The Impact of High Speed Trains on Socio-Economic Activity: The Case of Ashford (Kent)

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Abstract

This paper reports on part of some work being undertaken for the South East England Development Agency to determine the impact of the London-Paris-Brussels-Amsterdam-Cologne high speed rail network on socio-economic development.

A detailed literature review has been undertaken which has covered computable general equilibrium models, accessibility studies and monitoring studies. This review indicates that there are theoretical reasons to expect high speed rail to have socio-economic benefits over and above those measured in conventional cost-benefit analyses, largely due to the promotion of more competitive land and labour markets and of agglomeration economies. However, at the practical level these net benefits are difficult to measure, as they may be swamped by external factors, although gross effects are easier to discern.

In the empirical part of this paper data on economic activity rates, population changes, planning consents and land values are collated and related to changes in travel patterns and accessibility for a case study of Ashford (Kent).

1. Introduction

This paper reports on parts of some work in two projects being undertaken by the University of Southampton (and others) for the South East England Development Agency (SEEDA) to determine the impact of the London-Paris-Brussels-Amsterdam-Cologne high speed rail network on socio-economic development. The first called HST Impact, aims to determine the 'added value' of two NWE INTERREG IIIB projects – HST Integration (HST4i) and HST Connect. These two projects are valued at €48 million, with an ERDF share of €22 million[1]. The second, called HST Connect, will develop an HST advice guide, a toolkit on station integration and connectivity and an assessment of new technologies. These projects are due to be completed in June 2008 and February 2007 respectively. This paper therefore very much reflects work in progress. Some maps showing the stakeholders involved in the two projects are given by Figures 1 and 2.

This paper consists of three further sections. In section 2 a review of the literature is provided which covers computable general equilibrium models, accessibility studies and monitoring studies. This review indicates that there are theoretical reasons to expect high speed rail to have socio-economic benefits over and above those measured in conventional cost-benefit analyses, largely due to the promotion of more competitive land and labour markets and of agglomeration

[1] See http://www.hst4i.net/ and http://www.hstconnect.net/

economies. In section 3, a case study of Ashford (Kent) is provided. Ashford is a medium sized town with a 2001 population (including surrounding districts) of 102,661. However, Ashford has been designated as a growth area for the South East region and its population is expected to double by 2031. This will involve the development of 31,000 homes and 28,000 jobs. Ashford is a historic rail centre, being the hub for five local services (see Figure 3) and it has been a centre for the railway manufacturing and engineering industries. Since 1996, Ashford has been served by Eurostar trains, with a current daily service of six trains to/from Paris and four to Brussels (but six from Brussels). In total this represents 22 trains a day which is a reduction on earlier timetables which provided 30 trains a day (seven to Paris, five to Brussels and nine return trains each). Data for Ashford on economic activity rates, population changes, planning consents and land values are collated and related to changes in accessibility. In section 4, some conclusions are drawn. The Ashford case study confirms the results of the literature review namely that the wider economic benefits of high speed rail are difficult to detect, as they are swamped by external factors.

2. Literature Review

Most impact studies suggest that transport investments in advanced economies will result in only modest uplifts in economic performance. For example, the European Commission (1997) estimated that the priority Trans European Networks (TENs - which are dominated by high speed rail schemes) would add 0.25% to European Union GDP and 0.11% to employment over 25 years. Brocker (1999) using a forerunner of the CGEurope model (see below) estimates the maximum impact of TENs in any region to be 3% of GDP.

Additional evidence on the impact of high speed rail investments has come from three main sources. These will be discussed in turn.

2.1. Computable General Equilibrium Models

A computable general equilibrium model called CGEurope has been run to examine the impact of transport infrastructure developments (implementation of projects for the Trans European Network) and for Social Marginal Cost (SMC) pricing policies as part of the IASON (Integrated Appraisal of Spatial economic and Network effects of transport investments and policies) project (Renes et al., 2004). In summary these results suggest that:

- Spatial distribution effects are very moderate
- Total welfare effects are underestimated by 20% compared to the situation where welfare effects are measured through the cost-benefit analysis (CBA) effects alone
- Effects of transport initiatives tend to be additive

A similar model suite, entitled RAEM, has been used to assess two magnetic levitation rail (Maglev) projects, each with two variants (Oosterhaven and Elhorst, 2003): (1) An inner ring or an outer ring connecting the four largest cities in the Randstad region (Amsterdam, The Hague, Rotterdam and Utrecht), (2) a direct connection between Schiphol Airport and Groningen, either running along the south-east or along the north-west borders of the “Ijsselmeer” lake. Additional benefits include :

- *Geographical job benefits* occur when labour demand shifts to regions with labour supply surplus (opposite in the case of job dis-benefits). The international job benefits should be interpreted in a similar way.
- *Geographical productivity benefits* are generated when labour demand shifts to regions with labour supply shortage (productivity dis-benefits would be the result if labour demand decreases in regions with labour supply shortages). A similar interpretation can be given for international productivity benefits.
- *Quantitative labour matching benefits* occur when commuter flows shift from regions with labour supply surplus to regions with labour demand surplus.
- *Qualitative labour matching benefits* refers to the ability of firms to access better suited skills due to increased commuting distances. In the empirical analysis these benefits have been approximated by the willingness to commute over longer distances. This has been estimated by the number of workers crossing the borders of NUTS-3 regions and by the assumptions that in 10% of these cases firms are able to access better suited skills and that labour productivity due to these better matches increases by 10%.
- *Open landscape benefits* from the rail schemes result from the relocation of housing and jobs leading to (net) less pressure on open landscapes.

