Economic Impact of High Speed 1

Final report

London & Continental Railways

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In association with

Volterra

Economic Impact of High Speed 1
Final report

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Summary

This summary sets out the findings of a study undertaken by Colin Buchanan and Volterra, commissioned by London & Continental Railways. The aim of the study is to investigate the economic impact of High Speed 1 (HS1).

High Speed 1 is a new high speed track connecting St Pancras International station with the Channel Tunnel. It enables faster journey times on Eurostar international services, and will provide faster domestic rail services from December 2009. Journey time savings will range from 10 - 40% compared to existing services.

Overall the scheme provides significant benefits. In this study the benefits that have been valued fall into four main categories:

- Financial (net rail revenues)
- Transport user benefits (time savings and reduced congestion)
- Wider economic benefits (enabling central London growth, reducing travel costs and improving labour markets)
- Regeneration (supporting government social and economic development policy objectives along the route)

Costs and Net Earnings

In financial terms the HS1 project cost £5.7 billion[1] to deliver and it will cost some £1.6 billion to operate the additional commuter services. An overall cost therefore of £7.3 billion. Against that cost HS1 is forecast to generate additional rail and car park revenues (allowing for revenue losses to existing rail services) worth some £3.4 billion thereby offsetting all of the net operating costs and a share (approximately 31%) of the capital investment.

Transport Benefits

The benefits to transport users of HS1 and the existing rail lines have been valued using parameters and assumptions set out within Department for Transport appraisal guidance. On that basis HS1 delivers some £3.8 billion of transport benefits. Combined with the operating surplus that would offset the whole project cost.

It should be noted that in the case of HS1 there are also significant external benefits.

Wider Economic Benefits

WEBs value changes in productivity derived from the additional capacity and accessibility delivered by transport projects. HS1 enables additional commuter rail services which help to relieve a transport capacity constraint on central London employment growth. In addition the new terminal capacity at St Pancras will enable additional platforms at Waterloo to increase capacity there. Improvements to accessibility will enhance the economic prospects of areas around the stations in central London, the Thames Gateway and in Kent. These impacts have been valued at some £3.8 billion.

Regeneration

Regeneration impacts are difficult to value in the same way as the impacts described above, but they fall into two main categories:

[1] All prices in this summary are present values in 2008 prices, discounted by economic discount rates and with assumptions on real price changes. The outturn cost of HS1 was £6.2bn undiscounted which includes the stations and depot.

(a) HS1 has enabled the delivery of three major development schemes in Ebbsfleet, Stratford and King's Cross. Those schemes will significantly impact on three regeneration areas with plans for over 15,000 homes and 70,000 jobs resulting in quantifiable residential spending and output. This is summarised in the table below.

Table S 1: Impact of development schemes associated with High Speed 1

	King's Cross	Stratford	Ebbsfleet	Eastern Quarry
Permanent jobs	22,100	34,000	24,000	7,200
GDP per annum	£1.3bn	£1.8bn	£1bn	£275m
Homes	2,000 (plus some student housing)	Up to 5,500	2,100	6,250
Household spending per annum	£50m	£140m	£49m	£144m
Temporary jobs during construction (FTE)	2,500	4,000	3,500	

Source: Hunt Dobson Stringer: London & Continental Railway, Making Regeneration Happen, February 2008

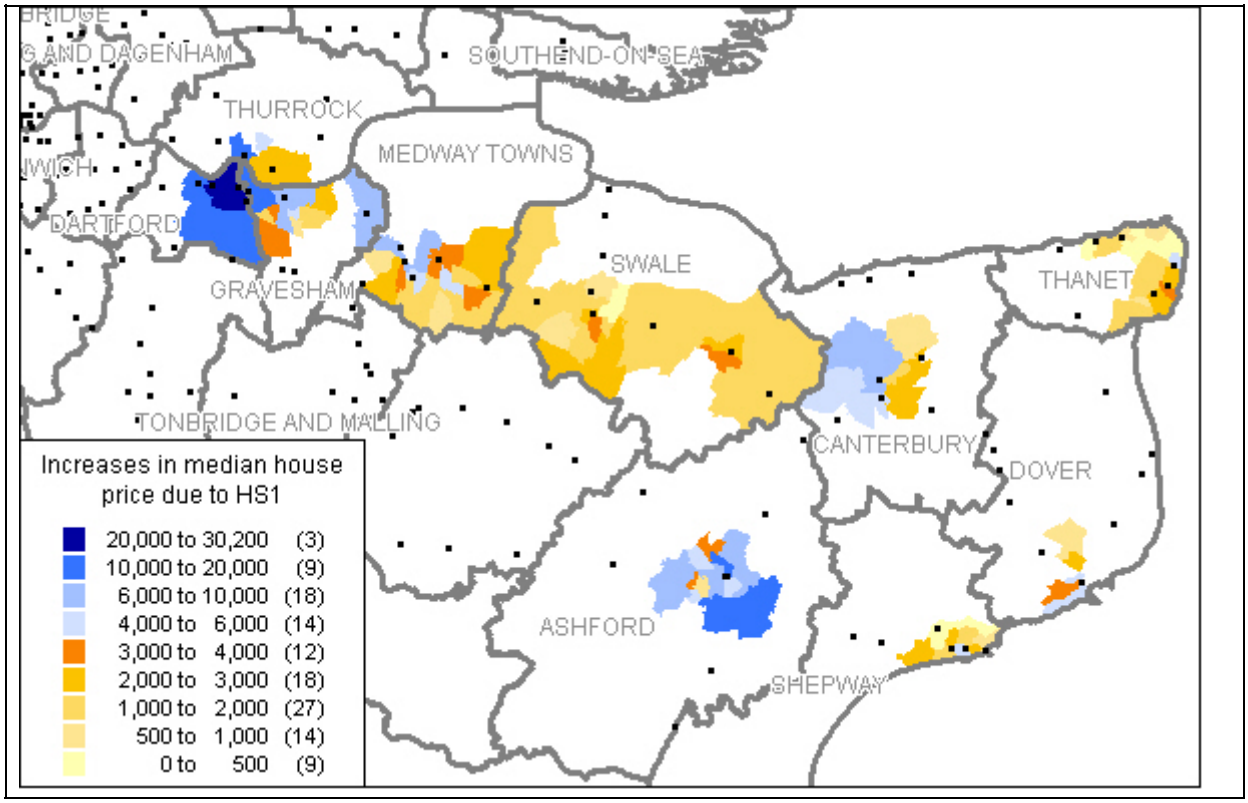
Even a conservative estimate suggests that the economic gains accruing to regeneration areas associated with these developments could be worth £10bn as a Present Value over 60 years.

(b) HS1 will drive the success of the three sites above, but will also bring economic benefits to other regeneration areas along the route with expected growth in population, employment and increases in house prices. Increasing accessibility to London will also lead to an increase in commuting from locations in Kent to London, with an associated increase in earnings. Depending on the assumptions used the value of the additional earnings could be in the range of £62m - £360m.

The prospect of higher house prices is more likely to encourage developers to invest in these areas and provide additional housing and employment capacity, thus supporting the potential to achieve the development targets set in the region.

In total, the increased value of houses in and around the stations has been estimated at approximately £1.6bn as a Present Value over 60 years. The changes in house prices by location is shown in Figure S 1 below; in a sense this represents part of the capitalised amount of central London value that is being relocated. The rest is the consumer spending which generates local jobs and the potential for further investment in new productive capacity in new settlements such as Ebbsfleet. This is not included at all since we essentially assume it is just a transfer from elsewhere in the UK. If however these locations can now attract investment which would otherwise go elsewhere, then the benefits to UK plc will be larger.

Figure S 1: Absolute average house price increases estimated when HS1 services are operational



Whilst there is some overlap between the regeneration benefits and the WEBs, the regeneration is still estimated to be worth at least an additional £10bn as a Present Value over 60 years.

HS1 also has impacts beyond those valued within this report. Those would include effects on international image and profile, better international links, environmental gains and tourism growth. Even on those on which we have placed a value, it seems clear that the scheme has provided good value for money. The impacts that have been quantified are summarised in Table S 2.

Table S 2: Economic impacts of HS1

	£bn
Transport benefits	3.8
Wider Economic benefits	3.8
Regeneration benefits	10.0
Total benefits (Present Value over 60 years)	17.6

1 Introduction

1.1.1 Colin Buchanan (CB) and Volterra were commissioned by London & Continental Railways to investigate the economic benefits of High Speed 1 (HS1), the high speed rail line connecting London St Pancras International station with the UK end of the Channel Tunnel.

1.1.2 Prior to the implementation of High Speed 1, Eurostar services between Paris / Brussels and London were required to travel at normal speeds for the UK part of the journey, using existing track and serving London Waterloo station. High Speed 1 has subsequently been delivered in two sections:

- Section 1 (September 2003): a high-speed track from the Channel Tunnel to North Kent, with the remainder of the journey through to Waterloo continuing to use existing lines.
- Section 2 (November 2007): a further section of high-speed track from the newly-constructed Ebbsfleet station through to London St Pancras. This has enabled even faster journey times on Eurostar international services, and the HS1 track will also be used to provide additional, quicker domestic services between St Pancras and Kent stations.

1.1.3 Our assessment takes into account the overall change to the transport network as a result of High Speed 1 – so our base (or 'Do Minimum') scenario assumes that there is no high speed track within the UK and Eurostar services go to Waterloo. Against this we compare the 'Do Something' scenario where Section 2 of HS1 has been implemented, with Eurostar switching from using Waterloo to St Pancras instead.

1.1.4 The transport impacts have been valued in a manner consistent with Department for Transport (DfT) guidance. In valuing the regeneration gains this study has determined the likely increase in output and expenditure within regeneration areas.

1.1.5 The report does not take into account the future potential to add services through the North London Line connection north of St Pancras, additional international trains under open access and the potential to run double decker trains which are provided for within the HS1 infrastructure. The study also excludes the positive benefits on the environment through sustainable transport improvements, reuse of heritage buildings such as St Pancras International and St Pancras Chambers, and any benefits to freight.

1.1.6 The rest of the report is divided into the following chapters:

- Chapter 2: transport user benefits;
- Chapter 3: wider economic benefits (WEBs);
- Chapter 4: an estimate of the regeneration benefits, first using a method compliant with DfT guidance and then taking an alternative, more realistic approach;
- Chapter 5: a cost-benefit analysis based on the benefits that have been monetised; and
- Chapter 6: conclusions.

1.1.7 The Appendix provides further details on some of the assumptions underpinning the main results and the results of some sensitivity tests.

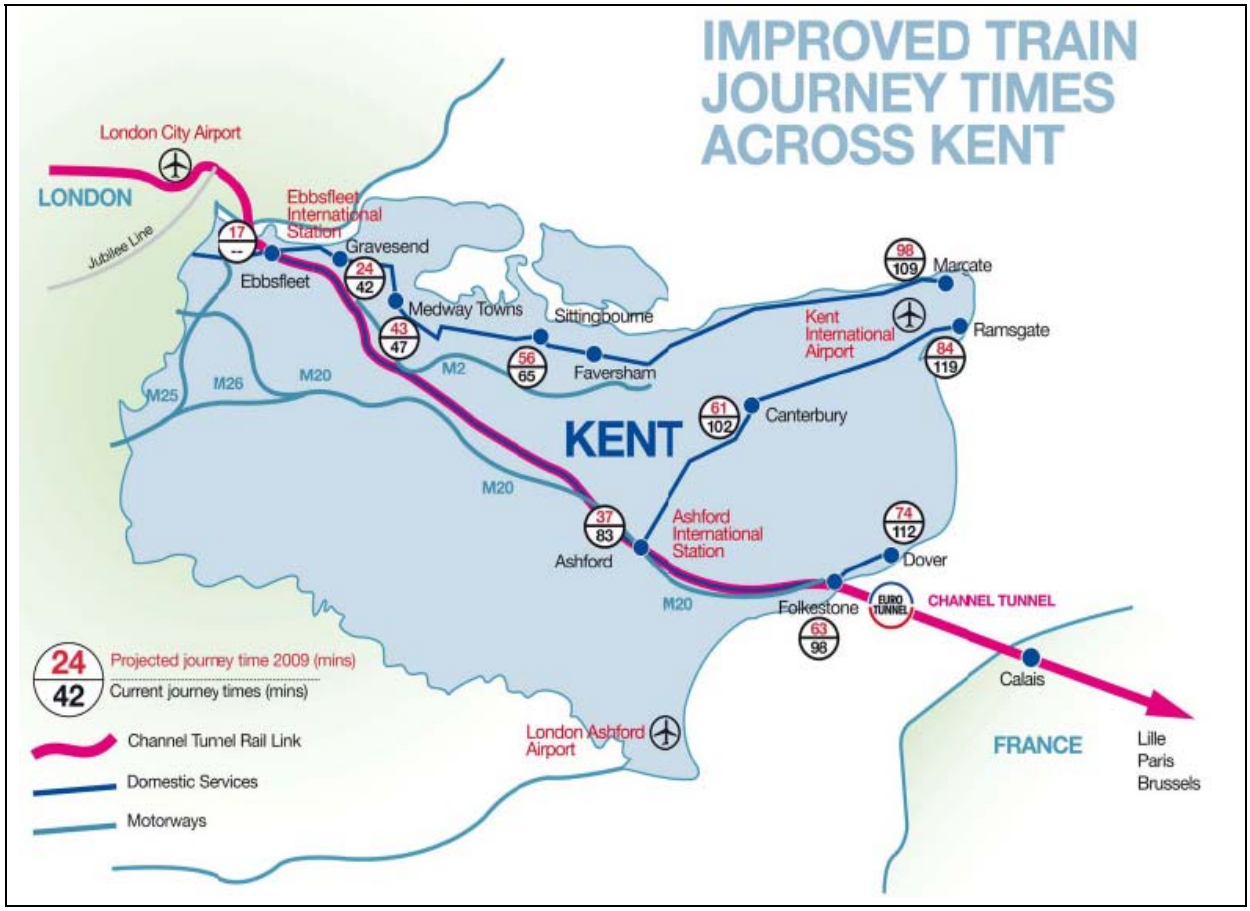
2 Transport user benefits

2.1 Journey time savings

2.1.1 There are time savings for journeys on international and domestic rail services arising from High Speed 1:

- International: existing Eurostar services become quicker due to the introduction of high speed track for the UK section of the international journeys. The overall time saving per journey between London and Paris / Brussels as a result of High Speed 1 is approximately 35 minutes.
- Domestic: from December 2009, Southeastern will use the high speed track to operate additional domestic services to the existing 'classic' services between Kent and London. Figure 2.1 shows a comparison of the estimated in-vehicle times for the classic and high speed services for selected stations.

Figure 2.1: Journey times on domestic services to London



Source: http://www.southeasternrailway.co.uk/content/doc/cms/Connectivity%20map%202.pdf

2.1.2 The map in Figure 2.1 shows that there will be substantial time savings for passengers that switch to the high speed domestic services, for instance a 46 minute saving between Ashford and London and a 41 minute saving between Canterbury and London.

2.1.3 To calculate total time savings, data on demand has been obtained. For the international services, Eurostar provided total passenger numbers for trips between London and Paris / Brussels.

2.1.4 For domestic services, a time series of demand for the classic services was obtained from LENNON (the rail industry's central ticketing system). For the base scenario it was assumed that demand was in line with the LENNON figures, with an annual growth rate of 3.2% applied for future years (based on historic LENNON data).

2.1.5 To estimate the higher demand due to HS1, the generalised costs of travel in the Do Minimum and Do Something scenarios were estimated. Our generalised costs include:

- Rail journey time
- Walk time to the origin station and from the destination station
- Change in access time within London (i.e. passengers will have a shorter or longer journey time within London due to arriving at St Pancras instead of Waterloo / Charing Cross / Victoria)
- Fare (it was assumed that fares on the high speed domestic services will be 30% higher than the fare for classic services)

2.1.6 An elasticity was then applied to estimate the increase in demand as a result of High Speed 1.

2.1.7 For commuting demand a higher uplift was applied, based on an estimate of the relationship between journey times to London and the proportion of workers who commute to London as a result. The new journey times to London under HS1 were then used to estimate the extent of the increase in commuting demand.

2.1.8 The relationship between journey times and commuting patterns is explained in more detail in Appendix B. Table 2.1 summarises the proportion of commuters in the base scenario (a weighted average of wards within 5km of each station using 2001 census data), and our estimate of the new proportion when the journey times improve (taking into account the frequency of high speed trains relative to existing services).

Table 2.1: Changes to journey times and commuting patterns

Station	Base time (minutes)	HS1 time (minutes)	% commute by rail to London in base	% commute by rail to London under HS1
Ashford	83	37	3.4%	4.6%
Gravesend	42	24	6.3%	7.5%
Chatham	60	43	5.8%	6.2%
Strood	54	37	4.8%	6.5%
Rochester	57	40	4.2%	5.0%
Gillingham	63	46	7.8%	8.7%
Rainham	66	49	7.2%	7.6%
Sittingbourne	65	56	4.2%	4.5%
Faversham	78	66	4.9%	5.3%
Canterbury West	102	61	1.4%	2.2%
Folkestone Central	98	63	1.3%	1.6%
Dover Priory	112	74	0.4%	1.2%
Ramsgate	119	84	0.8%	1.0%
Margate	109	98	0.7%	0.8%

2.1.9 The value of time used to monetise the benefit is in line with guidance from WebTAG. Further details on the appraisal assumptions are provided in the Appendix.

2.1.10 Table 2.2 shows the total time saving benefits for the international (taking into account the first few years of smaller time savings as a result of Section 1) and domestic services, expressed as a Present Value over 60 years.

Table 2.2: Value of time savings (£m, 60-year PV, 2008 prices)

Journey type	Time saving
International	2,500
Domestic	1,200
TOTAL	3,700

2.2 Congestion relief

2.2.1 As well as journey time savings, the additional domestic capacity provided by High Speed 1 will relieve crowding on trains to London.

2.2.2 Due to lack of available data this benefit is more difficult to quantify than the time savings. Our approach has been to assume that the congestion relief would be valued at 40 pence per trip for passengers who switch to the new high speed domestic services, and 20 pence for remaining passengers, with an annual growth rate of 1% applied to those values.

2.2.3 This approach indicates that, over 60 years as a Present Value, the congestion relief benefit would be **£113.6m**. It should be noted that this is an underestimate, since passengers on other services (not just those that board in Kent) will benefit from the overall reduction in crowding. However it has not been possible to estimate the full extent of the congestion relief benefit without a proper assignment model.

2.3 Costs

2.3.1 There are two elements to the cost of High Speed 1; the capital costs arising from the new infrastructure and the operating costs from providing additional services.

2.3.2 Our understanding is that the capital costs were approximately £6.2bn (undiscounted, in 2007 prices including the stations and depot). In our appraisal we have spread the costs over a number of years and discounted accordingly.

2.3.3 Any additional operating costs associated with the international services have been assumed to be zero or negligible; however this is not the case for the domestic services as a number of additional services will be operated, using Class 395 high speed trains.

2.3.4 Table 2.3 shows the total discounted value of the capital and operating costs.

Table 2.3: Capital and operating costs (£m, 60-year PV, 2008 prices)

Type	Cost
Capital	5,700
Operating	1,600
TOTAL	7,300

2.4 Revenue

2.4.1 High Speed 1 will lead to an increase in rail revenue, as the faster journey times and increased capacity will lead to additional demand on international and domestic services. Fares for HS1 services will also be higher than the fares on classic services.

2.4.2 The scheme also leads to the generation of extra car park revenue as a result of the new Ebbsfleet International station.

2.4.3 The changes in demand that were estimated as part of the benefit calculations have also been used to estimate changes in revenue. An average fare has been applied for the international services; for the domestic services it is assumed that fares for the high speed trains are 30% higher than the fares for the classic services.

2.4.4 As a Present Value over 60 years, the additional revenue as a result of High Speed 1 has been estimated as **£3,353m**. Over 90% of this amount is due to the rail revenue impacts but it is important to note that this is not the total HS1 revenue, only the marginal change in overall rail revenue as required within the economic appraisal.

2.5 Conclusions

2.5.1 Table 2.4 summarises the transport impacts of HS1. It shows that HS1 provides a significant total transport benefit of £3.8bn (as a Present Value). HS1 also increases revenue (rail & car park) by £3.4bn, offsetting the operating costs and some 31% of capital costs. The lower discount rates applied to economic appraisal mean that this is not equivalent to a financial appraisal.

Table 2.4: HS1 transport impacts

	£m, 60-year PV
Journey time savings	3,700
Congestion relief	100
TOTAL BENEFITS	3,800
Capital cost	5,700
Operating costs	1,600
Revenue	-3,400
TOTAL COST	3,900

3 Wider Economic Benefits

3.1 Introduction

3.1.1 The inclusion of Wider Economic Benefits (WEBs) in transport appraisal is a recognition of the benefits that a scheme can bring about in terms of increasing workers' productivity and the associated increase in output. Transport schemes can cause this in two main ways:

- By enabling a **Move to More Productive Jobs** (M2MPJ): if peak period rail services to city centres (where productivity tends to be highest) become overcrowded, this may prevent some people from making that journey. The provision of additional capacity can help to enable more workers to access city centre jobs where they will be more productive.

- By increasing the 'effective density' of employment areas and leading to a '**Pure' agglomeration** benefit. Transport schemes can enable an increase in city centre employment as described above, but they can also increase accessibility between locations by reducing the generalised costs of travel. Both of these impacts mean that a larger number of workers are effectively located closer to each other, leading to an increase in density. There is a positive relationship between effective density and productivity.

3.1.2 High Speed 1 provides an M2MPJ benefit because there will be an increase in peak capacity on the domestic services from Kent stations to London, and the spare capacity made available at Waterloo International Terminal (WIT) could also be used. It also leads to a pure agglomeration benefit because of the reduction in generalised costs of travel between London, Kent and international destinations.

