked difference between lower GVA and higher GDHI per head.

B. The change of sub-regional economic structure

Table 12 shows that the sub-regions of North West England have largely transformed their economic structures into a service-economy base, except for four local authorities within Lancashire County Council which retain a high percentage of secondary industry, construction and energy supply: Fylde, Pendle, Ribble Valley and Rossendale. Lancashire CC also has the largest number of local authorities with the highest percentage of public service employment. Among them, Chorley is extraordinary since its knowledge-intensive employment is as high as 14%, marking the most dramatic increase in the whole region. Greater Manchester South is consolidating its economic power through more knowledge-intensive activities and public services in comparison with other economic activities. Cheshire West and Chester, Cheshire East, Halton, and Warrington also score strongly in commerce, transport, and other services.

Alternatively, Table 13 shows three types of property values relating to our observation periods before and after introduction of HST services on the WCML. The WCML modernisation was completed only in December 2008, creating a problem of the short period of observation with no long-term economic restructuring data yet available. However, the issue of upgrading the WCML had been discussed since the 1960s and the routes and stations served by HST had been confirmed since the 1990s. Hence, it would be reasonable to expect that even before 2008 speculation regarding the impact could have been reflected in rising property values around Greater Manchester South, Cheshire CC, Halton, and Warrington. The July 2009 values for industrial, warehouse and housing land were inevitably affected by

the economic recession, but it appears that those sub-regions served by HST proved more resistant to the general fall in property values than those without HST connection.

Table 13 Property Value change

Regions		Office rental values change				Industrial and warehouse land values				Housing land value							
		town centre		off town		Typical Values				Bluk land (>2 ha)				Sites for flats or mansionettes			
		£/m ² /ann		£/m ² /ann		£ per ha (thousands)				£ per ha (thousands)				£ per ha (thousands)			
		1982	2008	1982	2008	1982	2008	2009	08-'09	1982	2008	2009	08-'09	1982	2008	2009	08-'09
England and Wales	(excluding London)	43	157	34	118	147	730	600	0.82	139	2,480	1,770	0.714	-	2,650	1,960	0.740
London	(Inner London)	169	543	119	394	584	2,475	1,942	0.78	549	8,500	6,290	0.740	-	9,900	8,020	0.810
	(Outer London)	90	202	64	173	-	-	-	-	-	5,980	4,420	0.739	-	6,400	5,190	0.811
North West/ Merseyside	North West	37	149	30	108	85	502	409	0.81	101	2,500	1,790	0.716	-	2,560	1,930	0.754
	Merseyside	-	-	-	-	-	-	-	-	-	1,270	900	0.709	-	1,590	1,100	0.692
Sub-regions / UA s	LA s (areas)																
Great M/C North	Bolton	33	120	28	110	86	550	450	0.82	100	2,000	1,485	0.743	-	1,900	1,485	0.782
	Oldham	28	113	20	80	75	475	390	0.82	85	1,650	1,300	0.788	-	1,800	1,300	0.722
	Wigan	28	115	25	80	68	400	320	0.80	70	1,850	1,400	0.757	-	1,900	1,400	0.737
Great M/C South	Manchester	72	310	60	180	125	650	540	0.83	125	4,800	3,200	0.667	-	4,000	3,200	0.800
	Stockport	35	130	-	-	170	500	430	0.86	125	4,600	2,950	0.641	-	3,800	2,950	0.776
	Trafford (Altrincham)	47	160	30	130	135	825	650	0.79	150	3,100	2,100	0.677	-	2,600	2,100	0.808
Merseyside	Liverpool	43	180	35	150	90	275	240	0.87	75	1,875	900	0.480	-	1,875	1,100	0.587
Halton & Warrington	Warrington	48	170	32	95	110	500	390	0.78	135	2,800	1,650	0.589	-	2,500	1,700	0.680
Chester CC	Chester	38	138	29	105	50	450	365	0.81	110	2,700	1,900	0.704	-	4,000	2,800	0.700
	Macclesfield (Wilmslow)	48	143	35	120	55	450	365	0.81	150	1,950	1,550	0.795	-	2,000	1,600	0.800
Blackburn with Darwen	Blackburn	18	120	30	100	70	500	380	0.76	65	1,550	1,100	0.710	-	1,700	1,100	0.647
Lancashire CC (part)	Lancaster	28	-	28	95	55	550	450	0.82	90	2,050	1,550	0.756	-	-	-	-
	Preston	17	-	27	100	100	625	500	0.80	110	2,100	1,560	0.743	-	2,000	1,560	0.780

Source: VOA

Notes:

1. The figures for offices rental value in town centre is the average of type 1 and 2.
2. The property market report(PMR) in general is released twice a year. The figures in this table were sourced from the versions of March 1982, July 2008, and July 2009.
3. The decimal fractions here had been rounded up and down.