The results reflecting the wider benefits were compared to what the net benefits would have been under perfect competition (standard CBA appraisal). For the urban agglomeration project the ratio between the two benefit measures is approximately 1.2 and in the core-periphery project it is 1.8. This implies that the true benefits in the urban agglomeration project are some 20% greater than what would have been calculated in a standard CBA, while the true benefits in the core-periphery project is 80% greater than the benefits would have been calculated to in a standard. Although the latter figure appears large it should be noted that the Dutch results are based on an empirical analysis (rather than a theoretical model) and take into account not only the product market but also the labour market and the housing market.

A recent report for the UK Department for Transport on the wider economic benefits of transport infrastructure (DfT, 2005) has highlighted three source of additional economic benefit:
(i) Agglomeration benefits calculated as the product of the elasticity of productivity with respect to effective density, the change in effective density, GDP and employment.
(ii) Imperfect Competition impact calculated by multiplying the sum of business time savings and reliability improvements by the product of the proportionate price mark up of the imperfect good and its price elasticity.
(iii) A tax wedge calculated as 40% of the GDP of new workers and 30% of the GDP of those working longer hours and those relocating to higher productivity areas.

An empirical application to the proposed East-West Crossrail scheme in London suggests a multiplier of 1.56. However, there may be concerns about double counting, particularly as increased output in an imperfect product market could be viewed as a form of agglomeration benefit.

2.2 Accessibility Approaches

Gutierrez et al. (1996) estimate that HST investments in the European 12 between 1993 and 2010 will increase rail accessibility of major centres by between 20% (Thessaloniki) and 65% (London). However, this will overstate the overall change in accessibility as rail is not, nor will

be, a dominant mode on many origin-destination pairs. Vickerman et al. (1999) provide a range of more sophisticated estimates of accessibility changes.

Accessibility changes can be combined with appropriate elasticity measures to estimate the economic impact. Prud'homme and Lee (1999) estimate an elasticity of productivity with respect to accessibility of 0.3, although this will be on the high side as some productivity gains will be reduced by dispersal of activity. Rice and Venables (2004) suggest an elasticity of 0.1. For example, Vickerman (1987) estimated that the maximum increase in accessibility by all modes as a result of the Channel Tunnel was 10%. This would suggest a maximum economic impact of between 1 and 3% of GDP in areas such Nord-Pas de Calais and Kent.

2.3 Monitoring Studies.

There have been some ex-post evaluation studies, particularly of the TGV Sud-Est (Paris-Lyon), the AVE (Madrid – Seville) and the Japanese Shinkansen (Bonnafous, 1987, de Rus and Inglada, 1997, Banister and Berechman, 2000). These show increases in commercial activity and hence land values around some (but by no means all) high speed rail stations. For examples between 1983 and 1990 there was a 43% increase in office space around Lyon Part-Dieu station (250,000 m^2). In Japan land values in commercial areas rose by 67% with a Shinkansen station (Nakamura and Ueda, 1989). It should be noted that these measures may reflect displacement of activity from elsewhere and should not be interpreted as being indicative of net growth.

There have been some studies of the extent to which high speed rail can encourage long distance commuting. For example, the Svealand line, opened in 1997, provided a high-speed regional rail link between Ekilstuna and Stockholm. Rail usage has increased by a factor of seven, with rail's share of the relevant travel market increasing from 6% to 30% (Froidh, 2005). Similarly, there has been substantial growth in commuting from Ciudad Real and Puertollano to Madrid on the AVE. In 1992 Ciudad Real had 18 through trains a day to Madrid. By 2005, this had increased to 47 (Alvarez and Tordesillas, 2005).

There are also examples of ex-ante appraisal. For example Evers et al. (1987) estimate that a high speed rail line between Amsterdam and Hamburg, via Groningen, would increase employment in the northern Netherlands (+0.20%) and northern Germany (+0.37%) but this would be partly offset by losses elsewhere in the study region. Overall a net increase of 19,900 extra jobs was forecast (+0.05%). Martin (1997) estimated that a new high speed rail service between Montreal and Toronto would increase welfare by up to Can$ 1,285 million and GDP by Can$ 539 million (1993 prices). The difference between these two figures is attributed to leisure travel and consumption within the project. The total GDP in this corridor is estimated at Can$165 billion so that the overall uplift represents only around 0.03% of GDP.

2.4 Conclusions

Although there is a substantive literature on the impact of transport investments on economic growth, the literature on rail in general and high speed rail in particular is more limited. Most economic impact studies of transport investments, such as high speed rail lines, in advanced economies suggest that these will only have modest economic growth impacts, typically less than 1% of GDP overall, but as a high as 3% in the most affected regions. Impacts on net employment are also likely to be modest. Recent work, particularly based on computable general equilibrium models, indicates that conventional approaches may have underestimated some

benefits, particularly of reducing the deadweight losses of imperfect competition and through the promotion of scale economies and agglomeration. However, the recommended uplift in benefits (typically between 20% and 80%) is not likely to change the broad conclusion that it will be very difficult to identify an impact of high speed rail investments on GDP. The type of impacts that might be expected would occur over a long time period and would be swamped by the exogenous year on year changes in GDP. To put this into context, historical studies suggest that the introduction of rail technology in the nineteenth century led to uplifts in GDP of 10% to 30%, mainly attributed to the movement of freight (Crafts, 2004, 2005). Incremental improvements to existing passenger services in the early twenty first century may only be expected to provide a fraction of this economic impact. Although the impact of high speed rail on economic growth is likely to be so modest that it will be difficult to measure, monitoring studies of existing high speed services suggest that the impact on patterns of economic activity may be more substantive. In particular, at certain high speed station sites there may be expected to be large increases in commercial activity and commensurate increases in land values. Increases in excess of 50% for both indicators have been observed. However, much of this activity will be transfers from other areas and should not be viewed as a net gain. Moreover, these impacts may only be observed where there are favourable local circumstances and will be by no means uniform across high speed networks.