3.2 Move to more productive jobs

Increased capacity on domestic services

3.2.2 When the new domestic services are opened, our understanding from discussions with the DfT is that there are likely to be six high speed trains per hour (four twelve-car trains and two six-car trains) during the peak period. Assuming that the capacity of each six-car train is 368 seats and 154 standing, the total additional capacity per peak hour will be 5,220 (or 15,660 during the three-hour morning peak period).

3.2.3 To estimate the likely benefit, the additional capacity of HS1 was compared with the additional rail capacity that Crossrail will provide. HS1 provides approximately 18% of the amount of peak capacity that Crossrail will provide. It was therefore assumed that the number of additional central London jobs as a result of HS1 is 18% of the expected total for Crossrail (which equates to approximately 4,800 jobs). That is consistent with 30% of the additional peak capacity provided by HS1 being filled by additional growth in central London employment.

3.2.4 To quantify this as a benefit, it is necessary to know the difference in productivity levels between central London and the areas in Kent where the workers were previously located. In line with research undertaken by the DfT, Table 3.1 shows the productivity differentials by district[2], relative to the national average.

[2] The value for London is an average of inner London boroughs, weighted using borough employment levels.

Table 3.1: Productivity differentials relative to the national average, by district

District	Stations within district	Productivity differential relative to national average
London		+22.35%
Newham	Stratford	+2.71%
Dartford	Ebbsfleet	-0.02%
Ashford	Ashford	-10.28%
Gravesham	Gravesend	-10.12%
Medway	Chatham, Strood, Rochester, Gillingham, Rainham	-9.88%
Swale	Sittingbourne, Faversham	-14.18%
Canterbury	Canterbury West	-10.35%
Shepway	Folkestone West / Central	-12.62%
Dover	Dover Priory	-9.06%
Thanet	Ramsgate, Margate	-12.69%

Source: DfT

3.2.5 This shows that productivity in London is significantly higher than most areas of Kent – for instance, London's productivity is 22% higher than the national average and Canterbury's is 10% lower than the national average – hence workers in London are approximately 32% more productive than those in Canterbury.

3.2.6 It is assumed that the additional central London workers were previously working in their 'home' district, with the total number of workers split proportionally to the number of trips from each district to London. The productivity differentials in Table 3.1 can then be applied to calculate the total increase in output.

Waterloo International Terminal

3.2.7 Since Eurostar services previously used Waterloo as the London terminal and now use St Pancras as a result of HS1, there is potential to use the platform capacity available at WIT for domestic services. This is a direct consequence of High Speed 1 so it can legitimately be claimed as a benefit.

3.2.8 Network Rail's *South West Main Line Route Utilisation Strategy* in 2006 noted of Waterloo that:

"The footprint of the station and its approaches is severely constrained, even by the standards of central London terminals. Use of part of the footprint of the long international platforms would allow other platforms in the station to be extended and the track layout in the station's 'throat' to be remodelled for much greater flexibility."

3.2.9 There are five platforms at WIT (Platforms 20 – 24). It was announced in 2008 that work would be undertaken to enable Platform 20 to be used for existing domestic services. The DfT[3] is then planning to:

"make all the platforms at Waterloo long enough to accommodate 10 car trains and to modify the junction layouts on the approaches to the station, so that, ultimately, all the

[3] http://www.parliament.the-stationery-office.co.uk/pa/cm200708/cmhansrd/cm080707/text/80707w0014.htm

platforms at Waterloo, including those once used by Eurostar, can be used by 10 car domestic services"

3.2.10 As there is uncertainty about the exact timescale and implementation of such a scheme, we have been relatively conservative in our estimate of the impacts. It has been assumed that Waterloo can currently handle 85,000 passengers and that using WIT enables a 15% increase in capacity, of which 50% is filled by demand that was previously crowded off. This approach suggests that using WIT for domestic services may enable central London employment to grow by approximately 6,300 (in addition to the 4,800 estimated in the previous section). This is valued using the same approach as outlined above, with a ramp-up applied such that it takes four years for the full 6,300 jobs to be achieved.

Results

3.2.11 The move to more productive jobs leads to an increase in GDP; however, the current DfT guidance is that only a proportion of this increase in output can be claimed as a welfare benefit when undertaking a transport appraisal. This is because it is argued that some of the benefit of working in a more productive job is outweighed by the costs associated with it such as increased stress and responsibility. Only 30% of the GDP increase can be claimed as a welfare increase.

3.2.12 Table 3.2 shows the GDP and welfare increase for both elements of the HS1 move to more productive jobs benefit – the additional capacity provided by the high speed services and the increased capacity provided by WIT.

Table 3.2: Move to more productive jobs benefit (£m, 60-year PV, 2008 prices)

Capacity increase	GDP increase	Amount of GDP increase that can be claimed as a welfare benefit
Additional high speed domestic services	2,300	700
Additional capacity at WIT	3,400	1,000
Total	5,700	1,700

3.3 Pure agglomeration

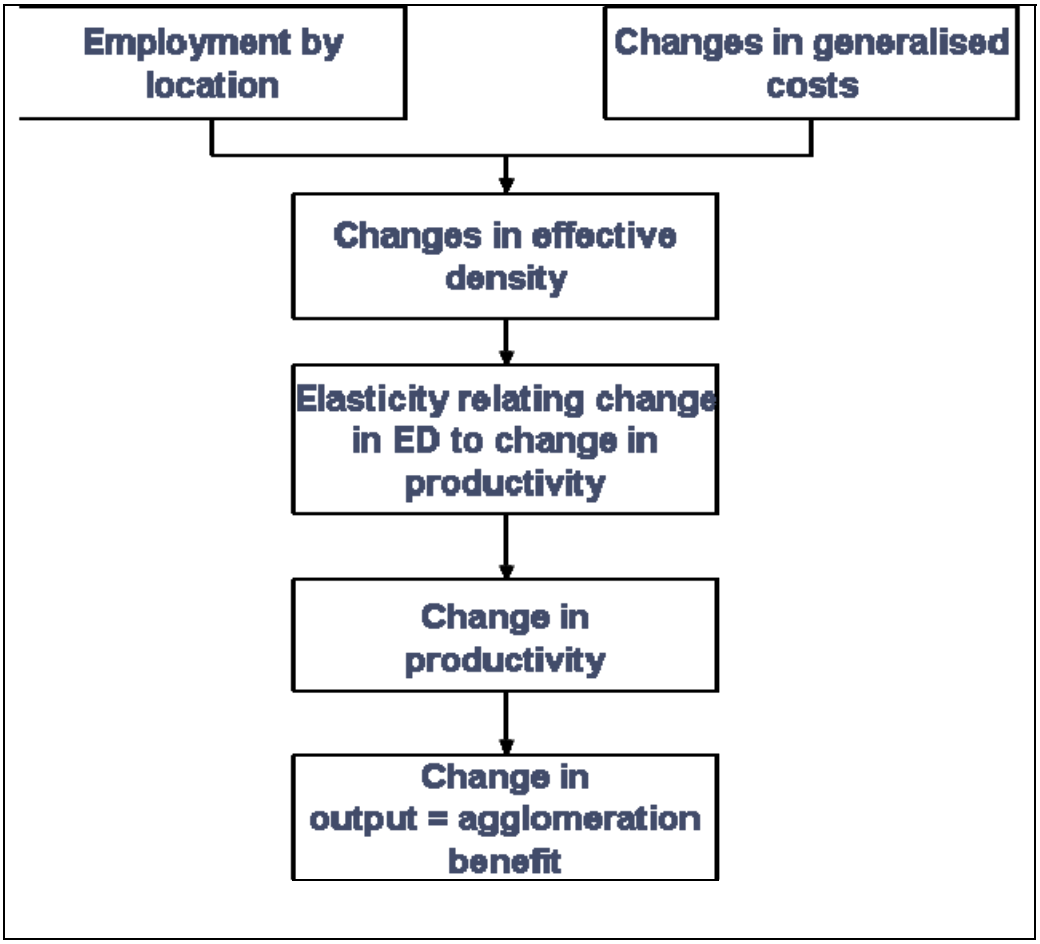
3.3.1 As explained in section 3.1, High Speed 1 will increase the effective density of employment centres along the route, since accessibility between locations will increase as a result of the faster journey times.

3.3.2 An increase in density results in an increase in productivity for a number of reasons. It leads to:

- A larger, deeper, labour market – providing employers with more choice of skills and more competition for jobs;
- More competing and complementary businesses and institutions – providing additional pressure for innovation and efficiency and enabling greater specialisation amongst support services;
- A larger, deeper, client market – London's Finance and Business Services (FBS) sector for instance is a global player attracting business from around the world; and
- Greater potential for contact and knowledge sharing – both informally via social interaction and more formally via conferences.

3.3.3 The process for calculating the pure agglomeration benefit is shown in Figure 3.1.

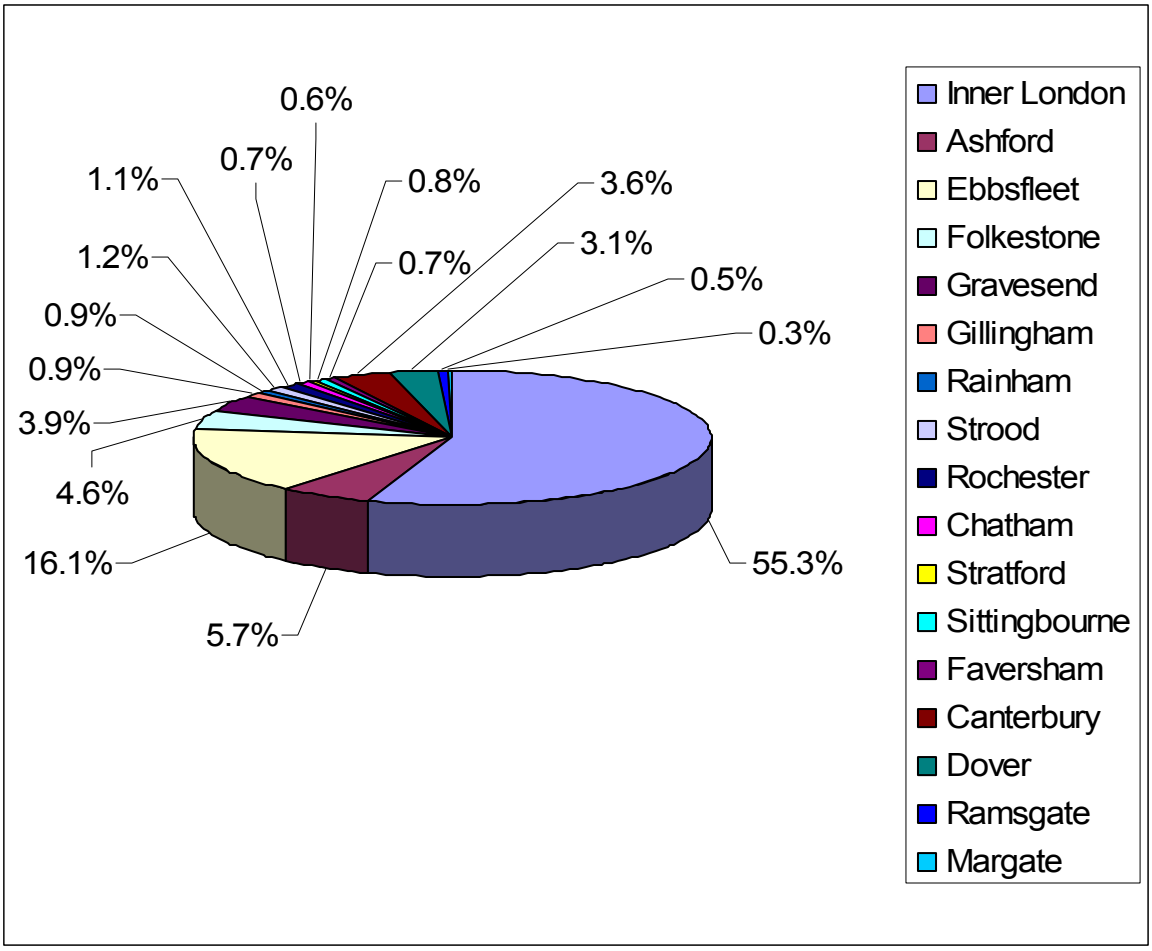
Figure 3.1: Process for calculating pure agglomeration benefits



3.3.4 So once the changes in effective density as a result of HS1 have been calculated, an agglomeration elasticity is applied. The elasticity determines the scale of the change in productivity and varies by location – elasticity values are available from the DfT.

3.3.5 Our calculations indicate that the value of the pure agglomeration benefit, as a Present Value over 60 years, is **£1,775m**. Figure 3.2 shows how this is split between each location.

Figure 3.2: Proportion of pure agglomeration benefits by location



3.3.6 Figure 3.2 shows that the majority of the pure agglomeration benefits accrue to Inner London. This is because it has the highest density of employment, the highest productivity and also benefits from the improved accessibility to Paris and Brussels (any increase in effective density for Paris and Brussels themselves has not been included).

3.4 Other WEBs

3.4.1 Two other WEBs are identified in the DfT guidance that can be applied to HS1:

- Increased labour force participation: reducing the generalised costs of travel means that 'effective wages' are increased, which will have an effect on labour force participation;
- Imperfect competition benefits: reducing the generalised costs of travel may induce firms to increase output, which in imperfect markets is kept below its optimal level.

3.4.2 The DfT recommends that these benefits are calculated by taking a percentage of the time saving benefits, hence they are much easier to calculate than the M2MPJ and pure agglomeration benefits.

Labour force participation

3.4.3 The labour force participation (LFP) benefit is calculated as 21% of the commuter time savings. Only 40% can be claimed as welfare benefit. The value of the commuter time savings is £557m (as a PV over 60 years) and so the value of the increase in output as a result of LFP is £117m, of which **£47m** can be claimed as a welfare benefit.

Imperfect competition

3.4.4 The imperfect competition benefit is calculated as 10% of time savings to business trips. The value of 'In Work Time' time savings is £2,442m (as a PV over 60 years) and so the value of the imperfect competition benefit is **£244m**.

3.5 Summary

3.5.1 Table 3.3 summarises the WEBs results described above.

Table 3.3: Wider Economic Benefits of HS1

	£m, 60-year PV
Move to more productive jobs	1,700
Pure agglomeration	1,800
Labour force participation	50
Imperfect competition	250
TOTAL WIDER BENEFITS	3,800

4 Regeneration benefits

4.1.1 HS1 was intended to create the widest regeneration effects possible as part of its original planning. The domestic line will run through the government's largest regeneration area, the Thames Gateway, which is the backbone of regional planning policies in London and the South East.

4.1.2 In this chapter we outline the two approaches which have been undertaken to estimate the likely regeneration impacts of HS1. The first is compliant with DfT guidance and restricts regeneration benefits to increased employment amongst currently unemployed residents of regeneration areas. The second approach takes a broader, more realistic view, recognising how HS1 will have significant impacts in changing development and employment around the HS1 stations.

4.2 DfT approach

4.2.1 Improvements in accessibility from regeneration areas to areas of employment can help unemployed and economically inactive residents to obtain employment. HS1 will radically speed up journeys to London from large parts of Kent.

4.2.2 However, the cost of season tickets (from £60 a week upwards before any premium may be added for high speed services) are such that it is difficult to envisage those who are presently unemployed who are predominantly lower skilled taking up employment in central London due to the new faster services.

4.2.3 What is more likely to occur is a trickle down effect. That is, people presently in employment working in parts of Kent to be served by new high speed domestic services may take up employment in London and their jobs are in turn taken by people presently unemployed.

4.2.4 Projecting present passenger numbers forward for the Do Minimum scenario and then looking at the changes in generalised cost to determine passenger numbers on the new service we have calculated the increases in passenger numbers projected to arise from each major station into London on the new high speed domestic services.

4.2.5 Using DfT figures on the proportion of passengers travelling on season tickets an annualisation figure of 813 has been determined. This has then been used to assess how many additional "commuters" there will be from each station to London as a result of HS1.

Definition of regeneration areas

4.2.6 The main regeneration area in the South East is Coastal South East which covers Kent Thames Gateway, East Kent and Ashford, Sussex Coast, South Hampshire and the Isle of Wight. A significant proportion of this area therefore covers all the towns to be served by the new high speed domestics.

4.2.7 The number of people who are unemployed by qualification level in each of the local authority districts covering these areas is given in Table 4.1.

Table 4.1: Unemployment by qualification level & district

	Ashford	Dover	Gravesham	Medway Towns	Shepway	Swale	Thanet
Economically active with NVQ4+ - working age	900	200	900	0	500	1,100	300
Economically active with NVQ3 only - working age	500	300	0	800	500	300	400
Economically active with Trade Apprenticeships - working age		0	400	0	200	600	0
Economically active with NVQ2 only - working age	1,000	600	400	1,700	1,000	800	700
Economically active with NVQ1 only - working age	600	300	2,300	2,700	500	1,600	2,600
Economically active with other qualifications - working age	0	0	700	1,100	500	0	0
Economically active with no qualifications - working age	300	0	1,400	900	200	300	300

Source: NOMIS

4.2.8 Table 4.2 shows an estimate of the average skill levels required in London.

Table 4.2: Skill levels of London jobs

Qualification level	Proportion of London jobs at this skill level
No qualifications	8.7%
Other qualifications	15.6%
Level 1	10.5%
Level 2	13.9%
Level 3	14.4%
Level 4 and above	36.9%

4.2.9 If it is assumed that only those people with level NVQ2 and above commute given the level of fares then the proportion of people commuting by skill level from each location will be as shown in Table 4.3.

Table 4.3: Proportion of workers that will commute to London at each skill level

Qualification level	Proportion of people at this skill level who will commute
Level 2	21%
Level 3	22%
Level 4 and above	57%

4.2.10 Assuming that the increase in commuting is split 50:50 between people switching jobs to take up employment in London and people moving into the area because of the new fast

rail links, the number of existing local residents by location taking up employment in London by skill level is set out in Table 4.4.

Table 4.4: Number of local residents taking up employment in London

	NVQ2	NVQ3	NVQ4
Stratford	1	1	3
Ebbsfleet International	71	73	188
Ashford	23	24	61
Gravesend	22	23	59
Chatham	16	16	42
Strood	4	4	9
Rochester	3	3	9
Gillingham	9	9	24
Rainham	9	10	25
Sittingbourne	3	3	9
Faversham	3	3	7
Canterbury West	8	8	21
Folkestone Central	5	6	14
Dover Priory	2	2	6
Ramsgate	2	2	5
Margate	1	1	2

4.2.11 Ignoring Ebbsfleet (in the latter case all the jobs will be taken up by new residents), 521 jobs are potentially now available for local unemployed residents. With the exception of the Medway towns (Gravesend, Chatham, Strood, Rochester, Gillingham) where there are not enough unemployed residents with NVQ4 skills available, there are enough residents with the appropriate skills available to fill those jobs.

4.2.12 At a fairly rudimentary level, the total regeneration impact in relation to unemployed residents taking up employment because of the direct impacts of High Speed domestic services is in the order of 400.

4.3 Alternative approach

Introduction

4.3.2 Regeneration is about more than just increasing employment amongst currently unemployed residents of regeneration areas. It also relates to reinvigorating areas that are not fulfilling their potential or whose economic focus has been lost. This requires ensuring that a focus is placed on productive new economic activities, thus attracting inward investment from developers and appealing to new residents as places to live and work. Public transport infrastructure can play a crucial role in this, facilitating sustainable and efficient travel patterns and enabling economies to be connected to one another.

4.3.3 The time it takes to travel to work and the local amenities available are important factors for people when choosing where to live. The HS1 domestic line will reduce travel times and make the areas appeal more to commuting residents, leading to inward investment and higher incomes which can in turn support better local amenities. In other words, the transport investment can be the first step in a virtuous circle towards regeneration of an area.