Analysis 3: The relationship between the TGV effects of time-space shrinkages and economic restructuring

The effects of HSTs on assisting the transformation towards the knowledge economy could be further scrutinised by a correlation analysis between the change of transport capacity and the change in economic structure. With the aim of distinguishing the intra-regional impacts, analyses were conducted for both national and regional linkages of sub-regions.

Table 14 shows the result of statistical correlation between the change of train capacity and employment change in different economic groups between Paris and sub-regions of Nord-Pas-de-Calais region respectively for two periods: before (1982-1990) and after (1990-2006) the arrival of the TGV. The train capacity used here is a composite index resulting from the multiplication of the change of train time and frequencies. Prior to the arrival of TGV in this Region, between 1982 and 1990, the change of train capacity only shows a positive statistical significance of 0.618 with the change of public services employment, and not with other

economic categories. This implies that the weakness of general transport capacity (the reduction of limited train times and the reduction of train frequencies) before the arrival of TGV in this region correlates with the increase of public service employment. However, after the arrival of TGV services, the change in train capacity from and to Paris demonstrates a negative statistical significance of -0.675 against the percentage of knowledge-intensive employment change, which implies that the marked reduction of train times and the massive increase of train frequencies are correlated with the increased percentage of knowledge-intensive employment.

Table 14 The correlation between the change of train capacity between Paris and Nord-Pas-de-Calais sub-regions and the change of economic structure in Nord-Pas-de-Calais sub-regions

The change of percentage of employment in economic groups	The change of train capacity (Δ time x Δ frequencies)	
	1982-1990 (before TGV)	1990-2006 (after TGV)
Primary industries	-	-
Secondary industries	-	-
Commerce	-	-
Public services	0.618*(0.032)	-
Knowledge intensive activities	-	-0.675*(0.011)

Notes:

1. - means the two figures have no statistical correlation.
2. * means correlation is significant at the 0.05 level (2-tailed).
3. ** means correlation is significant at the 0.01 level (2-tailed).
4. The figures shown here are Pearson correlations (Sig. (2-tailed)).

Although the correlation could not demonstrate a causal relationship, this finding presents an intriguing picture: it suggests that the change in transport connections between the national capital and the sub-regions of Nord-Pas-de-Calais could be associated with changing spatial-economic patterns. It seems that before the arrival of the TGV, the state was playing an active role in assisting sub-regions with poor transport connection suffering from economic restructuring, to help them overcome their inability to attract private investment. This correlation disappeared after the arrival of TGV in this region: during the period from 1990 to 2006, the change in knowledge-intensive employment in this region was significantly related to the transformation of train services by TGV-Nord with Paris.

Table 15 shows the result of the same analysis applied to the relationship between Lille and its sub-regions over the two periods of time. Similarly, before the arrival of TGV services in this region, the change of train capacity between Lille and its sub-regions also has a positive

statistical significance at 0.716 with the change of public service employment. The weaker transport capacity between Lille and its sub-regions is associated with the rise of public service employment, which is similar to the result found between Paris and the sub-regions of Nord-Pas-de-Calais. Additionally, the change of primary industries also has positive correlation with the change of transport capacity, with a lesser degree of 0.554. The reduction in secondary industry employment with improvement in transport capacity was smaller. Moreover, the change in secondary industry employment shows a negative correlation with the change of transport capacity, at -0.736. The minor reduction of primary industry employment was associated with greater disadvantage in transport capacity. Nevertheless, after the arrival of the TGV, the change of transport service between Lille and its sub-regions shows no correlation with any kind of economic change, which seems to suggest that the existing economic relationship within the regional capital and its sub-regions has been affected when sub-regions are drawn closer to the national capital.