3. A Case Study of Ashford (Kent)

In this section we will examine the impact of high speed rail services on the town of Ashford (Kent). Our work will be mainly at the meso-level. It will look initially at the impact of high speed services on accessibility. The effects of the improved accessibility will then be examined in terms of the impact on population and employment. Then trends in property rpices will be examined. Lastly, the likely impacts of more micro level, public realm improvements to the urban environment will be considered.

3.1 Accessibility

As Table 1 illustrates, the opening of Ashford International in 1996 led to a dramatic increase in the accessibility of continental destinations, with an estimated 85% increase. The completion of the first phase of the Channel Tunnel Rail Link (CTRL), completed in September 2003, led to further minor increases in accessibility of 3%.

Table 1: Accessibility Index changes for Ashford

	Paris	%	Lille	%	Brussels	%	**Total**	**%**
Before Channel Tunnel	21,993		2,862		2,356		27,211	
After Channel Tunnel	40,616	84.7	5,590	95.3	4,240	80.0	50,446	**85.4**
CTRL 1	41,712	2.7	5,795	3.7	4,360	3.0	51,867	**2.8**
After CTRL2 (07-09)	32,901	-21.1	3,612	-37.7	2,951	-32.3	39,464	**-23.9**
After CTRL2 (09-)	38,371	16.6	4,549	25.9	3,566	20.8	46,486	**17.7**

However, with the completion of CTRL Phase 2 in 2007, Ashford's Eurostar services will be reduced to three peak trains to Paris and one train to Eurodisney. There will be no direct service to Brussels. Access to international services is assumed to be via Ebbsfleet (see Figure 4), using conventional rail services up to 2009 and high speed domestic services after 2009. This is estimated as leading to a 24% decrease in accessibility, but with a subsequent accessibility increase as fast services to Ebbsfleet are introduced. However, there is clearly a danger that Ashford will be by-passed by Eurostar in the same way that Dijon was by-passed by TGV Sud-Est and Arras by TGV-Nord (Harman, 2006).

It should be noted that Eurostar services can not be used for travel between Ashford and London. However, with the completion of CTRL2 in 2009 a network of domestic high speed services to London St Pancras will be developed. Although there remain some uncertainties about the fares that will be charged and the appropriateness of St Pancras as a terminus (existing domestic services run to Charing Cross, London Bridge and Cannon Street), our estimates suggest there will be a large increase in accessibility (see Table 2). These domestic high speed services are expected to increase accessibility between London and Kent by around 20%. However, in the case of Ashford this increase is almost 75%. Moreover, the absolute increase in the Hansen type index (74,382) is in excess of the increase in accessibility to/from Paris (18,809) as a result of Eurostar services by a factor of almost four. Moreover, the current accessibility of London from Ashford is more than double the accessibility of Paris. If cultural barriers are taken into account this might be even greater. For example, Shires found crossing a national border reduced passenger rail demand by around 30% (Shires, 1998).

Table 2 Before and After domestic high speed service: accessibility for authorities

District or authority	**Before:** Accessibility , person/£		**After**: Accessibility , person/£		**Access-ibility Change (%)**
	District from London	London from district,	London from district,	London from district,	
Dartford	3,598	300,338	3,231	269,728	-10.2
Gravesham	2,336	175,014	3,067	229,801	+31.3
Medway	5,882	169,089	6,168	177,307	+4.8
Swale	1,850	108,039	1,795	104,858	-3.0
Thanet	1,213	68,679	1,820	103,002	+50.0
Ashford	1,413	98,734	2,463	172,066	+74.2
Dover	1,057	72,530	1,476	101,212	+39.5
Canterbury	1,611	85,386	2,033	107,769	+26.2
Maidstone	1,935	99,862	2,981	153,874	+54.1
Total	20,895	1,177,675	25,033	1,419,622	+20.5

3.2 Population and Employment

Figure 5 shows the historic trends in population in the Ashford District and compares them with South East England (SEEDA) and England. Dummy variable regression analysis suggested that Ashford's population received an11% uplift in the 1990s compared to the South East as a whole. Figure 6 shows similar trends in employment, with regression analysis suggesting that Ashford's

employment received a 6% uplift in the 1990s compared to the South East. However, these results were not statistically significant.

3.3 Property Prices

Figure 7 shows the increase in domestic property prices in the Ashford District. It is evident that an increase in prices coincided with the opening of the International station. However, Figure 8 suggests that the increases in Ashford during this period were broadly in line with those of surrounding districts. Regression analysis suggest that since 1996 property prices in Ashford have received an increase over and above the time trend of 26.5%. However, properties in the South East as a whole have received a stimulus of 23.2%. This suggests an additional increase in Ashford of around 2.7%, although this time the estimate is statistically significant.