4.3.4 The domestic high speed rail line will run through Kings Cross, Stratford, Ebbsfleet and Ashford International. It will result in significant travel time savings from these locations to central London. Travel by train from many other stations in the South East will also

improve as they connect for part of their journey into a quicker service. The stations which are expected to see significant travel time reductions are therefore as follows:

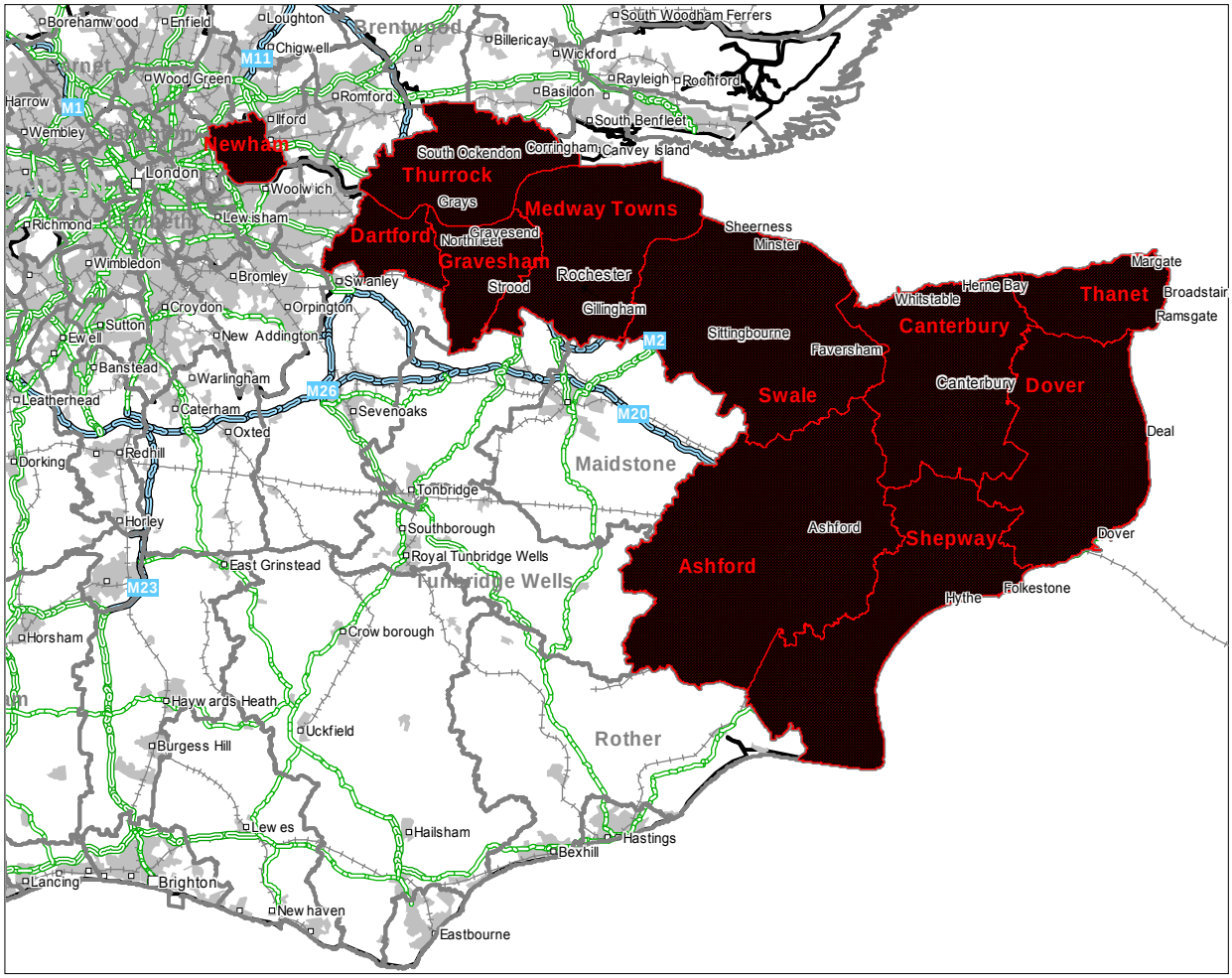
- Stratford
- Ebbsfleet
- Ashford International
- Gravesend
- Medway Towns (Rochester, Chatham, Gillingham, Strood, Rainham)
- Sittingbourne
- Faversham
- Canterbury
- Folkestone
- Dover
- Ramsgate
- Margate

4.3.5 Figure 4.1 below highlights the ten districts in which these stations fall on which High Speed 1 is expected to have a significant impact. These districts are:

- Newham
- Dartford
- Thurrock
- Gravesham
- Medway Towns
- Swale
- Ashford
- Canterbury
- Shepway
- Dover
- Thanet

4.3.6 With the exceptions of Newham and Thurrock, all of these districts fall within the South East of England, while Newham lies in the London region and Thurrock lies in the East of England region.

Figure 4.1: Districts potentially benefiting from High Speed 1 time savings – the study area



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4.3.7 HS1 has enabled the delivery of three major development schemes in Ebbsfleet, Stratford and King's Cross. Those schemes are delivering significant impacts on three regeneration areas with plans for over 15,000 homes and 70,000 jobs resulting in quantifiable residential spending and output.

4.3.8 The high speed rail line is a significant factor in bringing forward these and other developments. This section considers these and other regeneration benefits that may be expected to be realised as a result of delivery of the domestic services.

4.3.9 Further details and background information are provided in the Appendix which includes information such as employment and population in the study area.

Planning overview

4.3.10 Table 4.5 below provides a snapshot summary of aspirations and progress on the construction of dwellings and employment floorspace to date, in the relevant study

districts. This shows that Dartford and Ashford have the most ambitious targets in terms of housing and employment provision.

Table 4.5: High Speed 1 Districts Summary Table

	Housing					Employment		
	Strategy-based Dwelling projections (2006-2026)	Strategy-based Population projections (2006-2026)	ONS population projections (2006-2026)	Completions[4]	Ratio of annual completions to annual targets	Allocations/ Commitments (2006-7)	Implied jobs[5]	Completed floorspace (2001-7)
Thurrock[6]	18,500	-	28,500	5,173	79.9%	473,551	23,678	-
Dartford	15,700	28,600	19,000	1,954	49.8%	5,015,100	47,950	252,100
Gravesham	9,400	13,100	11,900	1,037	31.5%	1,801,200	21,550	76,500
Medway	16,400	- 2,700	23,300	8,796	82.5%	447,016	39,250	24,232*
Swale	9,200	3,900	26,300	3,700	134.1%	3,460,700	51,800	541,900
Canterbury	9,100	5,200	41,200	1,960	107.7%	801,100	13,050	58,400
Ashford	22,700	39,800	33,200	3,920	57.6%	2,185,300	28,600	282,600
Shepway	5,200	- 3,000	20,200	5,351	411.6%	763,000	11,800	315,000
Dover	8,000	2,100	14,500	2,010	83.8%	1,383,900	23,450	129,500
Thanet	7,400	700	19,900	1,558	105.3%	1,323,200	15,500	223,200

Sources: Regional Plan Strategy-based projections, Local Plans, District Annual Monitoring Surveys, District Annual Commercial Monitoring Surveys, Thurrock Employment Land Review 2007

** Medway floorspace completions for 1991-2004*

4.3.11 In terms of employment floorspace, Swale also has a significant allocation/commitment of almost 3.5 million square metres. Past completions of housing and employment construction have similarly been most impressive for Swale and Shepway.

4.3.12 Based on South East of England Regional Plan strategy however, Medway and Shepway are expected to experience population declines to 2026, despite projected growth from ONS population forecasts covering the same trajectory alongside significant employment growth.

4.3.13 The significant disparity between the strategy-based and the ONS population projections may be for a number of reasons:

- The strategy-based projections take into account the net growth in dwellings, in that they take account of any lost dwellings[7] and thus any resultant population loss.
- ONS projections are based on expected migration, fertility and death rates, and may not take into account the constraints that housing provision or changing average household sizes could put on growth.
- Migration assumptions are also likely to have varied between forecast-methods.

4.3.14 Even allowing for these methodological differences, the disparity between the two approaches is significant and should be kept in mind. This suggests a broad possible range of population growth in the study areas.

[4] Housing completions apply to a (varying) historic period of at least four years
[5] Implied jobs based on average 20 sqm per employee density
[6] Thurrock targets and applied population apply to period 2001-2021
[7] South East Plan 2006 Policy H1: Housing Provision

Delivery of growth at Kings Cross, Stratford and Ebbsfleet

4.3.15 HS1 has enabled the delivery of three major development schemes in Ebbsfleet, Stratford and King's Cross. Those schemes are delivering significant impacts on three regeneration areas with plans for over 15,000 homes and 70,000 jobs resulting in quantifiable residential spending and output.

4.3.16 Work by Hunt Dobson Stringer has summarised the development planned at King's Cross, Stratford and Ebbsfleet (and Eastern Quarry). The King's Cross development is significant, in total accommodating some 22,100 permanent jobs and 2,000 dwellings. The Stratford site could also create up to 34,000 jobs and up to 5,500 dwellings. The Ebbsfleet/Eastern Quarry site should cumulatively accommodate 31,140 jobs and 8,365 dwellings. These effects are summarised in the table below.

Table 4.6: Impact of development schemes associated with High Speed 1

	King's Cross	Stratford	Ebbsfleet	Eastern Quarry
Permanent jobs	22,100	34,000	24,000	7,200
GDP per annum	£1.3bn	£1.8bn	£1bn	£275m
Homes	2,000 (plus some student housing)	Up to 5,500	2,100	6,250
Household spending per annum	£50m	£140m	£49m	£144m
Temporary jobs during construction (FTE)	2,500	4,000	3,500	

Source: Hunt Dobson Stringer: London & Continental Railways, Making Regeneration Happen, February 2008

4.3.17 These developments will have a significant impact upon the areas in which they are located. For example, in 2006 employment in Dartford (the district in which Ebbsfleet is located) was just under 50,000 and has grown by 45 per cent over the last 15 years. The targets are considerable for a further 50,000 additional jobs by 2021. The planned development, creating office space which would house some 24,000 jobs will therefore represent a very large portion of the district's objectives for growth.

4.3.18 The construction of HS1 provided the justification for rolling back the green belt and previous strategic gap policies in the Ebbsfleet Valley where the previous planning history was one of strict development restraint. Without HS1 it is very unlikely that development of this quantum would have been permitted at Ebbsfleet.

4.3.19 Similarly in Newham, home to Stratford, employment currently stands at some 70,000 jobs and the planned jobs created at the development there will be three times the growth seen in the area over the last 15 years. These comparisons show the extent of the growth enabled by these developments. Furthermore, HS1 created the development site at Stratford by removing previous railway uses and dealing with all the land issues. Again, without HS1 it is very unlikely that development of this quantum in such an accessible location could have taken place.

4.3.20 It is difficult to quantify the extent to which any of this growth is additional. The DfT's approach is to assume that this growth would have otherwise occurred elsewhere and therefore a benefit cannot be claimed. However, if it is the case that a constraint exists which may have prevented this growth from occurring then it must be the case that some value should be attributed to delivery of this growth.

4.3.21 Such a constraint might be, for instance, the lack of easily available and attractive locations that would encourage businesses to expand or start up when they might otherwise not have done so. They could also attract investment that might otherwise have taken locations outside of the UK. This is particularly true in locations with easy access to other countries which is (by definition) true of the study area.

4.3.22 If just five per cent of the impacts are viewed to be completely additional then this would generate some £200m of additional GDP per annum. This results in a Present Value over 60 years (allowing for some growth) of almost £10bn. This is significant in comparison to the cost of delivery of the HS1 project. It does not seem unreasonable that at least five per cent of this growth could be completely additional. For the reasons set out in paragraphs 4.3.18 and 4.3.19, HS1 was fundamental in the availability of these particular sites for development.

Wider regeneration effects of HS1

4.3.23 The journey times to central London before and after HS1 were summarised in Table 2.1. HS1 will lead to travel time savings of up to 45 minutes.

4.3.24 These reduced journey times into London are likely to increase the levels of commuting into the city and in turn will accelerate the regeneration, development potential and values across this area of the South East. It is reasonable to expect that the large time savings resulting from HS1 in this key regeneration area may have significant impacts.

4.3.25 Travel time data at a detailed level is not readily available. Analysis was carried out to assess the degree to which a measure from the 2001 census on commuting patterns is a reasonable proxy for journey times into London. We find this to be the case and the potential changes in commuting rates as a result of HS1 time savings were in turn estimated. We then find a relationship between commuting patterns into London and indicators of regeneration.

4.3.26 Full details of this analysis can be found in Appendix B. We examined the socio-economic characteristics of local areas (employment and population densities, economic activity rates, house prices, deprivation measures) and considered how they might be related to accessibility.

4.3.27 We find a significant relationship between house prices, levels of deprivation and accessibility. Intuitively, we find that house prices are higher where deprivation is lower and in areas where commuting rates into London are higher. The details of the resulting model can be found in the Appendix.

4.3.28 The model allows us to estimate the impact that changes in rail commuting rates may have upon house prices in an area. House prices are often used as an indicator of prosperity and developers and investors are attracted to areas where they believe large returns can be made. We estimate that a five percentage point change in commuting by rail from a place leads to approximately a five per cent uplift upon house prices.

4.3.29 Across the study areas we estimate that house prices may increase by between 0.1 and 14.4 per cent, with the largest impacts seen around Ebbsfleet station. These impacts range in value to a home owner or developer from between a few hundred pounds to tens of thousands depending on the location and type of property.

4.3.30 We estimate that the prices of the current housing stock in the study area could increase in value by between £950m and £1.6bn, with a central scenario of £1.3bn, equivalent to just over a quarter of the cost of delivering the HS1 project. This represents a capitalised value of benefits of HS1 to the residents of the study area.

4.3.31 Next we turn to consider the potential effect on earnings which may occur in the study area as a result of the increased commuting to London. We consider various scenarios (whether the additional commuting is by existing or new residents and whether they in turn induce additional local jobs) and conclude that the benefits from the increased commuting facilitated and stimulated by HS1 range from between £62m and £360m additional earnings per annum.

Conclusion

4.3.32 The DfT compliant approach to valuing regeneration estimates that around 400 currently unemployed residents may take up employment because of the direct impacts of high speed domestic services. In a DfT appraisal a monetised value would not be applied to this benefit.

4.3.33 An alternative approach to estimating the regeneration impact would be to value the increase in economic activity taking place within regeneration areas.

4.3.34 The regeneration benefits quantified in the alternative approach are summarised below:

- If five per cent of the development impacts at King's Cross, Stratford and Ebbsfleet (which HS1 has been fundamental in facilitating) are viewed to be completely additional then this is some £200m of additional GDP per annum, representing a Present Value over 60 years of £10bn;
- The value of the housing stock in the study area may increase by around £1.3bn, representing a capitalised value of HS1 benefits to current residents;
- Earnings per annum across the study area may increase by between £62m and £360m due to the commuting facilitated by HS1.

4.3.35 It is important to avoid double counting with the other benefits that have been quantified as part of the appraisal. The development impacts associated with King's Cross, Stratford and Ebbsfleet can be viewed as entirely additional.

4.3.36 The increase in the value of the housing stock is already included within the increased value of earnings valued as part of the WEBs. The same is largely true of the £62m - 360m per annum of increased earnings across the study area. However, in one scenario a value is included for the impact of additional local jobs being generated and this would be additional – it accounts for £90m of the £360m total, equivalent to £4bn as a PV over 60 years.

4.3.37 The upshot of this analysis is that High Speed 1 is estimated to provide at least £10bn of regeneration benefits in addition to the other benefits that have been quantified.

5 Appraisal results

5.1 Introduction

5.1.1 In this section we present an appraisal with a Benefit/Cost Ratio (BCR) for the central results. First an assessment is made based solely on the transport benefits, and then the WEBs are added. The results of some sensitivity tests are provided in the Appendix.

5.2 Transport appraisal

5.2.1 The method for calculating the costs and benefits that are included in a traditional transport appraisal is outlined in chapter 2. The benefits include journey time savings and congestion relief. The costs include the capital costs and operating costs of additional domestic services, but the positive financial effect of the increase in revenues (shown as a negative cost in the results tables) also needs to be taken into account.

5.2.2 Table 5.1 summarises the costs and benefits.

Table 5.1: Summary of transport costs and benefits

	£m, 60-year PV
Journey time savings	3,700
Congestion relief	100
TOTAL BENEFITS	3,800
Capital cost	5,700
Operating costs	1,600
Revenue	-3,400
TOTAL COST	3,900
Net Present Value (NPV)	-100
Benefit/Cost Ratio (BCR)	0.96

5.2.3 Table 5.1 shows that the net costs are slightly higher than the benefits, hence the BCR is just under 1. However it should be recognised that the benefits of HS1 extend far beyond those that are included in a conventional transport appraisal as per Table 5.1.

5.2.4 Other potential transport benefits that have not been quantified here include:

- The reliability improvements that may result from having the new track;
- The improved connections that will result from having new stations at St Pancras, Stratford and Ebbsfleet;
- Other improvements that would have been unlikely to occur without HS1 such as the concourse and ticket hall improvements at King's Cross.

5.3 Appraisal including WEBs

5.3.1 Chapter 3 showed that HS1 will provide several wider economic benefits, including a move to more productive jobs due to the additional peak capacity into central London, and pure agglomeration from the increased accessibility that it enables.

5.3.2 Table 5.2 replicates Table 5.1, this time including both the conventional benefits and the WEBs. As explained in section 3.2, part of the M2MPJ benefit is dependant on

remodelling Waterloo International to enable domestic services to be operated and so an additional cost (assumed to be £400m undiscounted) is included in Table 5.2 to account for this.

Table 5.2: Summary of costs and transport benefits / WEBs

	£m, 60-year PV
Journey time savings	3,700
Congestion relief	100
TOTAL TRANSPORT BENEFITS	3,800
Move to more productive jobs	1,700
Pure agglomeration	1,800
Labour force participation	50
Imperfect competition	250
TOTAL WIDER BENEFITS	3,800
Capital cost	6,100
Operating costs	1,600
Revenue	-3,400
TOTAL COST	4,300
Net Present Value (NPV)	3,300
Benefit/Cost Ratio (BCR)	1.76

5.3.3 Table 5.2 shows that the Net Present Value increases significantly when the WEBs are taken into account. When the WEBs are included, the BCR increases from 0.96 to 1.76 indicating a much higher value for money.

5.3.4 Clearly regeneration also needs to be considered as this is a key aspect of the HS1 benefits. Although regeneration benefits can not be added to the user benefits, chapter 4 showed that they have been estimated to be worth at least £10bn as a Present Value over 60 years. They are clearly important and formed a major part of the decision to proceed with HS1.

5.3.5 As a comparison, a previous government estimate[8] of the value for money of the Channel Tunnel Rail Link indicated that the BCR of the scheme was 1.5. This included regeneration benefits worth £500m (PV) as part of the assessment. Our results indicate the value for money of the scheme is higher than that previous estimate.

[8] As reported by the National Audit office in *The Channel Tunnel Rail Link: Report by the Comptroller and Auditor General*, March 2001.

6 Conclusions

6.1.1 This study has investigated the economic impacts of High Speed 1. The scheme brings about improvements to journey times between London and destinations in Kent as well as Paris and Brussels. It also has significant regeneration impacts.

6.1.2 The benefits of HS1 are fourfold. It provides:

- A financial impact (increase in rail revenues)
- Conventional transport benefits (e.g. journey time savings)
- Wider economic benefits (enabling workers to move to more productive jobs by increasing peak capacity to central London, and increasing the effective density of London and locations in Kent by reducing the generalised costs of travel)
- Regeneration (helping to deliver the regional growth strategy and thus providing the land that allows new investment)

6.1.3 Based solely on the conventional transport benefits and wider economic benefits, our estimate of the Benefit/Cost Ratio for the scheme is 1.76, indicating a strong value for money.

6.1.4 Taking what we consider the most realistic approach to estimating the regeneration benefits of HS1, the impacts include:

- Development impacts at Kings Cross, Stratford and Ebbsfleet (which HS1 has been fundamental in facilitating): if just five per cent of the impact is viewed to be completely additional, this benefit will be worth almost £10bn as a Present Value over 60 years;
- The value of the housing stock in the study area may increase by around £1.3bn, representing a capitalised value of HS1 benefits to current residents;
- Earnings per annum across the study area may increase by between £62m and £360m due to the commuting facilitated by HS1.

6.1.5 Of those impacts, at least £10bn can be considered additional to the appraisal. Taking this into account along with the transport and wider benefits, it is clear that overall the scheme represents high value for money.

Appendix A – Appraisal assumptions

Table A 1 on the following page shows the values of some of the parameters that were used to obtain the results reported in the main text.

Table A 1: Appraisal assumptions

Parameter	Value	Source
Opening year of scheme	Benefits from Section 1 of HS1 begin in 2004, benefits of Section 2 begin in 2008. Benefits of additional domestic services begin in 2010.	Simplification as Section 1 opened in September 2003, Section 2 in November 2007 and domestic services will begin in December 2009.
Appraisal period	60 years from opening of domestic services (i.e. final year is 2069)	Standard industry assumption
Discount rate	3.5% for 30 years from scheme opening, 3.0% thereafter, discounted to a base year of 2002	WebTAG
Price base	Costs and benefits converted into 2008 prices using annual inflation rate of 2%	CB assumption
Journey purpose splits (domestic services)	In Work Time: 8.3% Commuting: 58.2% Leisure: 33.5%	WebTAG Unit 3.5.6, Table 8 http://www.webtag.org.uk/webdocuments/3_Expert/5_Economy_Objective/3.5.6.htm
Journey purpose splits (international services)	In Work Time: 30% Commuting: 0% Leisure: 70%	International Passenger Survey, Table 2.07 http://www.statistics.gov.uk/downloads/theme_transport/TravelTrends2006.pdf
Value of time	2002 values: IWT: 36.96 Commute: 5.04 Leisure:4.46 With WebTAG growth rates applied	WebTAG Unit 3.5.6, section 1.2 http://www.webtag.org.uk/webdocuments/3_Expert/5_Economy_Objective/3.5.6.htm
Demand (domestic)		LENNON data (provided by DfT)
Demand (international)		Based on Eurostar historic data
Changes to journey times	As shown in main text	Source: *http://www.southeasternrailway.co.uk/content/doc/cms/Connectivity%20map%202.pdf* & Eurostar
Fare	Eurostar: average £80 per trip (2008) Domestics: average fare per trip based on season ticket prices	Southeastern and Eurostar websites
Elasticity of demand with respect to generalised journey time	Trips to London: -0.7 Trips from London: -0.8	Passenger Demand Forecasting Handbook, section B3.3
Employment (pure agglomeration calculations)	Total of all super output areas within relevant districts	ONS

Proportion of passengers who find it beneficial to use new domestic services to St Pancras	40%	Based on analysis from CB's ABRA accessibility model, looking at destinations within London from each Kent district and length of time taken to access each ward from St Pancras relative to Charing Cross / Victoria
Average GDP per worker (2006)	£44,956	OECD http://stats.oecd.org/WBOS/Index.aspx?DatasetCode=LEVEL
Agglomeration elasticities	Separate values for each district e.g. Ashford 0.048, Medway 0.030, Shepway 0.056	DfT http://www.dft.gov.uk/pgr/economics/rdg/webia/webdatasources/agglomerationevidencebylaand3136
Productivity differential relative to national average	Separate values for each district as shown in Table 3.1 of main report	DfT
Rail share of trips	Matrix produced for all trips between London and Kent stations and London – Paris / Brussels. Examples include London – Ashford 79%, Gillingham - London 59%, Dover – Chatham 4%	2001 census (journey to work data)
Congestion relief benefit (domestic services)	40 pence per trip for passengers switching to new services, 20 pence per trip for passengers continuing to use classic services	CB assumption
Capacity of new high speed domestic trains	Per 12-car train: 736 seats, 308 standing	DfT / http://www.kentrail.co.uk/class_395.htm
Waterloo (excluding WIT) capacity per three-hour AM peak period	85,000	CB assumption

Appendix B – Regeneration

This Appendix summarises some of the data and approach that underpins the assessment reported in chapter 4.3.