Table 15 The correlation between the change of train capacity between Lille and its sub-regions and the change of economic structure in Nord-Pas-de-Calais sub-regions

The change of percentage of employment in economic groups	The change of train capacity (Δtime x Δfrequencies)	
	1982-1990 (before TGV)	1990-2006 (after TGV)
Primary industries	0.554*(0.05)	-
Secondary industries	-0.736**(0.004)	-
Commerce	-	-
Public services	0.716**(0.006)	-
Knowledge intensive activities	-	-

Notes:

1. - means the two figures have no statistical correlation.
2. * means Correlation is significant at the 0.05 level (2-tailed).
3. ** means Correlation is significant at the 0.01 level (2-tailed).
4. The figures shown here are Pearson correlations (Sig. (2-tailed)).

The same correlation analysis was carried out for North West England for the period between 1998 and 2007. However, there was no correlation between transport capacity change and economic structure change, either between sub-regions of North West England and London, or between Manchester and its sub-regions. After the completion of the modernised WCML, the data obtained so far do not allow to conduct a correlation analysis of economic change for the effects after 2008.

This paper forms part of a larger research project, within which this section is due to be updated as soon as new data are obtained and analysed. But, since the upgrading of the

WCML took place in two main stages of improvement, with reductions in train times and increases in frequency at each stage, the lack of correlation between the first stage and economic structural change implies that the upgraded HST system has had no decisive impacts on the economic structure of most sub-regions on North West. At most, some sub-regions seem to have progressed more rapidly towards the knowledge-intensive economy. This will be a key topic for further research.

Discussion and conclusions

The transformation of two post-industrial regions, Nord-Pas-de-Calais and North West England, towards the knowledge economy proves a complex and difficult process. In Nord-Pas-de-Calais, the findings demonstrate that the arrival of the dedicated TGV-Nord line dramatically shrinks time-space between Paris and Nord-Pas-de-Calais and that this shows significant correlation with the change in knowledge-intensive employment. However, these correlations seem to work better for the TGV service patterns between Paris and the sub-regions of Nord-Pas-de-Calais rather than to those between Lille and its sub-regions, reflecting a tension of influence between regional and national capitals, and seeming to reinforce the economic power of Paris over the sub-regions of Nord-Pas-de-Calais. In addition, Lille, a well-established regional capital, and some less-industrialised sub-regions enjoying the prestigious arrival of the TGV in their city cores, seem to demonstrate fewer problems in their transformation process than others. Even though correlation analyses show the statistically significant relationship between the transport capacity and knowledge-intensive employment, in 2006 four out of twelve TGV sub-regions were still dominated by high percentage of employment in secondary industry. Some places even showed negative growth in knowledge-intensive employment, for instance Valenciennes. Thus for some sub-regions continuing path dependency seems to hamper their development towards a more knowledge-intensive structure.

In North West England, due to the short observation period to observe the spatial-economic impacts since December 2008, it is not possible to fully reach a decisive conclusion about the impacts of the upgraded WCML. But the study of transport capacity patterns over the period from 1998 to 2007 allows us to measure the effects of first stage of an upgraded WCML. A statistically significant correlation between transport improvement and economic change was not found, but marginally reductions in train times seem to have benefited Greater Manchester South, where the core of the regional capital is located, and some well-connected

sub-regions with good transport location on the WCML, in developing their knowledge economies. The relative resilience of property value in the depressed conditions of 2009, after the completion of WCML, suggests that these sub-regions did demonstrate greater resilience in the face of economic recession. By contrast, the poor transport connectivity for the majority of sub-regions - not only with the national capital but also the regional capital - seems to condemn them to lingering economic disadvantage.

To sum up, the available evidence shows that for both regions, connection with the national capital by faster train services did economically strengthen the regional capital, but not some sub-regions around it, especially former industrial sub-regions. The effects of time-space shrinkage vary in the two cases, suggesting that a dedicated HST can generate economic change but that there are real limits in exploiting an upgraded existing track. Even in the Nord-Pas-de-Calais region, with TGV connectivity for most sub-regions, wider economic transformation is still to happen, while the laboriously-upgraded WCML seems to show limits to its transformative power. These two post-industrial regions are still in the course of a long transition process towards the knowledge economy. This process involves much more than connection with high-speed rail, significant as this may be – a question requiring extended further discussion in a further paper.

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