Some trends for commercial properties are given by Table 3. The main favourable trend is that there has been a drop in vacancy rates in Ashford (from 13% in 1998/9 and 8% in 2004/5). By contrast, vacancy rates elsewhere have increased from 7% to 9%. There has also been a greater growth in the number of new businesses in Ashford than elsewhere, whilst the decline in retail properties with accommodation has been less in Ashford than elsewhere. However, the growth in floorspace and the growth in rateable values has been less than in the South East as a whole or in England. Overall, the growth in occupied floorspace in Ashford has been similar to that of the South East as a whole (8%) and slightly higher then for England (6%).

Table 3: Summary of All Bulk Classes of Commercial Properties: percentage change between 1998/2004.

	Ashford	***SEEDA***	***England***
Number of businesses (count)	5	4	2
Area (1,000m square)	2.3	10.8	8.6
Rateable value (1,000x£)	27	37	41
Rateable value (£/m square)	24	25	31
Retail with accommodation (count)	-2	-11	-12
Vacancy Rates	-38%	(+)28%	(+)28%

3.4 Micro-level Impacts

As Figure 9 shows the International and adjacent domestic stations are located to the south of Ashford town centre and separated from it by a ring road. On a minor scale there has been a lack of integrated planning in a similar manner to the problems identified at Tours/St Pierre des Corps (Harman, op cit.)..

To rectify this some £10 million is being invested in public realm improvements to the links between the town centre and the stations. The local authorities have high hopes that these investments will stimulate investments in the town centre and around the stations. However, the

impacts of this investment will be difficult to detect, particularly as they are dwarfed by the size of the local economy, which is worth around £10 billion per annum in gross value added terms.

4. Conclusions

There are often political expectations that access to high speed rail services will lead to large economic development impacts. A review of the literature suggests this is rarely the case. This is also confirmed by our case study of Ashford. Although the opening of the International station led to large increases in the accessibility of Paris, Lille and Brussels, these were not centres that Ashford traditionally interacted with. Ashford has increasingly looked towards London for economic connections, a trend which is likely to be strengthened by the introduction of high speed domestic services in 2009. However, the current international services do not connect Ashford with London. As a result, demand has been relatively low as witnessed by the current low level of service (22 trains per day), which will decrease further next year (to 8 trains per day) with the opening of Ebbsfleet. The opening of Ashford International station has coincided with an 11% increase in population, a 6% increase in employment and a 3% increase in house prices over that of the South East a whole. However, attribution of causation is difficult, particularly given the designation of Ashford as a Growth Area for the South East by the Office of the Deputy Prime Minister (now the Department of Communities and Local Government).

The limited impact of high speed rail services at Ashford should not be a surprise. Ashford is a medium sized market town, not a regional centre on a par with Cologne, Lille, Lyon or Seville. It probably has more in common with other intermediate station on the TGV such Calais Fréthun, Haute Picardie, Le Creusot or Macon Loché. However, the introduction of high speed domestic services could lead it to become a similar commuting centre to Ciudad Real in Spain.

References

Alvarez, A.R. and Corando Tordesillas, J.M. (2005) La Movidad de Alta Velocidad eb Estaciones Situadas en Ciudades de Tamano Regueno. Ingeneria y Territorio, 70.

Banister, D. and Berechman, J. (2000) Transport Investment and Economic Development. UCL Press, London.

Bonnafous, A. (1987) The Regional Impact of the TGV. Transportation. 14, 127-137.

Bröcker, J. (1998) Spatial Effects of Transeuropean Networks: preliminary results from a spatial computable general equilibrium analysis. *Diskussionsbeiträge aus dem Institut für Wirtschaft und Verkehr,* Nr., 4/98, Dresden.
(http://www.tu-dresden.de/vkiwv/VWL/diskp/dskp498.pdf)

Crafts, N. (2004) Social savings as a Measure of the Contribution of a New Technology to Economic Growth. London School of Economics, July.

Crafts, N. (2005) What Did Railways Contribute to Nineteenth Century British Economic Growth? London School of Economics, May.

De Rus, G. and Inglada, V. (1997) Cost-Benefit Analysis of the High Speed Train in Spain. The Annals of Regional Science, 31.

European Commission (1997) The Likely Macro-economic Benefits and Employment Impacts of Investments in Trans-European Transport Network. Staff Working Paper SEC 97(10). EC, Brussels.

Evers, G.H.M, Van Der Meer, P.H., Oosterhaven, J. and Polak, J.B. (1987) Regional Impacts of New Transport Infrastructure: a multi-sectoral potentials approach. Transportation, 14, 113-126.

Froidh, O. (2005). Market Effects of Regional High-Speed Trains on the Svealand Line. Journal of Transport Geography, 13.

Gutierrez, J., Gonzalez, R. and Gomez, G. (1996) The European High-Speed Train Network. Predicted effects on accessibility patterns. Journal of Transport Geography, 4, 4, 227-238.

Harman, R. (2006) High Speed Trains and the Development and Regeneration of Cities. Greenguage 21, London.

Martin, F. (1997) Justifying a High-speed Rail project: Social value v regional growth. The Annals of Regional Science, 31, 155-174.

Nakamura, H. and Ueda, T (1989) The Impacts of the Shinkansen on Regional Development. Proceedings of the 5th World Conference on Transport Research, Yokohama.

Oosterhaven, J. and Elhorst, J. P. (2003) Modelling Interactions between the Economy, the Environment and Transportation at the Local and Regional Level, with an Application to Dutch Maglev Projects. Paper presented at the TRIP research conference on the Economic and Environmental Consequences of Regulating Traffic, Copenhagen, February 2003.