Contextual baseline

Total employment

Table A 2 and Figure A 1 below show that Swale was the only area in the study which had a fall in employment between 1991 and 2006. This was roughly a loss of 5,850 jobs or a 13.7 per cent decline in employment. The most rapid employment growth occurred in Dartford, at almost 45 per cent during this period and the largest employment increase in absolute terms occurred in Thurrock, with over 15,000 additional employees over this 15 year period.

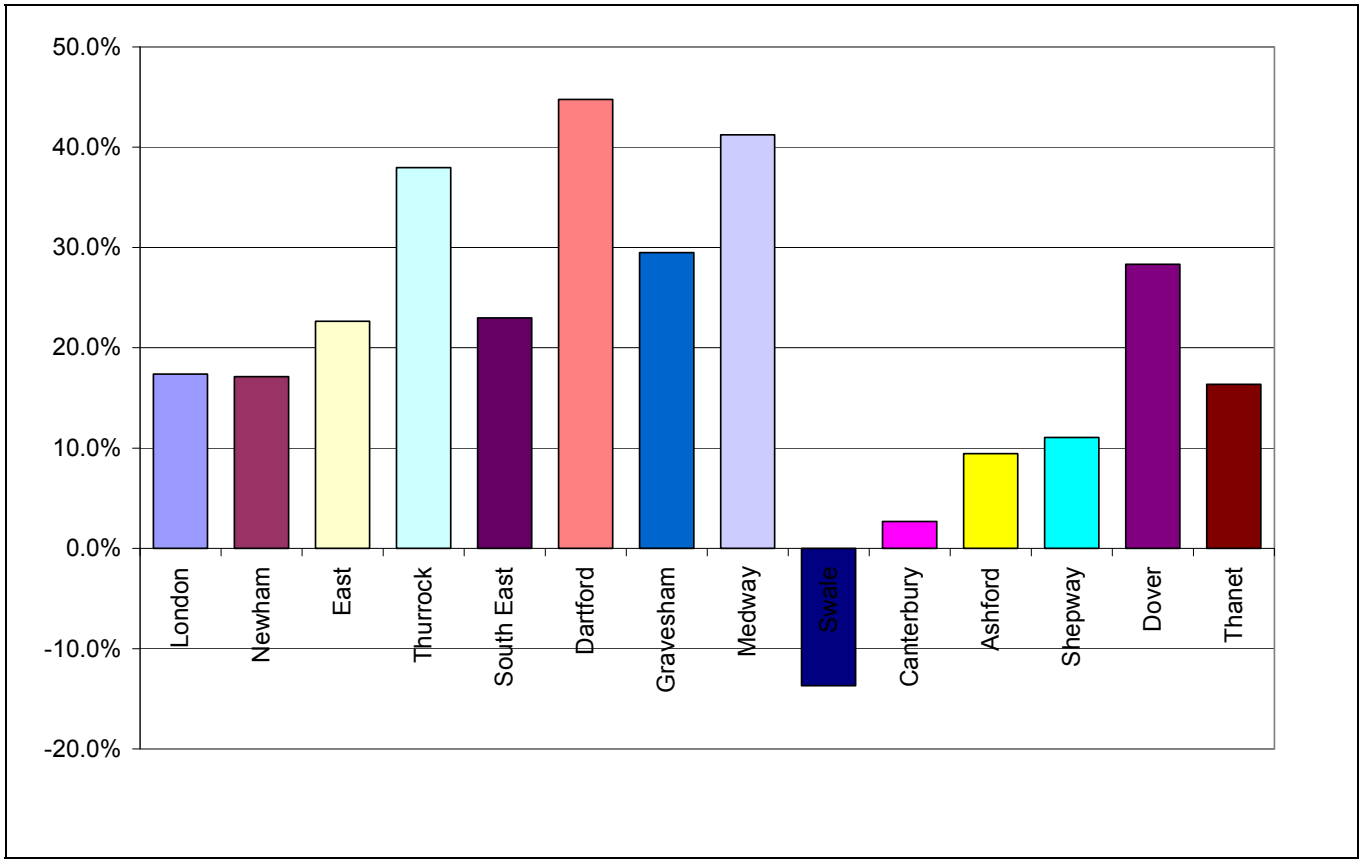
Table A 2: Total Employment, 1991 - 2006

	1991	2006	Absolute Change 1991-2006	% Change 1991-2006
London	3,405,119	3,996,570	591,451	17.4%
Newham	60,409	70,750	10,341	17.1%
East	1,939,581	2,378,727	439,146	22.6%
Thurrock	40,382	55,709	15,327	38.0%
South East	2,982,908	3,668,656	685,748	23.0%
Dartford	32,468	47,004	14,536	44.8%
Gravesham	44,997	58,261	13,264	29.5%
Medway	34,201	48,300	14,099	41.2%
Swale	42,696	36,844	-5852	-13.7%
Canterbury	24,996	25,667	671	2.7%
Ashford	78,888	86,343	7,455	9.4%
Shepway	29,833	33,128	3,295	11.0%
Dover	33,207	42,612	9,405	28.3%
Thanet	33,141	38,561	5,420	16.4%

Source: Annual Business Inquiry and Annual Employment Survey

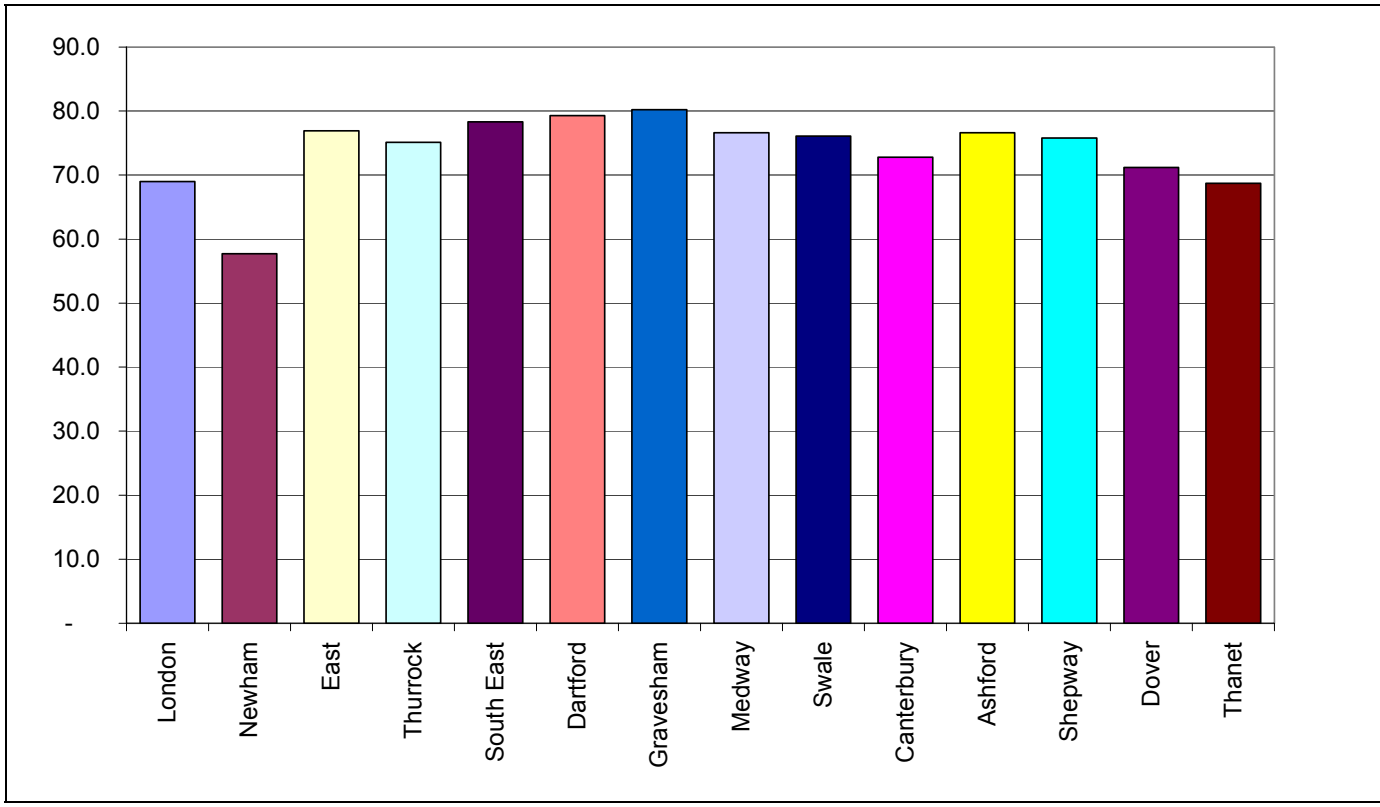
The latest data shows that Gravesham and Dartford have the highest employment and lowest unemployment rates of the relevant districts, while Canterbury and Thanet have relatively high unemployment and low employment. Of all districts in the study area, Newham has the highest unemployment and lowest employment rates.

Figure A 1: Total Percentage Employment Change, 1991-2006



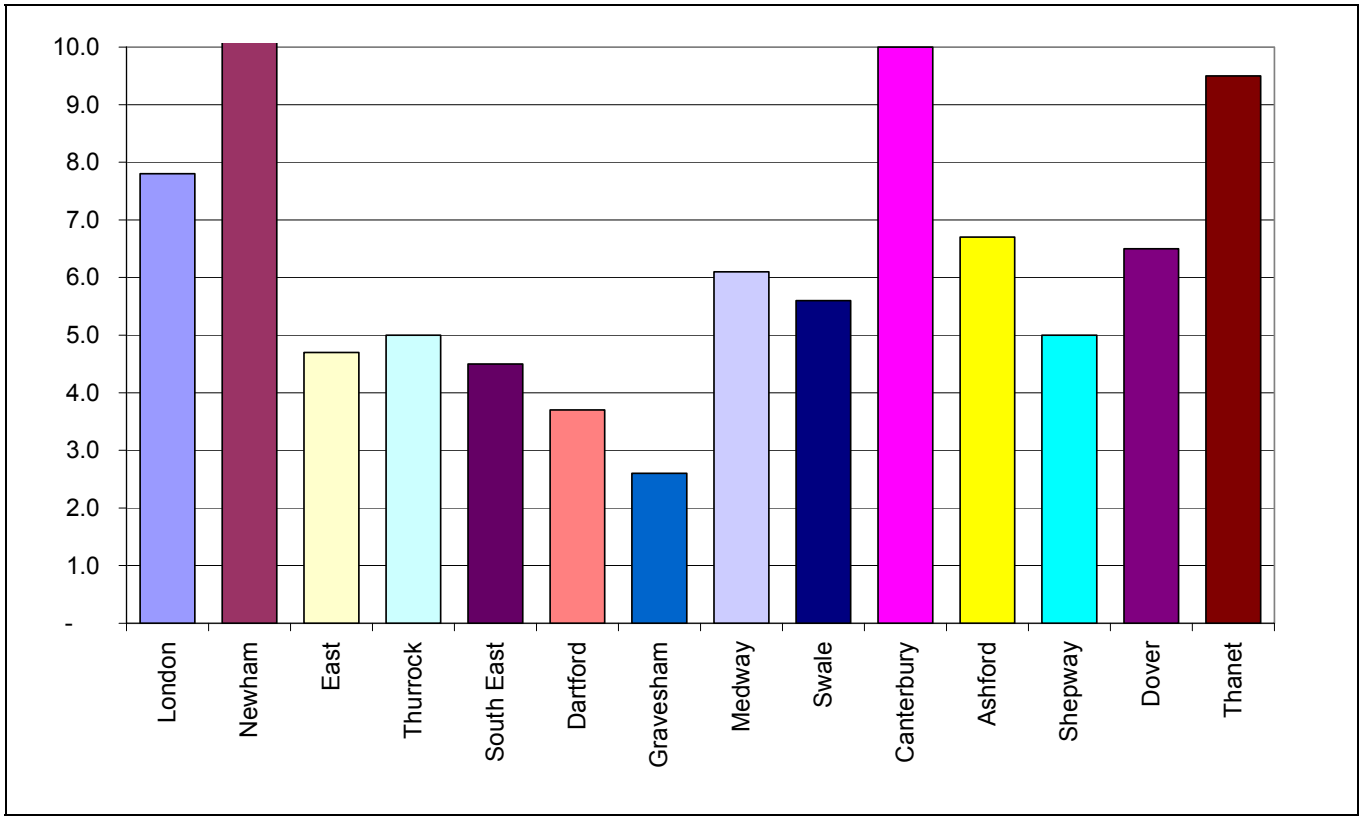
Source: Annual Business Inquiry and Annual Employment Survey

Figure A 2: Employment Rate (working age population) 2006



Source: Annual Population Survey

Figure A 3: Unemployment Rate (working age population), 2006

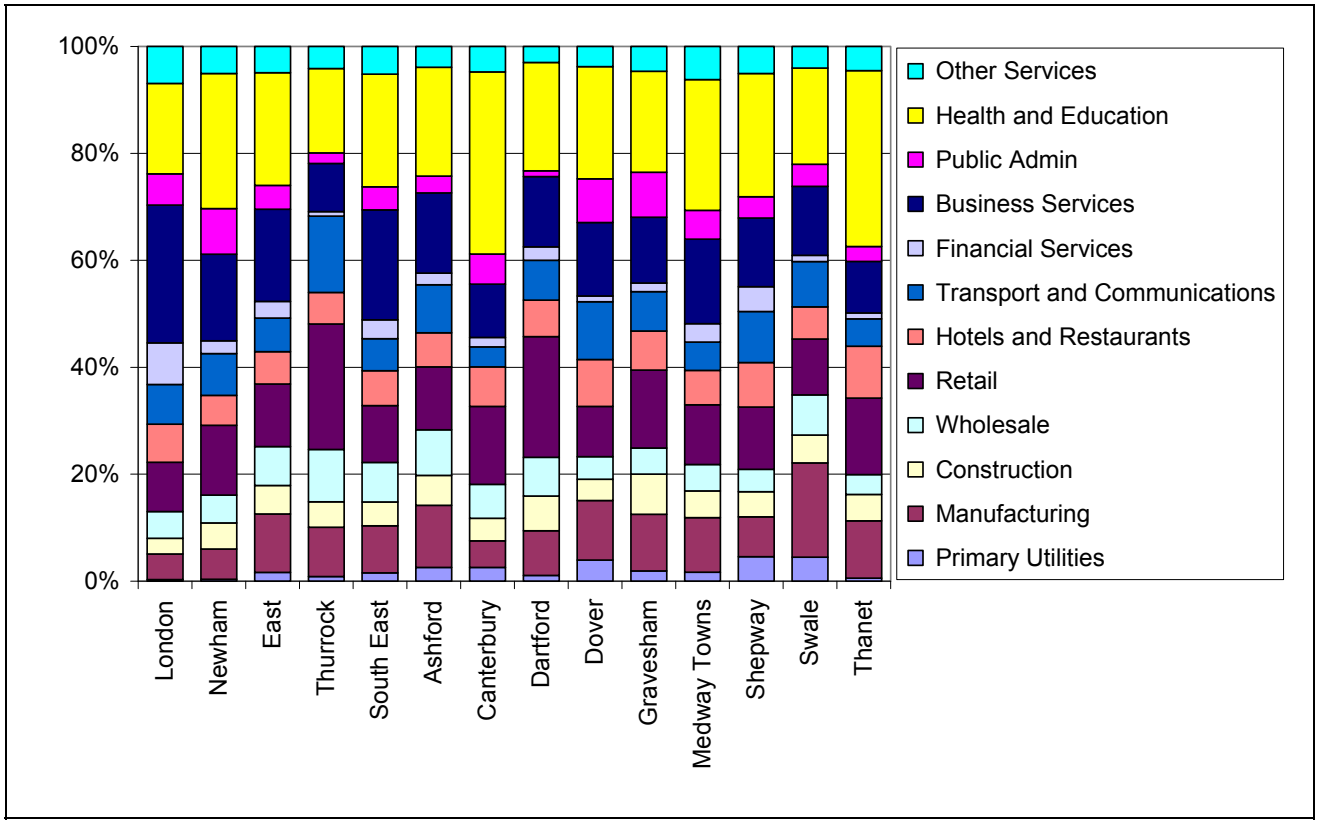


Source: Annual Population Survey

Industrial employment

Figure A 4 below highlights industrial employment shares by district for 2006. It shows that Canterbury and Thanet have relatively large shares of Health and Education employment, while Thurrock and Dartford have larger shares of retail employment. Relative to the high regional share of business services employment in the South East, Medway Towns has the highest share of the study districts. Newham has a low share of Business, Financial and Other services relative to the rest of London. It has higher Health, Education and Public Admin. Business services jobs typically provide more highly skilled and highly paid employment.

Figure A 4: Industrial Employment Shares, 2006

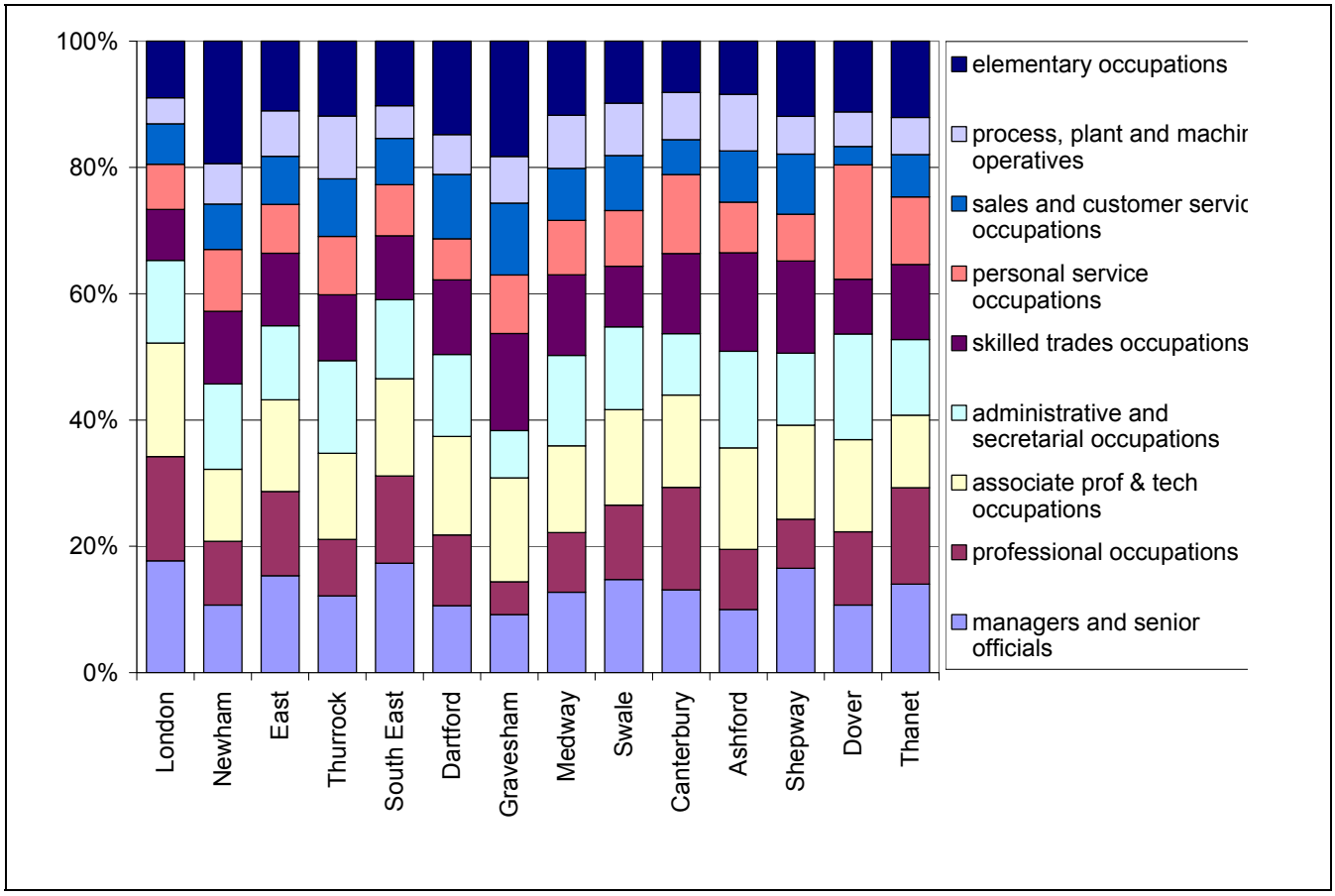


Source: Annual Business Inquiry

As shown in Figure A 5 below, Gravesham had the lowest share of residents employed in the most highly skilled occupations, and the highest share employed in elementary occupations. On the other hand, alongside the regional average for the South East, Canterbury had an occupations distribution most skewed to the highly skilled. This is interesting to note given its high unemployment and high health and education employment.

In line with the industrial distribution, Newham has lower shares of professional and managerial occupations than the London average and higher shares of elementary occupations.