Prud'homme, R. and Lee, C.W (199) Size, Sprawl, Speed and the Efficiency of Cities. Urban Studies, 36, 11, 1849-1858.

Renes, G., Schade, W., Burgess, A.W., Tavasszy, L.A. and Rustenburg, M. (2004) Consolidated Results of Case Studies in Transport Project Assessment. IASON (Integrated Appraisal of Spatial economic and Network effects of transport investments and policies) Deliverable 8. Funded by 5th Framework RTD Programme.

Rice, P. and Venables, A. (2004) Spatial Determinants of Productivity: Analysis for the Regions of Great Britain. CEPR Discussion Paper 4527.

Shires, J.D. (1998) Modelling Results for Rail. SORT-IT Deliverable 4, Appendix B. Insitute for Transport Studies, University of Leeds.

Vickerman, R.W. (1987) The Channel Tunnel: Consequences for Regional Development and Growth. Regional Studies, 21, 187-197.

Vickerman, R., Spiekermann, K. and Wegener, M. (1999) Accessibility and regional development in Europe, Regional Studies, 33, 1, 1-15

Figure 1 : HST 4 Integration - Strategic Partners

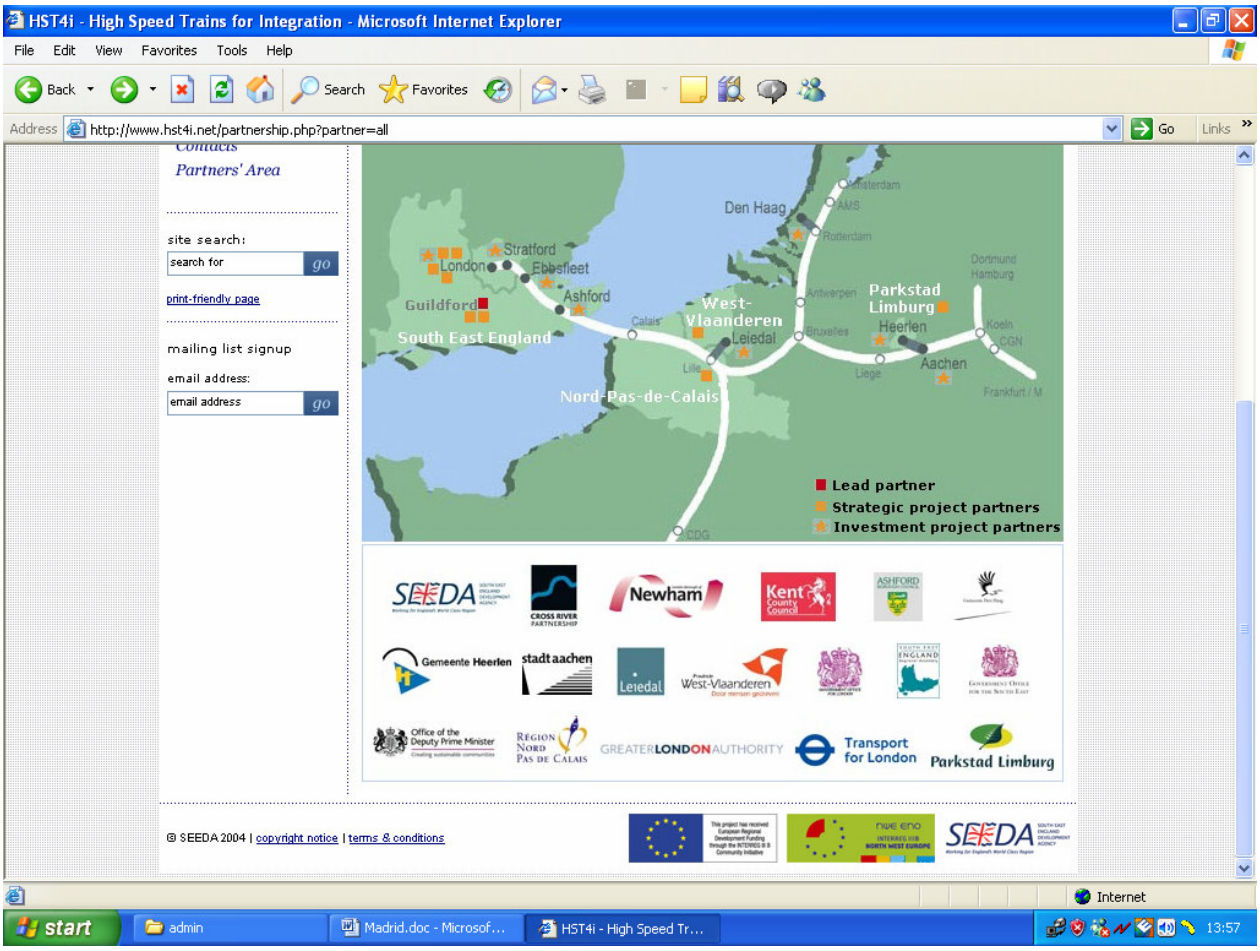

Figure 2: HST Connect Strategic Partners

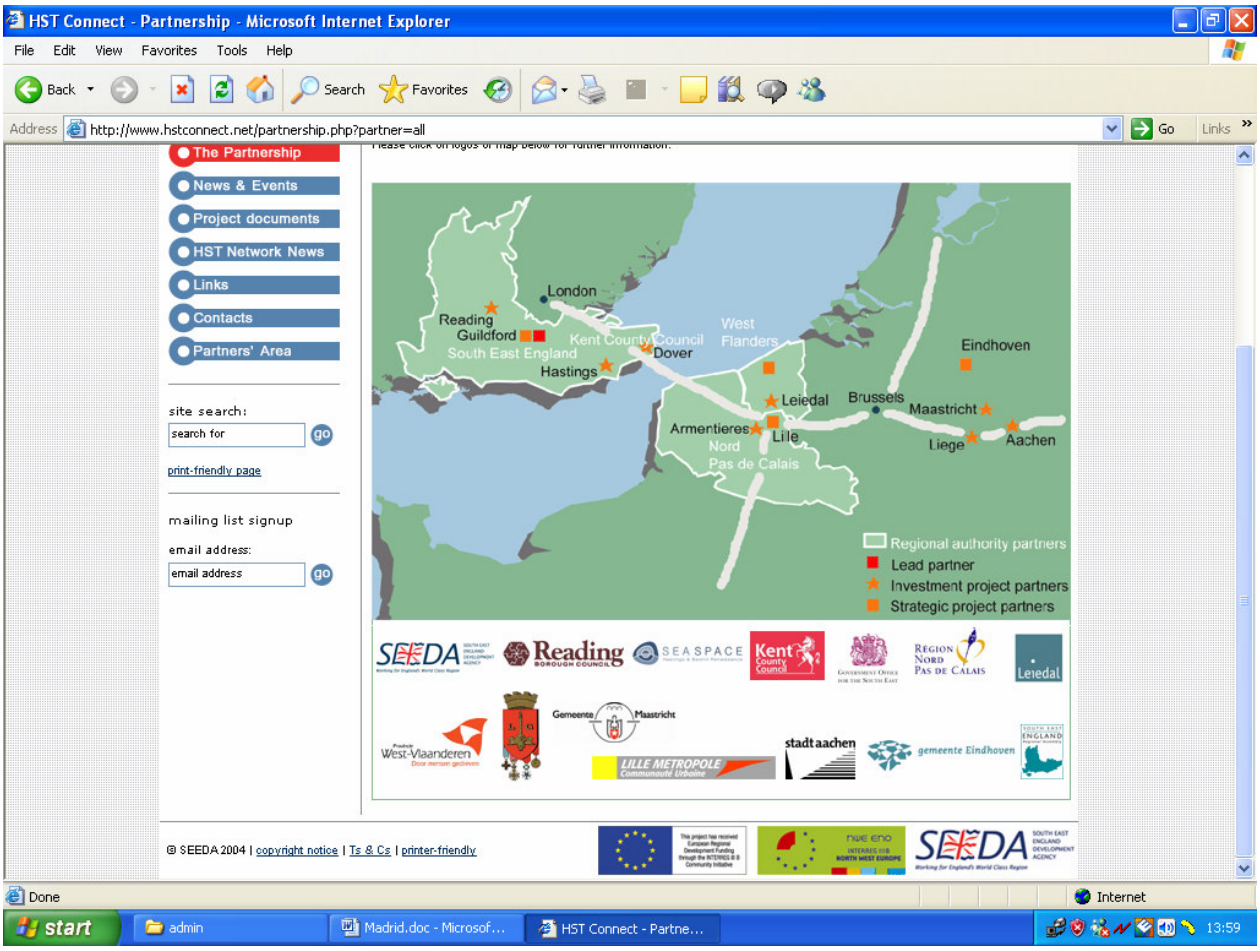

Figure 3. Ashford's Rail Network

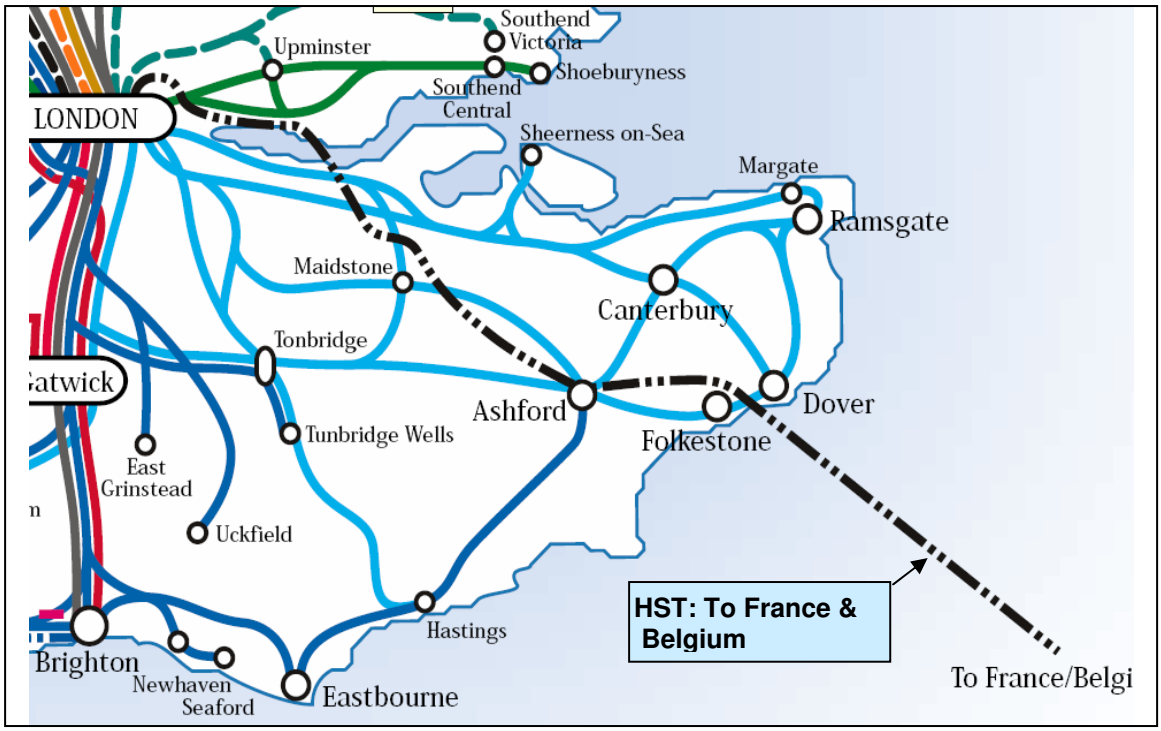