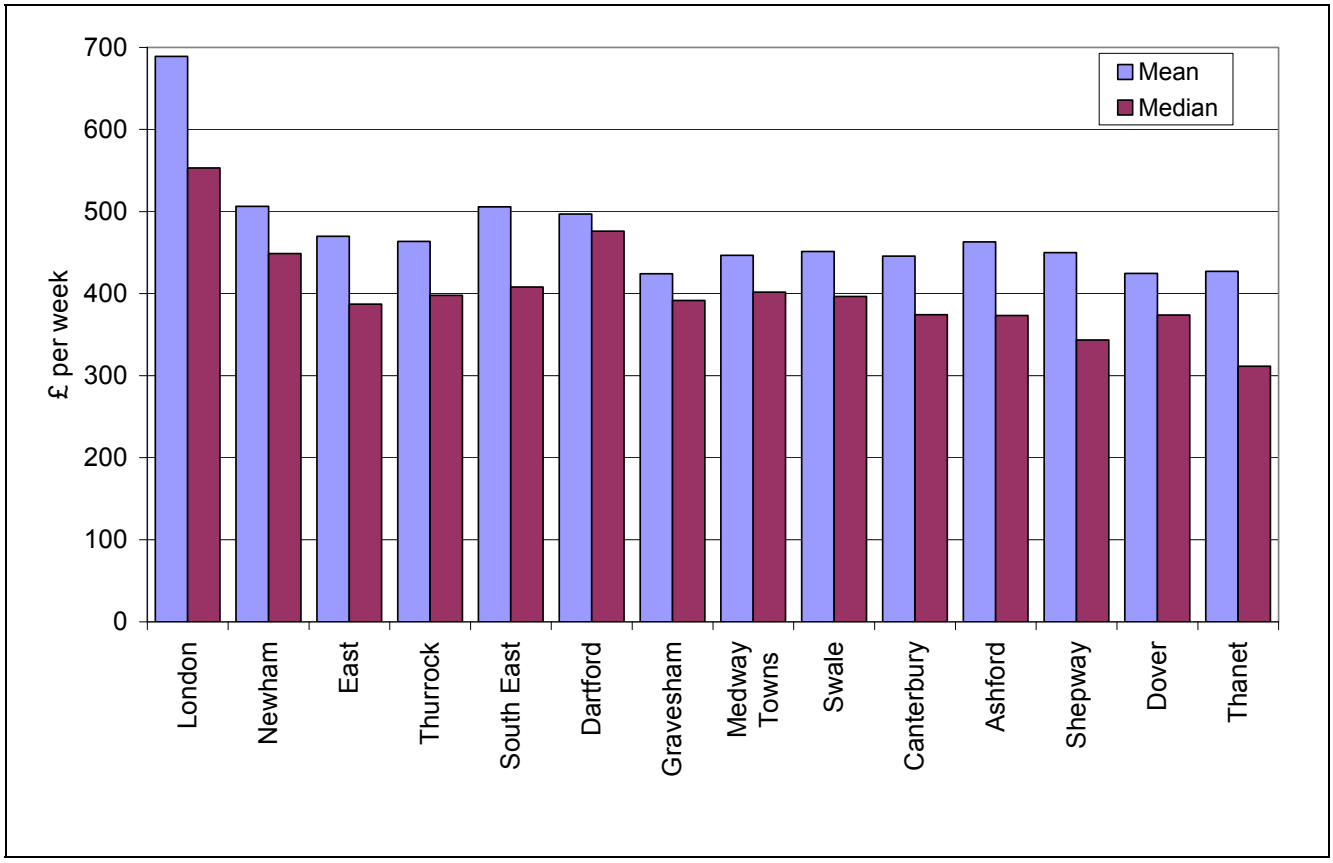
Figure A 5: Occupational Shares, 2006



Source: Annual Population Survey

Next we compare the weekly average earnings of residents. Of the study districts, Newham has the highest mean and Dartford had the highest median earnings in 2007. Dartford also had the lowest disparity between mean and median earnings, perhaps suggesting greater equality than in other areas. While Thanet's earnings were amongst the lowest of these districts, it also had the greatest disparity between mean and median earnings, suggesting that the distribution of wages was less equal than that of the other districts.

Figure A 6: Total Gross Resident Weekly Mean and Median Earnings, 2007



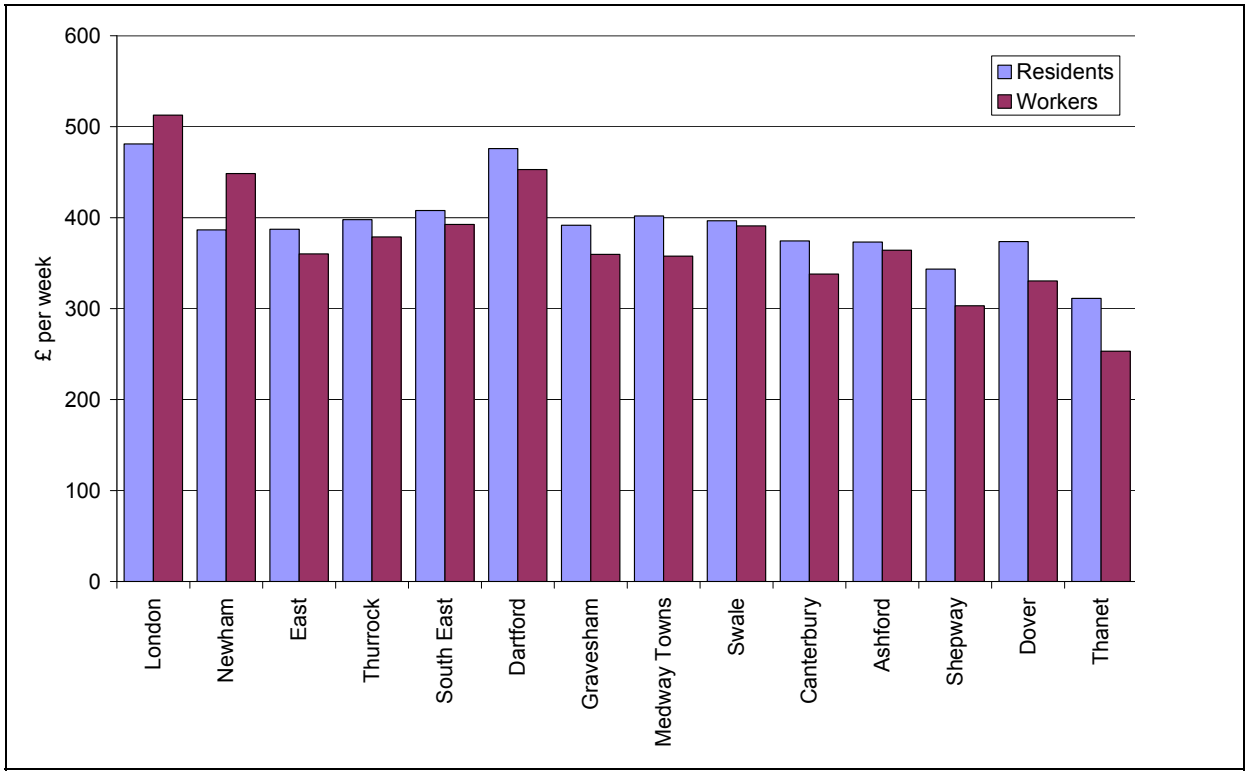
Source: Annual Survey of Hours and Earnings

We also consider the relative earnings of those who live in the study districts (residents), regardless of where they work, to those of the people that work in the study district (workers), regardless of where they live. Figure A 7 below therefore shows that the districts within or closest to London (such as Newham, Thurrock and Dartford) have both the highest worker and resident earnings of the study group, but that all districts have a level of disparity between resident and worker earnings.

We might expect that significant shares of residents in the districts earning relatively higher wages would be commuting to London for work as jobs in London are typically better paid. This is probably true for Thurrock and Dartford for example (and Newham which is within London). However for this argument to hold we would expect the greatest disparity in earnings between residents and workers for the districts closest to London which are likely to have the highest proportion of commuters to London, which is not the case. In fact, Canterbury has the highest earnings disparity, with workers earnings over 19.6 per cent higher than those of residents.

Newham is the only district in which workers have higher median earnings than residents. Although one possible explanation for this latter point could be that Newham is within London, thus providing these higher paid jobs itself. Highly skilled in-commuters could therefore be travelling to work in Newham to take the most highly paid jobs. While Newham has higher worker than residents earnings, both are still considerably lower than the wider London average, as we would expect given the business hub in central London.

Figure A 7: Total Gross Worker and Resident Weekly Median Earnings, 2007



Source: Annual Survey of Hours and Earnings

Population

In terms of population, Ashford has experienced the largest growth between 1981 and 2006, of 28 per cent. In contrast to the rapid employment growth of 44.8 per cent in Dartford between 1991 and 2006, population growth was only 10.6 per cent during this period, falling between 1981 and 1991 by 1.5 per cent, and rising overall by 12.2 per cent between 1991 and 2006. In absolute terms there has been an increase in population of 18,000 in Ashford over the last fifteen years but only 7,500 extra jobs whereas in Dartford over the same period there have been 15,000 new jobs but only 9,800 extra people. This suggests that a significant proportion of Dartford's residents were returning to the labour market, through increased participation rates for parents and carers, older people and adults with disabilities for example. There is also likely to have been significant growth in in-commuting from other districts to fill these additional jobs.

Gravesham also experienced a fall in population between 1981 and 1991, with modest overall growth of 2 per cent between 1981 and 2006.

Table A 3: Population change, 1981-2006

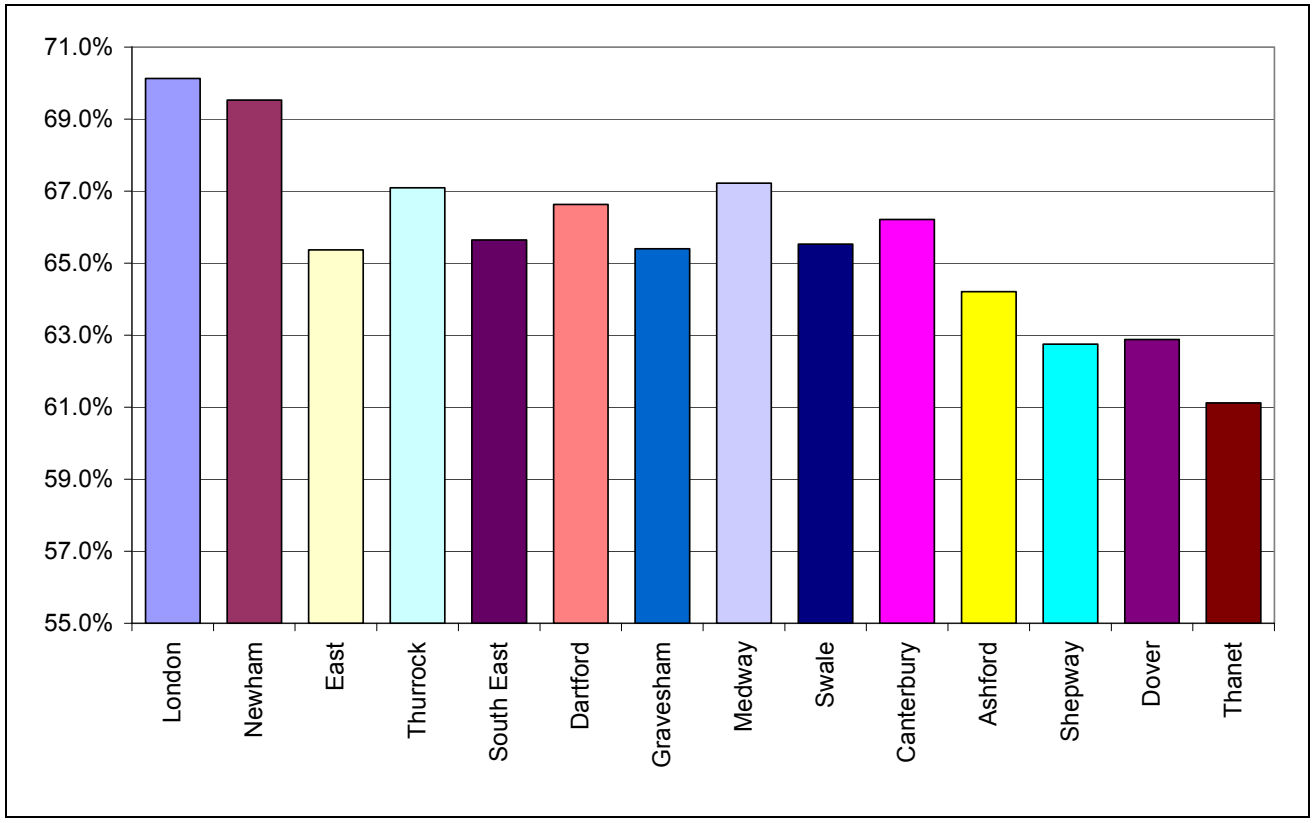
	1981	1991	2006	change 1981-2006	change 1981-1991	change 1991-2006	1981	1991	2006
				Number	%	Number	%	Number	%
London	6,805,000	6,829,300	7,512,400	707,400	10.4%	24,300	0.4%	683,100	10.0%
Newham	211,900	216,300	248,400	36,500	17.2%	4,400	2.1%	32,100	14.8%
East	4,855,000	5,121,100	5,606,600	751,600	15.5%	266,100	5.5%	485,500	9.5%
Thurrock	127,400	128,700	148,900	21,500	16.9%	1,300	1.0%	20,200	15.7%
South East	7,243,100	7,629,200	8,237,800	994,700	13.7%	386,100	5.3%	608,600	8.0%
Dartford	81,300	80,100	89,900	8,600	10.6%	-1,200	-1.5%	9,800	12.2%
Gravesham	95,500	93,300	97,400	1,900	2.0%	-2,200	-2.3%	4,100	4.4%
Medway	240,300	242,500	251,700	11,400	4.7%	2,200	0.9%	9,200	3.8%
Swale	110,100	116,100	128,500	18,400	16.7%	6,000	5.4%	12,400	10.7%
Canterbury	122,200	129,600	146,200	24,000	19.6%	7,400	6.1%	16,600	12.8%
Ashford	86,900	93,100	111,200	24,300	28.0%	6,200	7.1%	18,100	19.4%
Shepway	86,100	93,000	99,600	13,500	15.7%	6,900	8.0%	6,600	7.1%
Dover	103,500	104,400	106,400	2,900	2.8%	900	0.9%	2,000	1.9%
Thanet	121,800	126,100	128,600	6,800	5.6%	4,300	3.5%	2,500	2.0%

Source: ONS Mid Year Population Estimates

The share of the population of working age is also an important indicator of the potential earnings capacity of an area. This shows that (outside of London) Thurrock and Medway Towns have the largest working age population shares (ages 15 to 64), at 67.1 and 67.2 per cent respectively for 2006. On the contrary, Thanet has a far lower share, at only 61.1 per cent of the population.

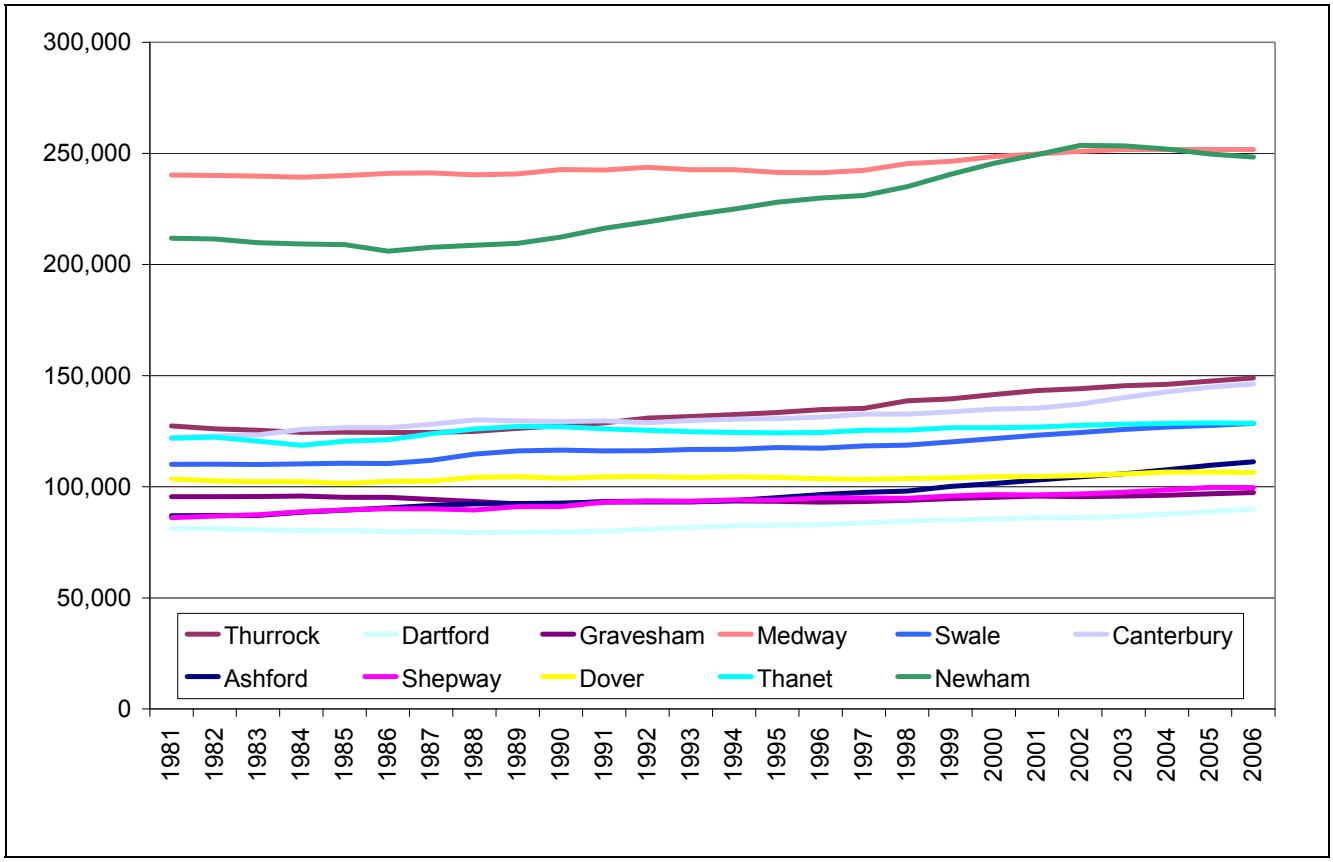
Canterbury, Gravesham and Thurrock have all experienced rapid population growth since the early 1990s. The population of the Medway towns however started from a far larger base and rose above 250,000 people for the first time in 2002.

Figure A 8: Population Share aged 15-64, 2006



Source: ONS Mid Year Population Estimates

Figure A 9: Population, 1981-2006



Source: ONS Mid Year Population Estimates

Population projections for each of the study districts to 2031 in Table A 4 below show that all are expected to experience large growth over the next 25 years. For every district, this growth is far higher than that of the last 25 years. District population growth targets based on Strategic housing growth vary significantly from the ONS population projections in most cases.

Particularly for districts such as Gravesham, Medway, Dover and Thanet which have experienced relatively slow past population growth, these projections represent a step change, reflecting large and challenging growth prospects for the future.

Projections for the remaining districts appear to represent more a continuation of recent population trends.

Table A 4: Population Projections, 2006-2031

	Change 1981-2006		2006	2016	2026	2031	Change 2006-2031	
	Number	%					Number	%
London	707,400	10.4%	7,512,400	8,114,300	8,632,600	8,857,900	1,345,500	17.9%
Newham	36,500	17.2%	248,400	249,600	254,700	258,400	10,000	4.0%
East	751,600	15.5%	5,606,600	6,179,500	6,747,400	6,997,400	1,390,800	24.8%
Thurrock	21,500	16.9%	148,900	163,600	177,400	183,200	34,300	23.0%
South East	994,700	13.7%	8,237,800	8,870,600	9,523,300	9,813,800	1,576,000	19.1%
Dartford	8,600	10.6%	89,900	99,900	108,900	112,700	22,800	25.4%
Gravesham	1,900	2.0%	97,400	103,100	109,300	112,000	14,600	15.0%
Medway	11,400	4.7%	251,700	262,300	275,000	280,700	29,000	11.5%
Swale	18,400	16.7%	128,500	141,600	154,800	160,400	31,900	24.8%
Canterbury	24,000	19.6%	146,200	167,800	187,400	196,500	50,300	34.4%
Ashford	24,300	28.0%	111,200	128,600	144,400	151,000	39,800	35.8%
Shepway	13,500	15.7%	99,600	109,200	119,800	124,500	24,900	25.0%
Dover	2,900	2.8%	106,400	112,700	120,900	124,600	18,200	17.1%
Thanet	6,800	5.6%	128,600	137,200	148,500	153,800	25,200	19.6%

Source: ONS 2006-based

Journey times and commute patterns

As a result of the domestic services operation on the HS1 line, journey times into central London will reduce both from the HS1 stations themselves and from other services which link into these routes.

Table A 5 below gives an approximate summary of these journey time effects. The travel time savings (on the high speed services) are significant, with the largest benefits of 30-50 minute savings seen in Ashford, Canterbury, Folkestone, Dover and Ramsgate and still large savings from the Medway towns and other stations in the South East. It is reasonable to expect that such large time savings may impact significantly on commuters' behaviour. It is our hypothesis that reduced journey times into London will accelerate the regeneration, development potential and values in this area of the South East.

Table A 5: Journey time impacts of HS1

	Base journey time (minutes)	HS1 journey time (minutes)	Time saving (minutes)
Stratford	8	7	1
Ashford	83	37	46
Gravesend	42	24	18
Chatham	60	43	17
Strood	54	37	17
Rochester	57	40	17
Gillingham	63	46	17
Rainham	66	49	17
Sittingbourne	65	56	9
Faversham	78	66	12
Canterbury West	102	61	41
Folkestone Central	98	63	35
Dover Priory	112	74	38
Ramsgate	119	84	35
Margate	109	98	11
Ebbsfleet	-	17	-

The ideal evidence in support of this hypothesis would be to find a relationship between journey times and indicators of regeneration, preferably at a very local level of geography as small time differences may have big impacts. For example, development very close to stations may be hugely accelerated but development further afield may be less affected.

Travel time data at the level of detail required does not exist and would be very time consuming to collate. This would require travel time from every station into central London, ideally adjusted for frequency and any capacity issues. In order to get a meaningful local measure, we would then also require distance from each small geographical area to the nearest station in order to calculate a measure of complete journey time at a local level. This is what detailed transport models do for a given impact area at a zonal level. However even if this existed for a set impact area it would still not be perfect for our purposes as the ideal evidence base would be to estimate a model on a much wider area – the wider commuting belt of London for example. What does exist, from the 2001 census, is the number of people who commute from each ward into London, and by which mode.

Our approach is therefore as follows. For a small study selection area, we consider whether a measure from the 2001 census detailed data is a reasonable proxy for journey times into London. We find this is the case, and we then use the detailed ward level data to estimate a relationship between relevant commuting patterns into London and indicators of regeneration.

The table below sets out the approximate journey times by rail from selected stations into London. It also details the percentages of people from the wards in which those stations are located who commute to London, by public transport and by rail.

Table A 6: Journey times to London by rail from selected stations, and % commuting to London

Station	Base journey time (mins)	Commuting to London from ward		
		total %	% by PT	% by rail
Stratford	8	97%	58%	10%
St Albans	25	31%	24%	23%
Hemel Hempstead	30	18%	6%	4%
Harpenden	30	23%	17%	17%
Welwyn Garden City	30	10%	4%	4%
Reading	33	7%	5%	4%
Luton	35	12%	9%	8%
Sevenoaks	35	39%	32%	31%
Epping	35	41%	22%	2%
Chelmsford	36	22%	18%	17%
Milton Keynes	38	5%	3%	3%
Guildford	38	11%	7%	7%
Amersham	39	20%	12%	6%
Gravesend	42	24%	12%	11%
Haywards Heath	45	20%	17%	17%
Crawley	49	6%	3%	3%
Strood	54	17%	7%	4%
Brighton	56	10%	9%	8%
Peterborough	56	3%	3%	3%
Rochester	57	14%	8%	7%
Oxford	58	5%	4%	3%
Maidstone	58	9%	4%	4%
Chatham	60	15%	9%	8%
Swindon	63	0%	0%	0%
Gillingham	63	14%	8%	8%
Sittingbourne	65	11%	7%	5%
Rainham	66	18%	13%	12%
Buxted	70	9%	6%	6%
Billingshurst	75	8%	5%	5%
Faversham	78	6%	5%	5%
Ashford	83	7%	5%	5%
Bristol	91	0%	0%	0%
Folkestone Central	98	6%	4%	3%
Canterbury West	102	3%	2%	1%
Margate	109	1%	1%	1%
Dover Priory	112	1%	0%	0%
Ramsgate	119	2%	1%	1%

Stratford has by far the highest total percentage of workers who commute into London but a relatively low proportion do so by rail. The large difference between the percentage who commute by public transport and by rail is due to the presence of London Underground (LU). LU travel is also evident from Amersham and Epping, but for all other locations, the majority of public transport commuting is done by rail.

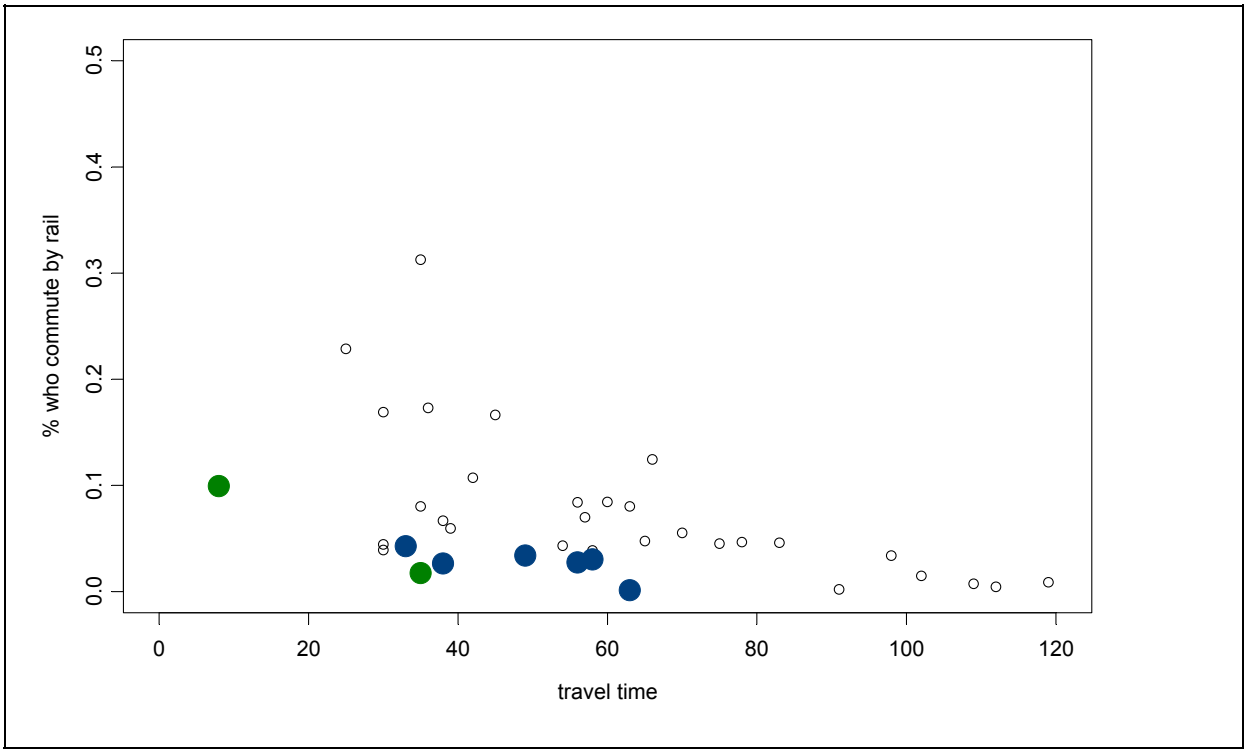
The table is ordered by journey time. By eye we can see that the percentages who commute broadly drop as the travel time rises. Noticeable outliers are Reading, Milton Keynes, Crawley (and Oxford, Swindon, Peterborough), which have quick travel times but lower percentages commuting than might be expected. This is likely to be due to the fact they have their own economies and are not entirely drawing from London's activity. For example, Reading is an office location, Milton Keynes is a hub for

business services and logistics, and Crawley's economy is focussed around Gatwick airport. Other areas very much form the London commuter belt.

The three commuting measures are all strongly negatively correlated with the travel time. The longer the travel time, the fewer commute. This is an intuitive finding. The percentage that commute by rail is the most relevant measure for use in our analysis.

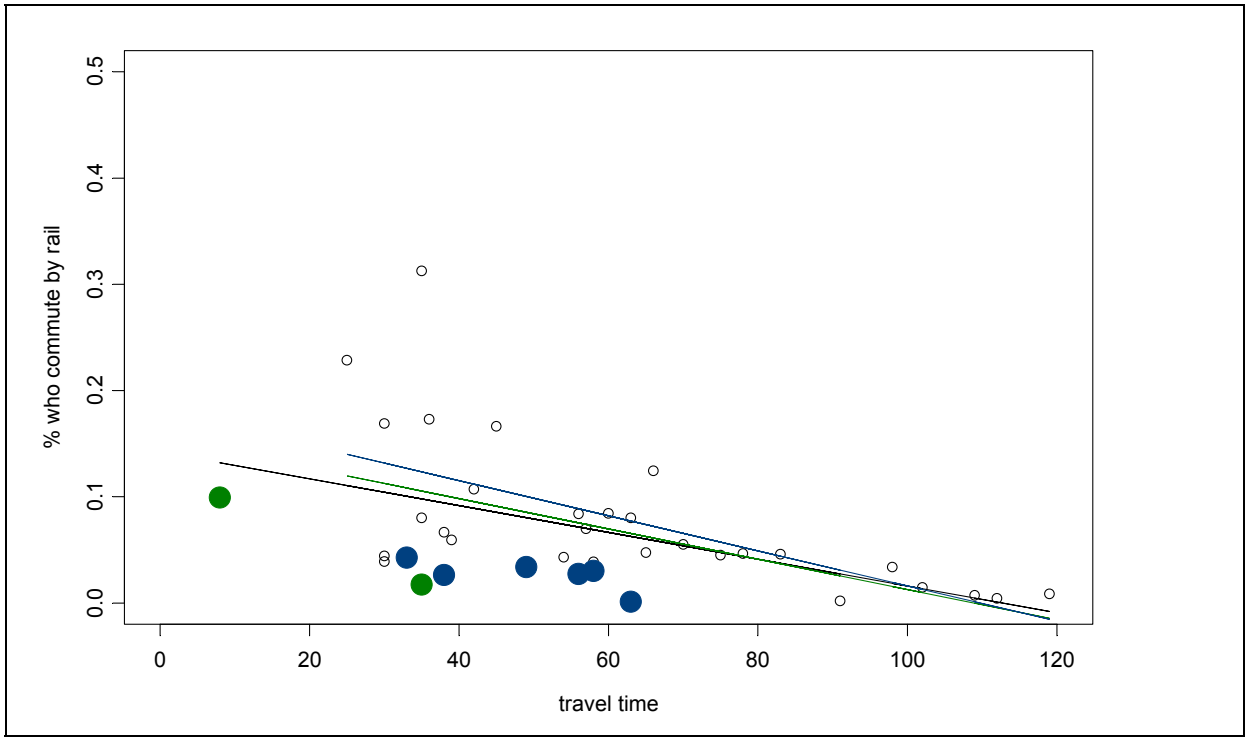
Figure A 10 below plots travel time against percentage who commute to London by rail. Stratford is highlighted green and pops out for the reasons identified earlier. The other location highlighted green is Epping, also mentioned previously for having a London Underground line which may be a reason that the rail percentage is low. The places highlighted blue are the 'active centres' discussed earlier, and we can see they fall in the lower part of the chart.

Figure A 10: Selected districts, % who commute to London by rail and travel time by rail



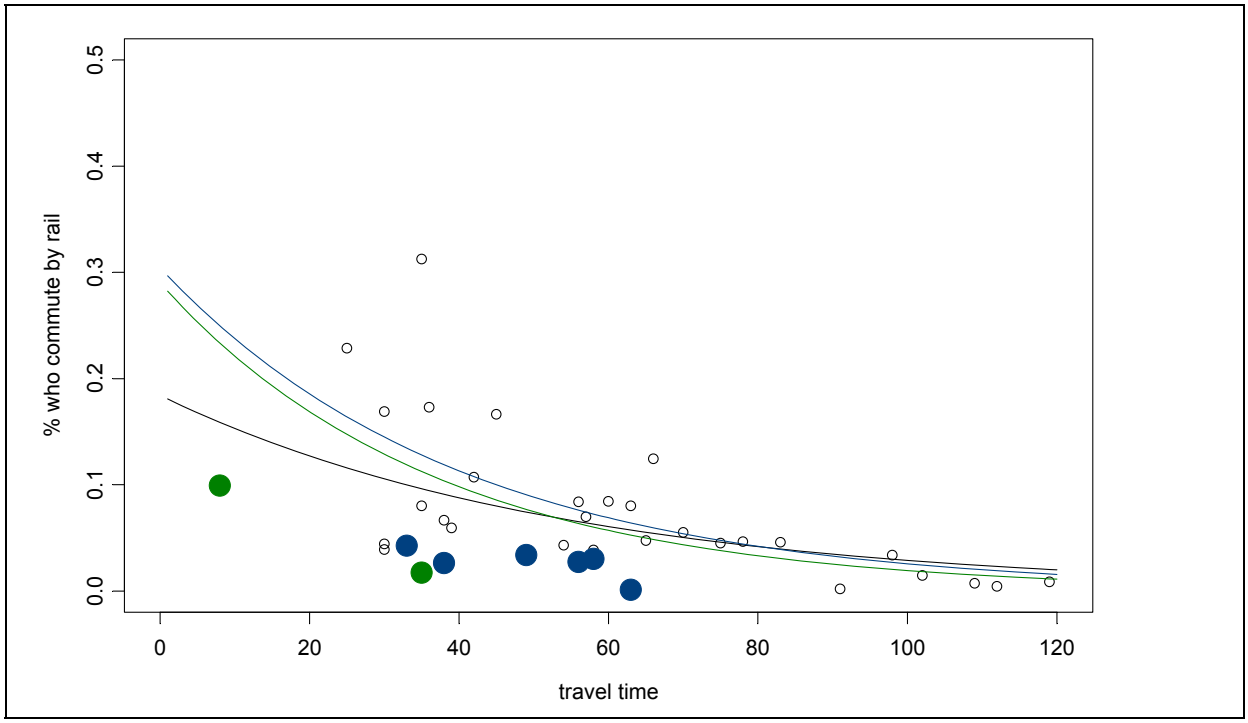
There is clearly a relationship between these two – with higher travel times by train translating into lower commuting into London by rail. Next we consider how to quantify this relationship. Linear fits to the data are shown in Figure A 11 below. The black line is based on all of the data, green excludes Stratford and Epping, and blue excludes those and the 'active centres'.

Figure A 11: % who commute and travel time – possible linear relationships



An obvious issue of considering a linear relationship is that it can go negative and will cut the y axis at a point which is below some experienced levels of commuting percentages. Clearly a proportion can range from 0 to 1 and a modelled relationship which does not have these characteristics is a drawback. Furthermore, the data suggests that the relationship is likely to be non-linear.

Figure A 12: % who commute and travel time – possible non-linear relationships



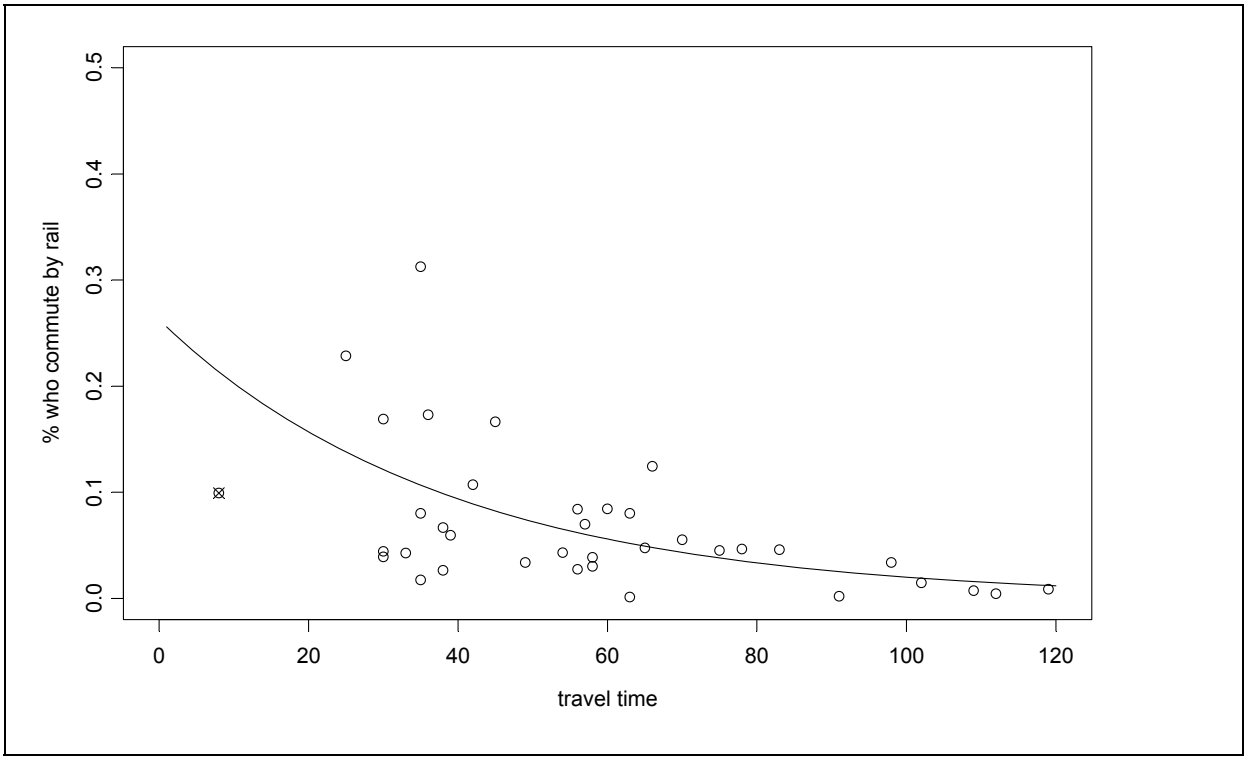
The fitted non-linear curves in Figure A 12 have the following functional form:

$$RailCommuting\% = \alpha \exp(-\beta * TravelTime)$$

Again, the relationships are estimated on all data, without Stratford and Epping, and without these and the 'active centres'. These are displayed in black, blue and green as previously.

The only observation which significantly changes the shape of the relationship found is Stratford, and for this reason we exclude this data point from the analysis. The chart below shows the preferred model.

Figure A 13: % who commute and travel time – chosen model



The relationship shown in the chart above has the functional form as described previously, with alpha and beta as detailed below.

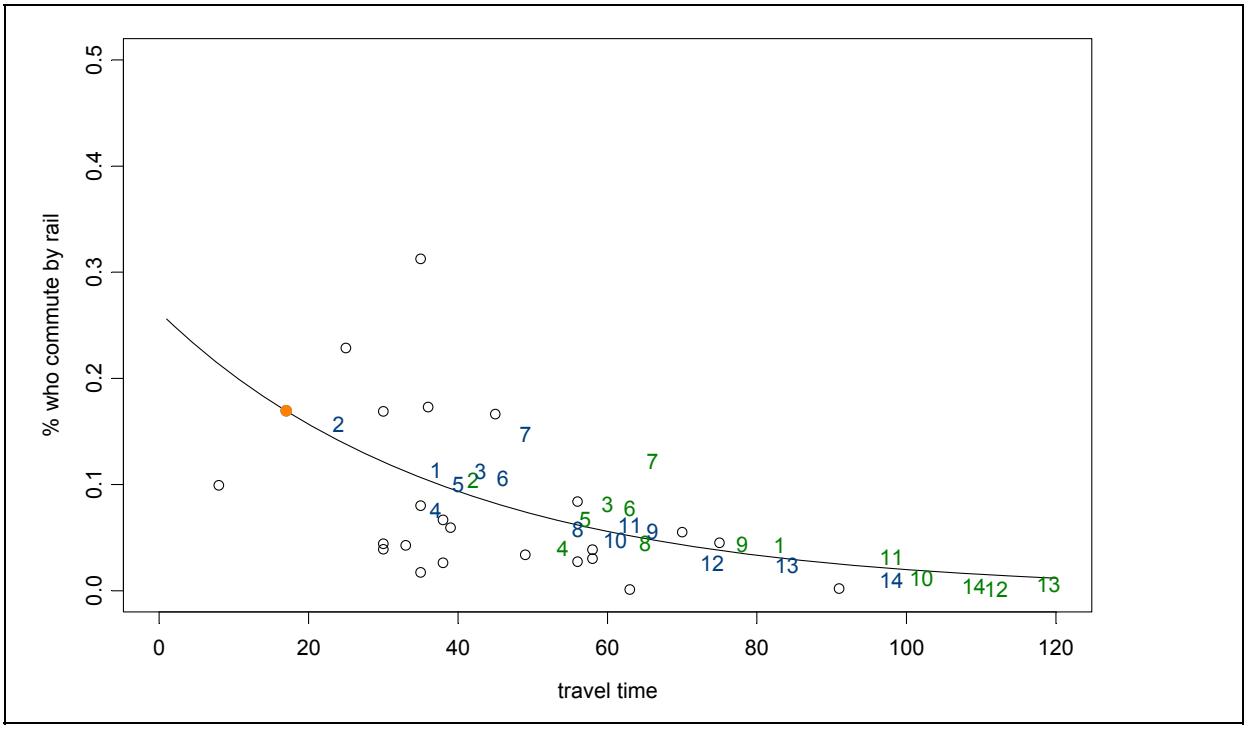
$$RailCommuting\% = \alpha \exp(-\beta * TravelTime)$$

Where α = 0.2625221 and β = 0.02574575.

The next step is to assess the effect of High Speed 1. We use the estimates of the relationship between rail travel time and the percentage of people who commute by rail to estimate what effect reductions in travel time will have on the percentage of people who commute. We assume that any comparative advantage or disadvantage which a location has is retained. This means that if a location starts from a baseline position a certain distance below or above the fitted values, it retains this relative position.

The estimated results are is shown in the chart below. The numbers represent places – green is current, blue is with HS1. For example, place 1 is Ashford from which the journey time will reduce from 83 to 37 minutes with HS1. As a result, the percentage who commute is modelled to rise from 4.5 per cent to 11.6 per cent. The yellow dot is Ebbsfleet – because it does not have a 'before HS1' travel time it is assumed to be on the modelled curve at the relevant position. Its modelled commuting by rail to London is therefore 16.9 per cent once domestic HS1 is in operation, which compares to a 2001 rate of 7 per cent.

Figure A 14: The effects of HS1 journey improvements on commuting



The table below shows these estimated changes in commuting to London as a result of the improved journey time once the HS1 domestic services are in operation. The journey time from Ashford more than halves and the percentage estimated to commute to London by rail more than doubles. The stations are listed in the table in the order 1 to 14 as they appear in the chart.