Figure 4: Ebbsfleet Station

Figure 5: Population Growth

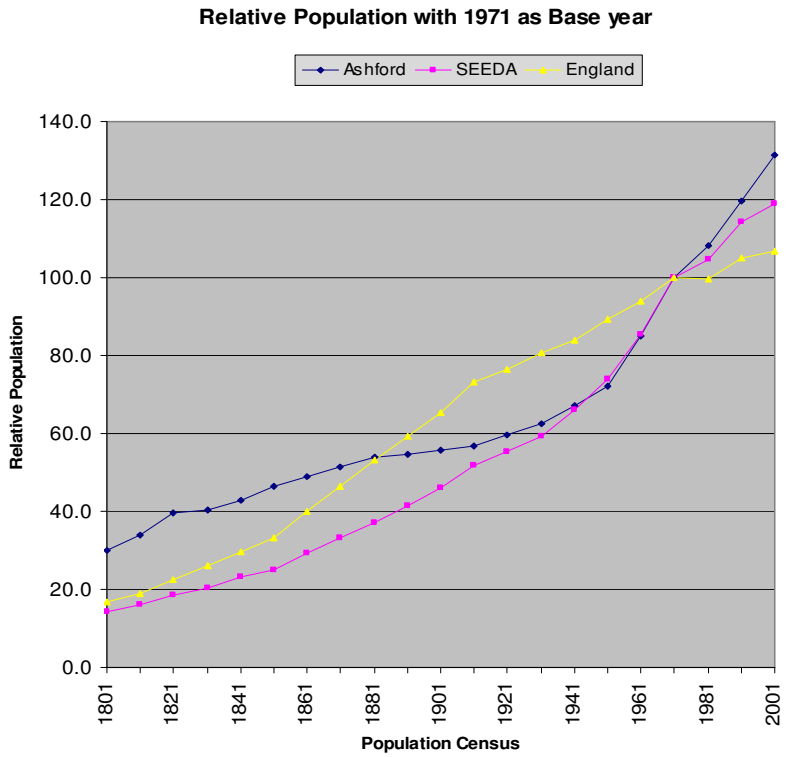

Figure 6: Employment Growth

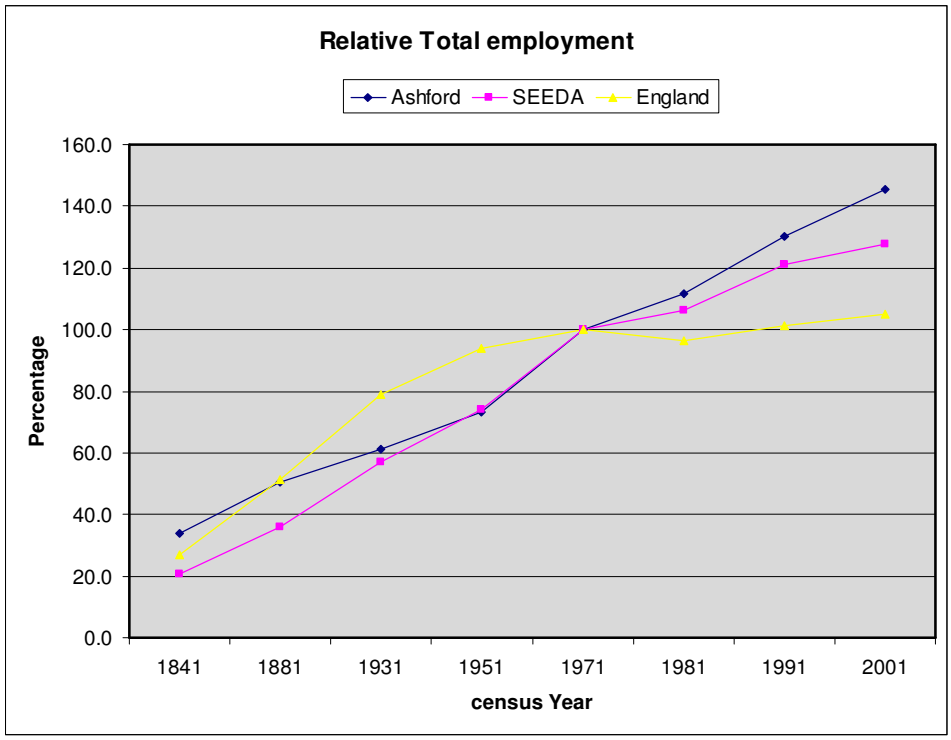

Figure 7: Trends in Domestic Property Prices

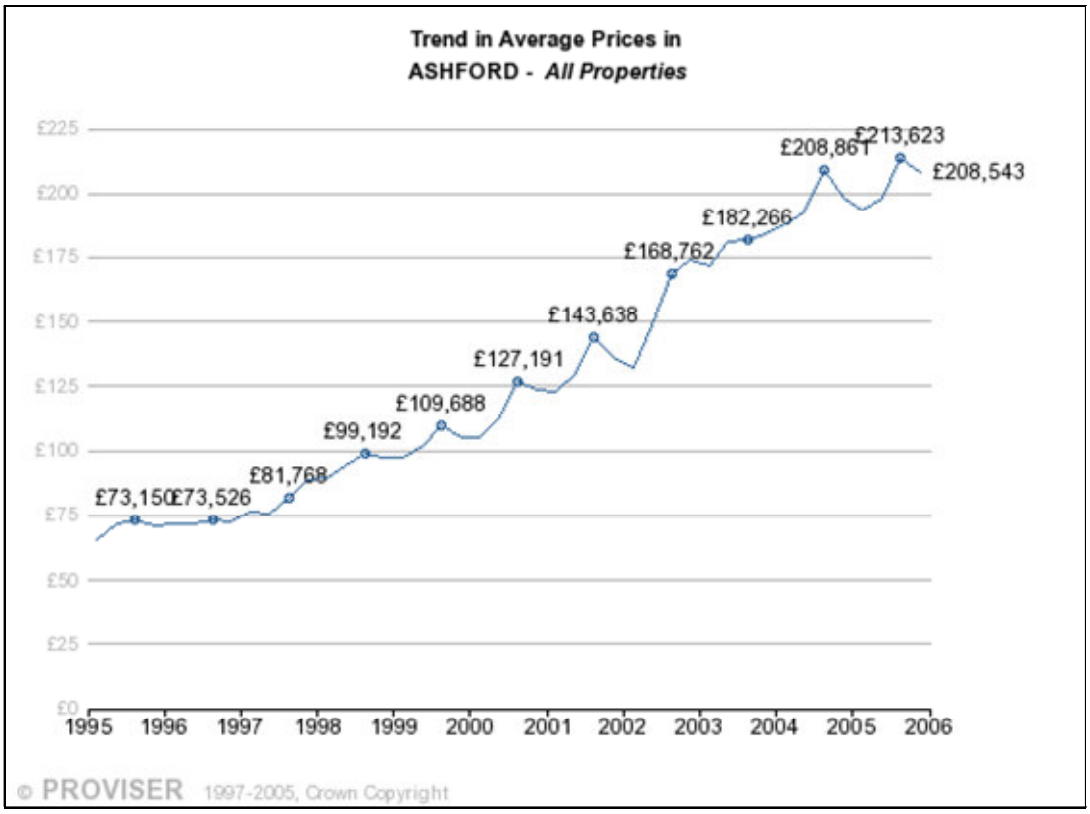

Figure 8: Property Prices in Ashford and Surrounding Authorities

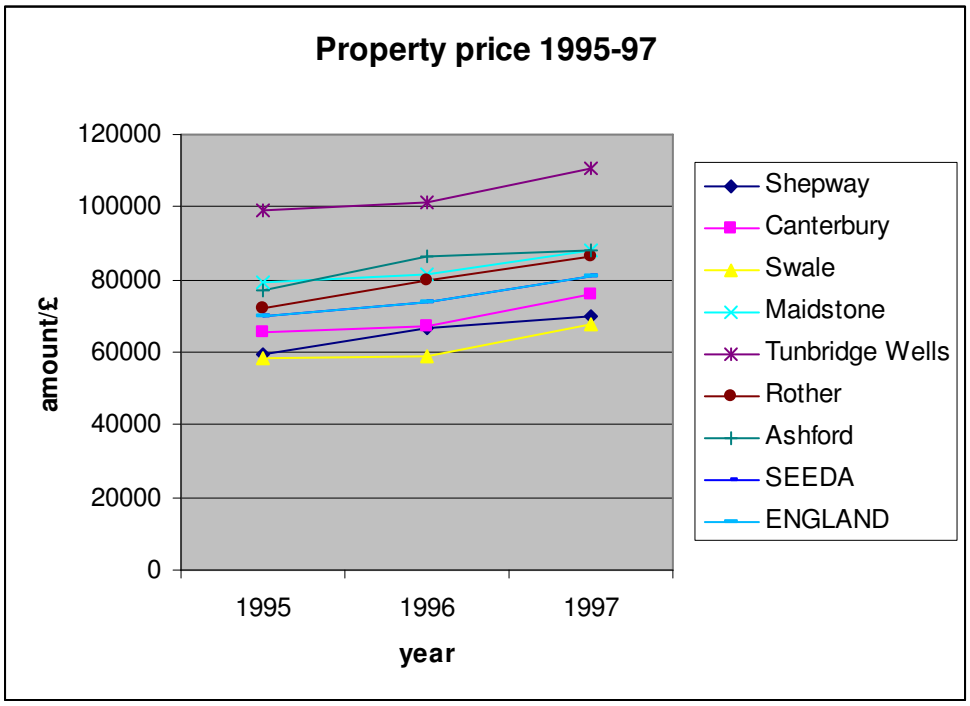

Figure 9: Map of Ashford