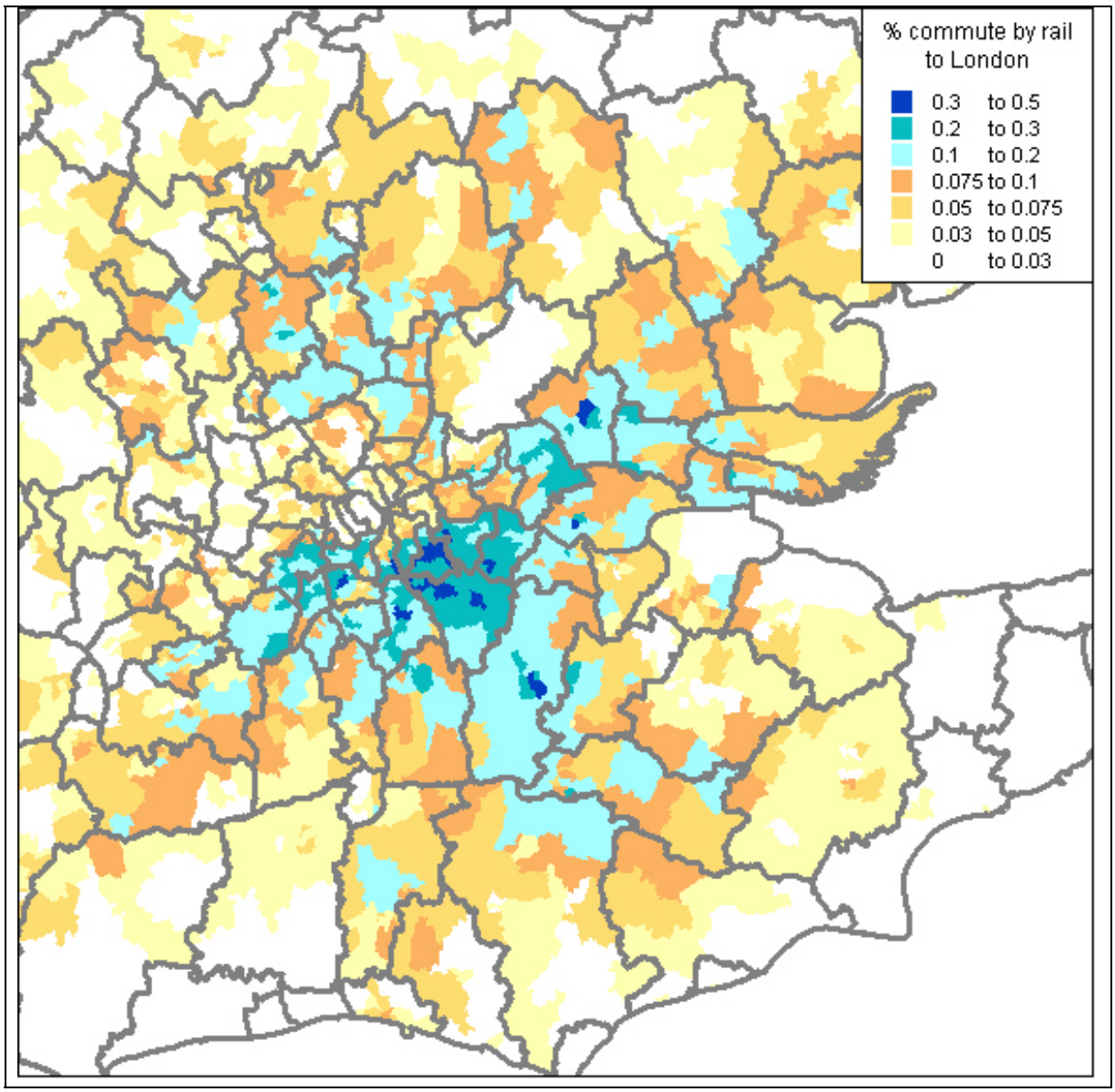
Table A 7: Journey time savings with HS1 and the impact upon commuting by rail to London

Station	Base time (minutes)	HS1 time (minutes)	% who commute by Rail to London (2001)	% who commute by Rail to London with HS1	Change (percentage points)
Ashford	83	37	4.6%	11.6%	7.0%
Gravesend	42	24	10.7%	16.0%	5.2%
Chatham	60	43	8.4%	11.5%	3.1%
Strood	54	37	4.3%	7.9%	3.6%
Rochester	57	40	7.0%	10.3%	3.3%
Gillingham	63	46	8.0%	10.9%	2.8%
Rainham	66	49	12.4%	15.1%	2.6%
Sittingbourne	65	56	4.7%	6.0%	1.3%
Faversham	78	66	4.6%	5.9%	1.3%
Canterbury West	102	61	1.5%	5.0%	3.6%
Folkestone Central	98	63	3.4%	6.5%	3.1%
Dover Priory	112	74	0.4%	2.9%	2.4%
Ramsgate	119	84	0.9%	2.7%	1.8%
Margate	109	98	0.7%	1.3%	0.5%
Ebbsfleet	-	17	7.4%	16.9%	9.6%

This model has allowed us to estimate the increase in commuting proportions in the ward in which each station is located. However it seems likely (and the ward map below supports this) that the effect

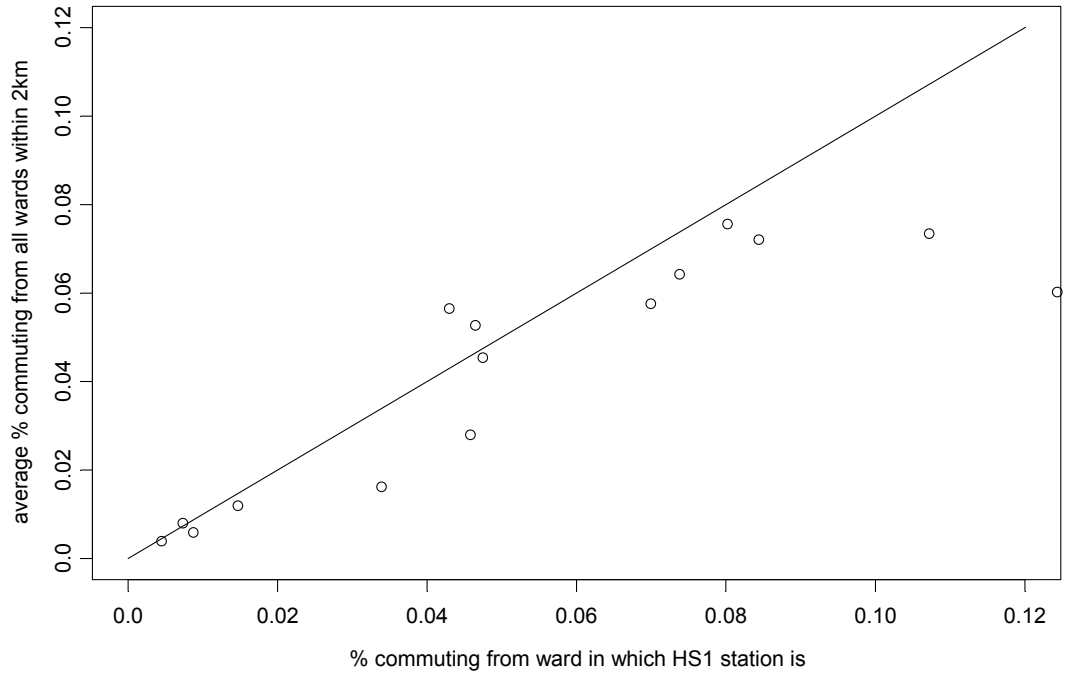
might not be quite this local, and improved journey times may in fact impact upon behaviour of commuters from some surrounding wards as well.

Figure A 15: Ward level commuting (by rail) to London



The chart below compares the percent commuting by rail from the ward in which each station is located with the average percent commuting by rail from all wards within 2km of each station. For interpretation, the line shown is the line of equality. On this basis we conclude that it is reasonable to apply the same uplift factor to the rail commuting rates from neighbouring wards. This will retain the same relative positions of wards, implicitly allowing for other factors which cannot be quantified here. A similar relationship is evident for locations between two and five kilometres from each station but for conservatism, we only apply half of the uplift factor to these. We do not make any estimates of benefits in locations further than 5km from each station.

Figure A 16: Relationship between % commuting by rail to London from ward in which station falls and wards within 2km



For example, in 2001 just under 1.5 per cent of workers commuted into London by rail from the ward in which Canterbury West station falls. With the new HS1 services, the model estimates this will increase to 5 per cent, an uplift factor of 3.4. We therefore apply this same factor to the wards within 2km of Canterbury West station, this results in an estimate that between 0.6 and 6 per cent of the workers who live within 2km of Canterbury West station will commute into London by rail once the HS1 services are in operation. The results of these assumptions are summarised, by station, in the table below.

Table A 8: Estimated commuting pattern changes when HS1 services are operational

Station	Ward in which station falls	No. of wards within 2km of station	No. of wards within 2-5km of station[9]	Range of rail commuting rates (2001)	Range of rail commuting rates (with HS1)
Ashford	00BBGU	8	11	0.5 – 8.8%	0.9 – 15.5%
Gravesend	29UBJB	6	9	2.5 – 10.7%	3.1 – 16.0%
Chatham	29UGGG	2	6	3.4 – 9.3%	4.0 – 11.5%
Strood	00LCNN	1	1	4.3 – 6.6%	7.9 – 9.4%
Rochester	00LCPF	1	1	2.7 – 7.0%	3.4 – 10.3%
Gillingham	00LCPB	3	0	7.3 – 8.0%	9.9 – 10.9%
Rainham	00LCNQ	2	4	4.0 – 12.4%	4.8 – 13.8%
Sittingbourne	00LCNZ	4	6	1.9 – 6.6%	2.2 – 8.4%
Faversham	29UMGF	4	2	3.4 – 6.7%	3.8 – 8.5%
Canterbury West	29UMGC	3	6	0.3 – 2.5%	0.6 – 6.0%
Folkestone Central	29UCGU	6	4	0.2 – 3.4%	0.2 – 6.5%
Dover Priory	29ULGK	6	1	0.0 – 0.9%	0.0 – 5.7%
Ramsgate	29UEGS	6	5	0.2 – 2.4%	0.4 – 4.9%
Margate	29UNGJ	5	4	0.3 – 1.4%	0.5 – 2.4%
Ebbsfleet	29UDGP	3	6	5.7 – 20.1%	13.1 – 33.1%

They are also shown in the next two maps. The increased commuting to London by rail expected along the south coast from Dover and Folkestone and increases from across the rest of the study area are evident.

[9] It should be noted that the Medway towns stations are close together. Each ward is considered relative to the station to which is it closest.

Figure A 17: % commuting by rail into London, study area 2001

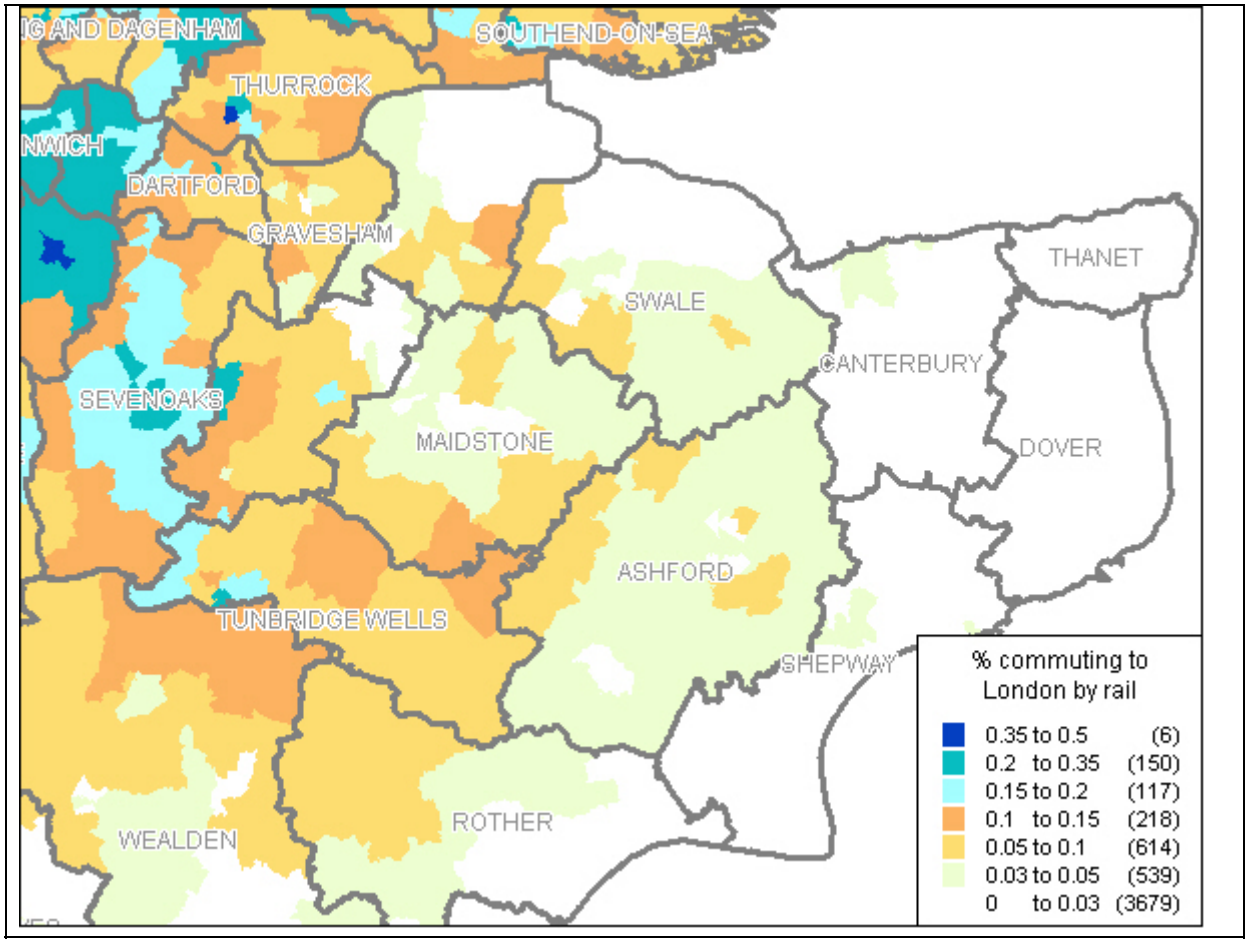
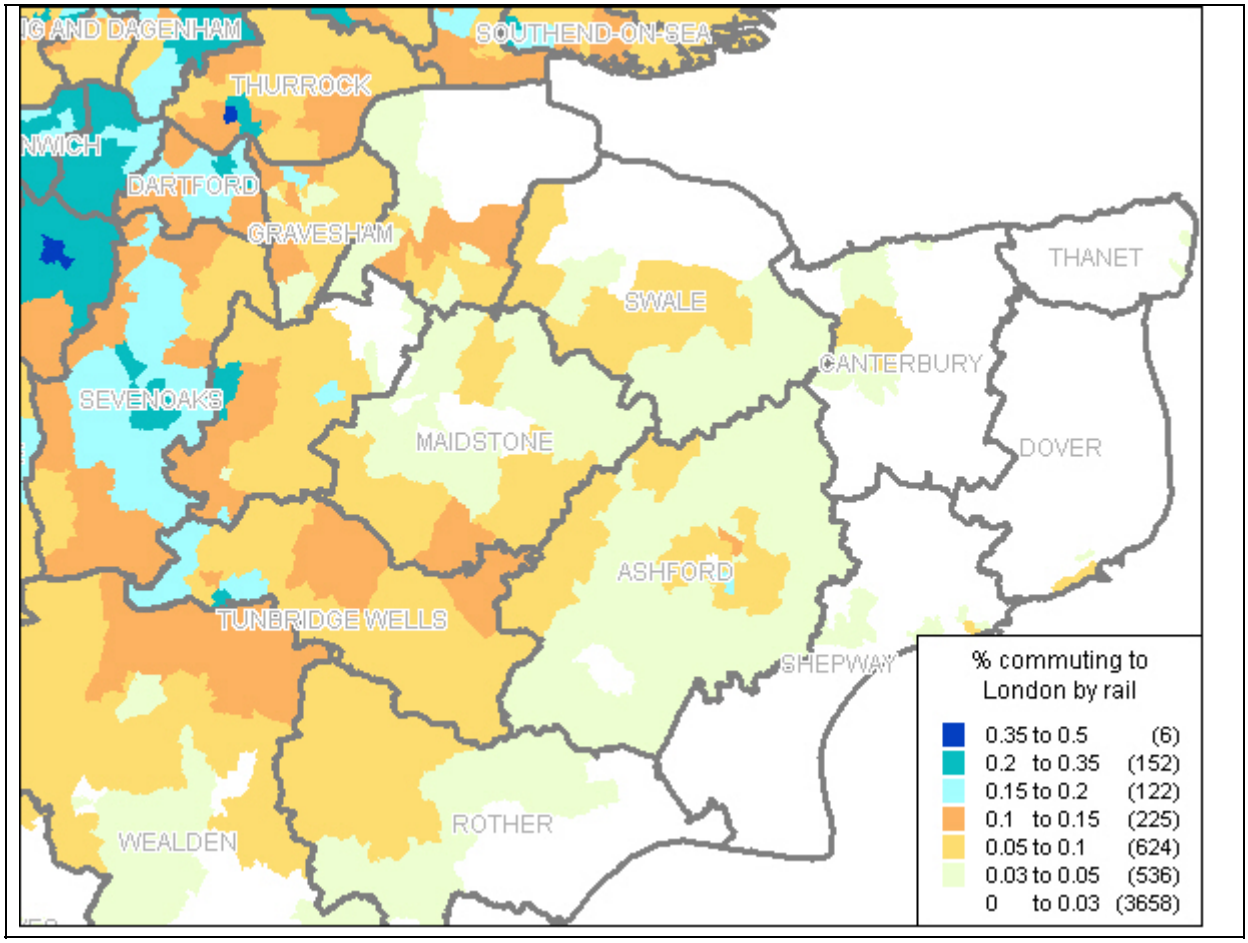


Figure A 18: % commuting by rail into London, study area after HS1 in operation



Relationship between commuting and regeneration

We now wish to examine the socio-economic characteristics of local areas and quantify how they might be related to accessibility. We considered the following characteristics[10]:

- Accessibility (proxied by the % who commute by rail to London)
- Employment density
- Population density
- Economic activity rates
- House prices
- Deprivation

We find a significant relationship between house prices, levels of deprivation and accessibility. Intuitively, we find that house prices are negatively impacted upon by increases in deprivation and positively impacted by increases in commuting rates into London by rail. The details of this model are summarised below.

[10] Accessibility, employment, population and economic activity were all considered at ST Ward levels of geography. House prices and IMD are available at MSOA and were converted onto ST Ward boundaries by area-weighting to enable direct comparison.

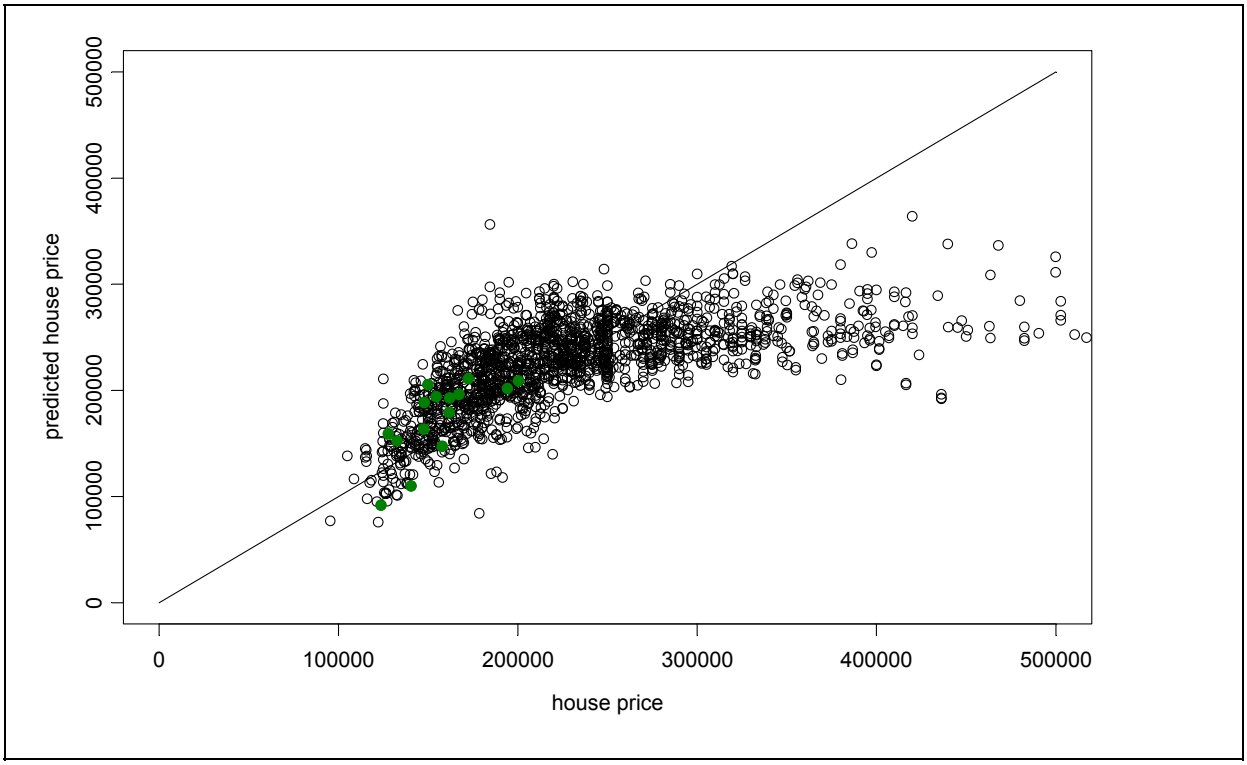
Figure A 19: House price model results

```
Model result
log(medianHP) = 12.5542 – 0.0239 x IMDscore + 1.0319 x London.%.Rail

Model detail
Coefficients:
                 Value Std. Error    t value   Pr(>|t|)
(Intercept)    12.5542     0.0125  1004.1750     0.0000
   IMDscore    -0.0239     0.0007   -36.4694     0.0000
London.% Rail   1.0319     0.1092     9.4533     0.0000

Residual standard error: 0.2128 on 1790 degrees of freedom
Multiple R-Squared: 0.4917
F-statistic: 865.9 on 2 and 1790 degrees of freedom, the p-value is 0
```

The model is run across all wards surrounding London but excluding those within London itself. This is because there is likely to be a different relationship between the very high house prices in London and the underground network rather than rail links. Excluding them from the model is therefore appropriate.

All explanatory variables are highly significant and the R-Squared value of 0.49 is reasonable for a cross sectional dataset. Examination of the residuals suggests they are randomly distributed exhibiting no signs of heteroskedasticity or model misspecification. The following chart shows the predicted against actual house prices. The green dots identify the wards in which the stations effected by HS1 are located. Whilst the model performs less well for higher priced properties, we can see that it performs well for the majority of house prices, and for the wards relevant to our analysis. An examination of the wards with house prices over £350,000 shows them to be located mainly around the M25 loop, out West along the M40 and M4 and some locations South West of London.

Figure A 20: House prices – actual and predicted by the model



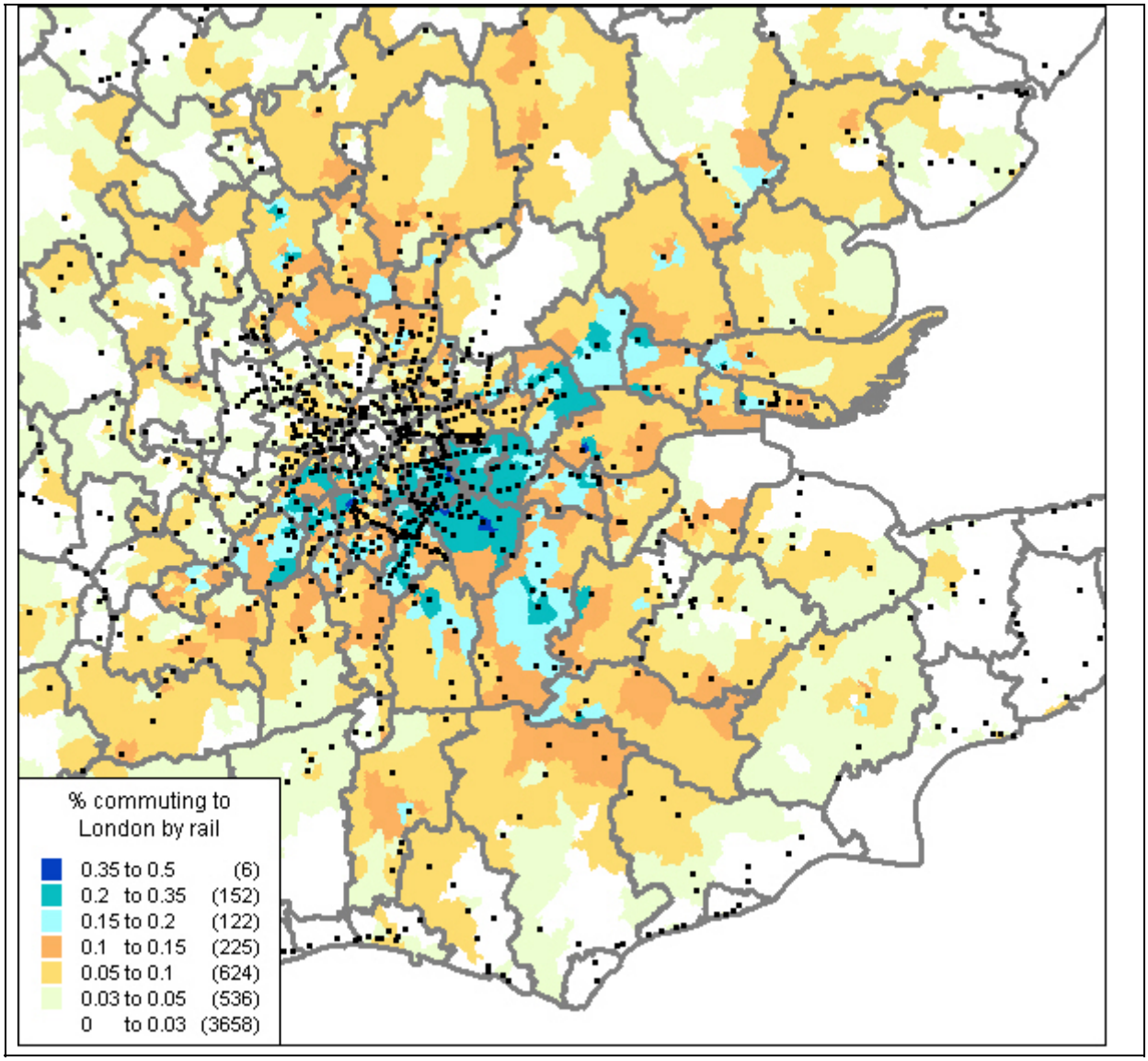
The effects of changes to rail commuting rates upon house prices implied by the parameters of this model are summarised in the table below. We can see that the model estimates that an x percentage point change in commuting by rail from a place has approximately an x per cent uplift upon house prices. This means that if 3 per cent more people commute by rail to London we might expect house prices to rise by 3 per cent.

Table A 9: House price impacts implied by model

Increase in commuting to London by rail (percentage points)	Percentage uplift in house prices
1%	1.04%
2%	2.00%
3%	3.14%
4%	4.21%
5%	5.30%
10%	10.87%

Maps of all three variables used within the model are shown below. The first map, of ward level commuting by rail, is a replica of that in Figure A 15, but with stations highlighted by black squares. It is evident that the blue spots further out are clustered around stations, as we might expect given the findings from the modelling. The darker blue spots evident in the south east and north west of London identify Sevenoaks, Harpenden and St Albans stations among others.

Figure A 21: Ward level commuting (by rail) to London with rail stations highlighted



The relatively lower house prices and higher deprivation in the study area are also evident.

Figure A 22: House prices, median 2006

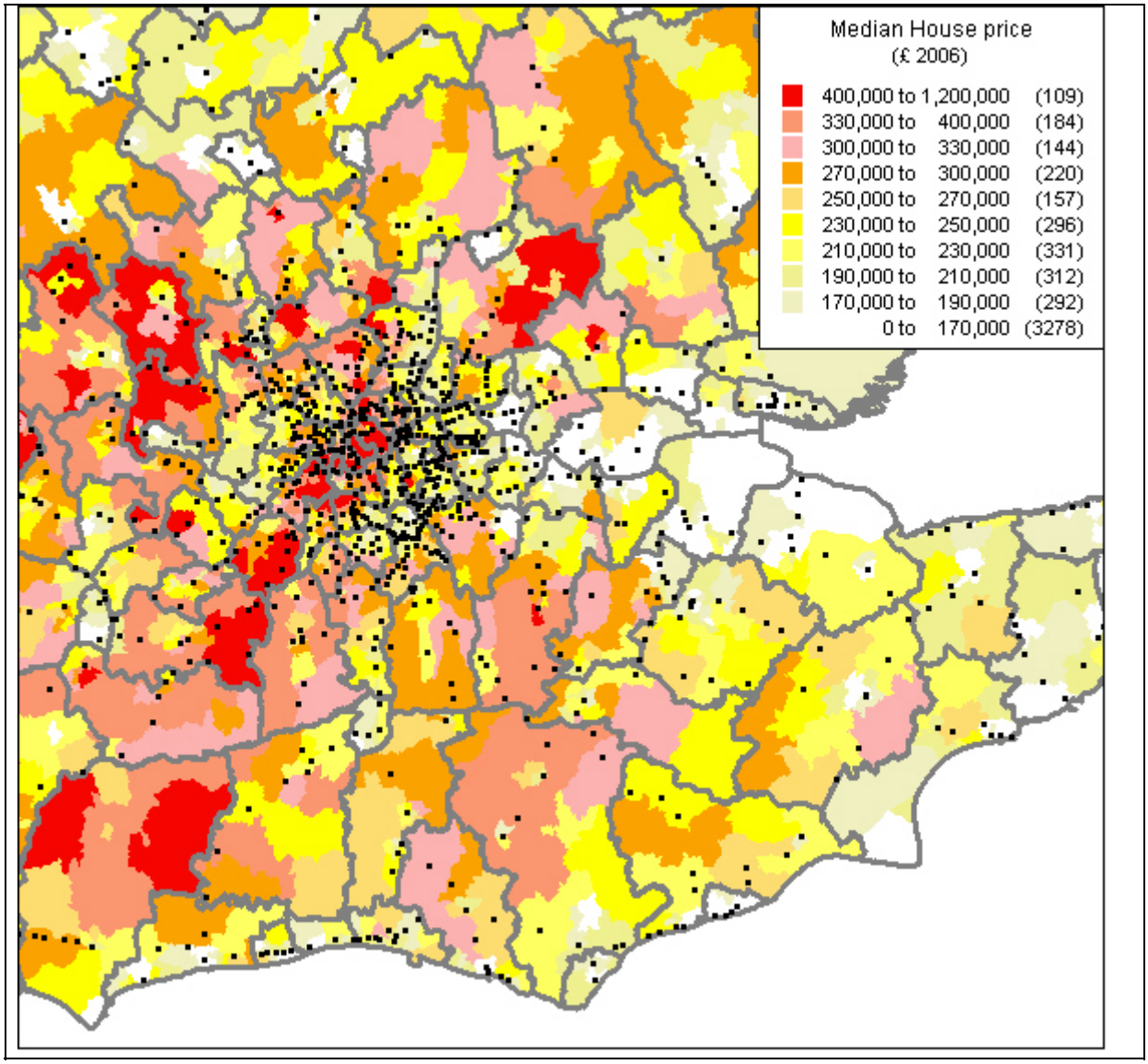
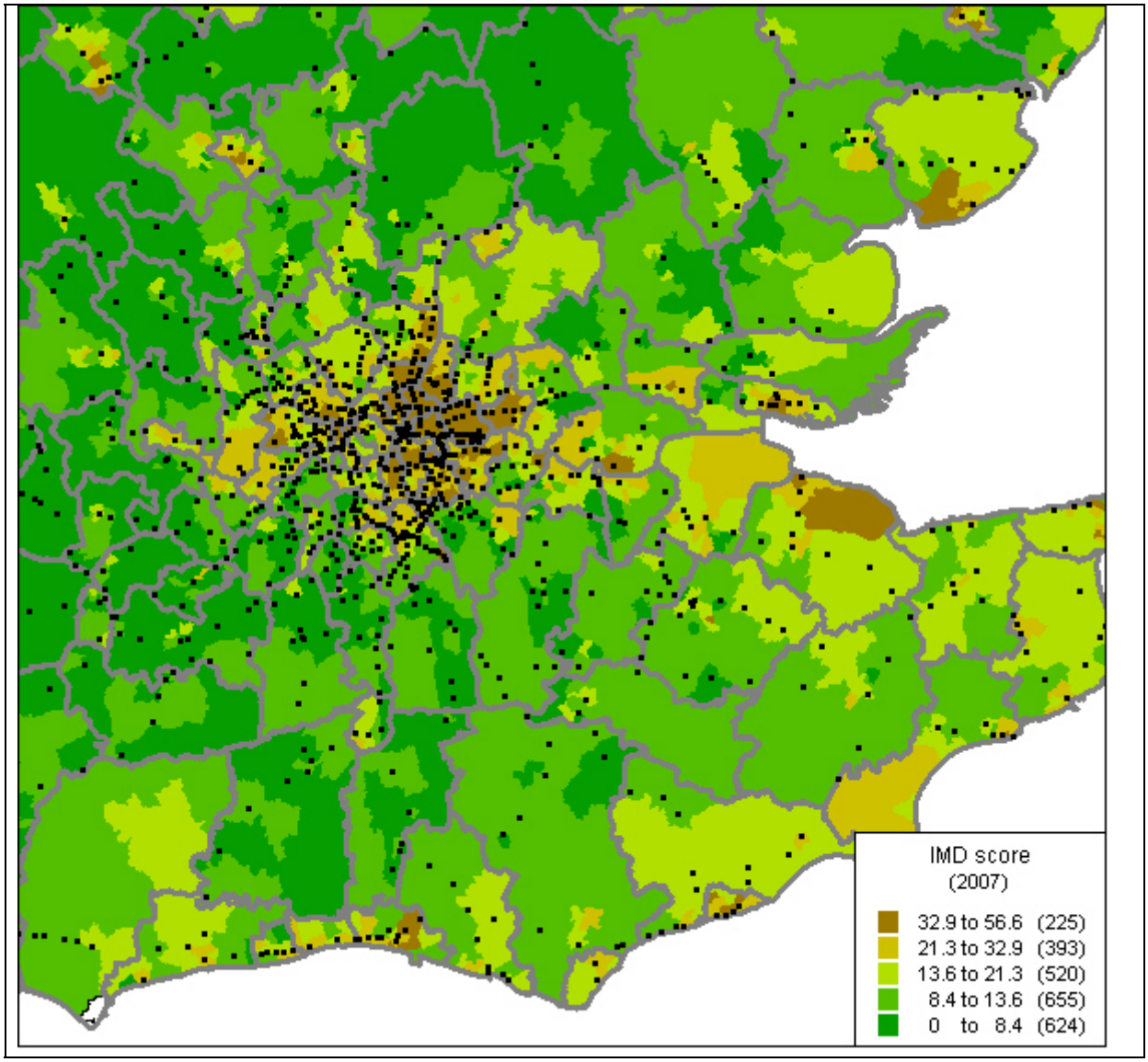


Figure A 23: IMD, 2007

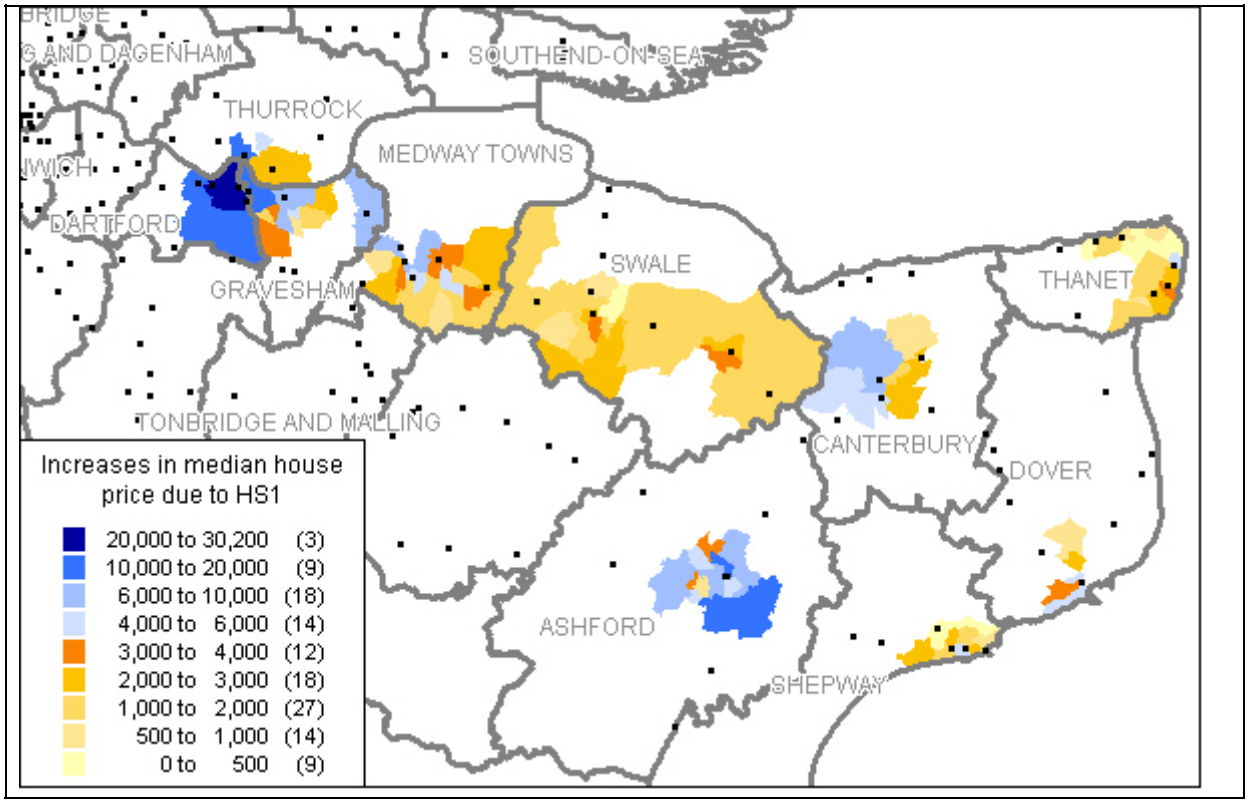


The range of uplifts in house price values is set out in Table A 10 below. The map then shows the per house increase in value estimated by the model. We can see that the model estimates house prices increases of between 0.1 and 14.4 per cent, depending on the station in question. The largest impacts are seen around Ebbsfleet station, with house prices potentially rising by more than 14 per cent.

Table A 10: Estimated changes to house prices when HS1 services are operational

Station	Range of house price % increases (with HS1)	Range of house price increases (with HS1), 2006 prices
Ashford	0.4 – 7.5%	£500 - £12,800
Gravesend	0.6 – 5.6%	£900 - £9,400
Chatham	0.6 – 3.2%	£900 - £4,100
Strood	2.9 – 3.8%	£6,300 - £6,800
Rochester	0.7 – 3.5%	£900 - £6,000
Gillingham	2.7 – 3.0%	£3,700 - £5,500
Rainham	0.7 – 1.8%	£1,100 - £3,600
Sittingbourne	0.3 – 1.9%	£300 - £3,800
Faversham	0.5 – 1.9%	£1,000 - £3,200
Canterbury West	0.3 – 4.5%	£500 - £8,800
Folkestone Central	0.2 – 3.2%	£100 - £5,100
Dover Priory	0.4 – 5.1%	£800 - £5,300
Ramsgate	0.2 – 2.6%	£300 - £4,900
Margate	0.1 – 1.0%	£300 - £1,600
Ebbsfleet	5.7 – 14.4%	£10,400 - £30,200

Figure A 24: Absolute average house price increases estimated when HS1 services are operational



The biggest impacts are seen around Ebbsfleet and Ashford but significant effects are seen all along the route.

Table A 11 estimates how these impacts on median house prices can be summarised at a district level. In order to estimate the effects at a district level assumptions have to be made about the distribution of housing across the district[11], household sizes and average prices[12]. A range of sensitivities are therefore presented around the results. We estimate that house prices in the study area could increase by between £950m and £1.6bn, with a central scenario of £1.3bn, equivalent to just over a quarter of the cost of delivering the HS1 project. This represents a capitalised value of benefits of HS1 to the residents of the study area.

Table A 11: Increases in house prices when HS1 is operational, cumulated across study area districts (£m)

Districts	Sensitivity (down)	Central scenario	Sensitivity (up)
Ashford	152.5	203.3	254.1
Gravesham	158.2	210.9	263.6
Medway	181.0	241.3	301.6
Swale	39.3	52.3	65.4
Canterbury	84.2	112.3	140.3
Shepway	28.2	37.6	46.9
Dover	33.5	44.6	55.8
Thanet	46.7	62.3	77.9
Dartford	143.1	190.8	238.5
Thurrock	81.8	109.1	136.3
Total study area	948.3	1,264.5	1,580.6

The prospect of higher house prices is more likely to encourage developers to invest in these areas and provide additional housing and employment capacity, thus supporting the potential to achieve the development targets set in the region.

Effect on earnings of the increased commuting to London

Earlier in this Appendix the travel time savings from the stations in the study area once the HS1 domestic services are in operation was summarised, along with the estimated changes in commuting to London which may occur as a result of these reduced travel times. We now turn to consider the potential effect on earnings which may occur in the study area as a result of the increased commuting to London.

In this section three scenarios are considered:

- If all additional commuting to central London was by existing residents of the study area then what would the change in total earnings be;
- If all additional commuting was filled by new residents what would the change in earnings be; and
- If all additional commuting was filled by new residents and each four new residents add one new local job what would the impact be.

Table A 12 translates the percentages of commuters estimated into absolute levels of workers which might travel into London by rail from the wards surrounding each station. These estimates are based on the 2001 total levels of commuters, and therefore do not take into consideration any other potential (population or employment) growth. This is likely to be a conservative estimate. On this basis, this suggests that an additional 7,500 people could commute from the study area to London as a result of HS1. Table 5.10 totals these commuters by the district that they come from.

[11] The assumption made is that houses are distributed in line with population density
[12] Land Registry mean house price figures by district in 2007 have been used.

Table A 12: Absolute numbers of commuters to London, by station

Station	Commuting (2001)	Commuting (HS1)	Increase with HS1
Ashford	940	1,980	1,040
Gravesend	2,350	3,220	870
Chatham	2,370	2,940	570
Strood	400	670	280
Rochester	410	560	150
Gillingham	1,370	1,860	490
Rainham	2,200	2,510	310
Sittingbourne	910	1,090	180
Faversham	640	780	150
Canterbury	300	800	510
Folkestone	270	470	200
Dover	50	300	250
Ramsgate	190	480	290
Margate	130	210	70
Ebbsfleet	2,820	5,010	2,200
Total study area	15,330	22,890	7,560

Table A 13: Absolute numbers of commuters to London, by home district

District	Commuting (2001)	Commuting (HS1)	Increase with HS1
Ashford	940	1,980	1,040
Gravesham	2,200	3,450	1,240
Medway	6,410	8,130	1,720
Swale	1,760	2,100	350
Canterbury	300	800	510
Shepway	270	470	200
Dover	50	300	250
Thanet	330	690	360
Dartford	1,520	2,640	1,120
Thurrock	1,560	2,320	760
Total study area	15,330	22,890	7,560

Table A 14 details the median earnings across the districts in the study area and in London. This shows that workplace earnings are higher across the whole of London than the study area and are higher still in Inner London.

Table A 14: Earnings across the study area and London

District	Median workplace earnings (2007)
Ashford	20,695
Gravesham	23,995
Medway Towns	23,473
Swale	24,961
Canterbury	21,969
Shepway	18,592
Dover	22,216
Thanet	20,670
Dartford	27,788
London	31,680
Inner London	35,319

Source: ASHE, weighted by TEMPRO employment estimates for London and Inner London estimates

Table A 15 considers how much these 7,500 people could earn. The first column assumes that they earn the median workplace earnings of their home district. The second column assumes that they earn the median London worker earnings and the third column assumes that they earn the median Inner London worker earnings. Across the total study area earning London wages instead of home district wages makes an annual difference of £62m, and this difference rises to almost £90m if Inner London wages are earned.

Table A 15: Potential earnings of the 7,500 workers (total, £m)

District	Home district	London	Inner London
Ashford	21.5	32.9	36.7
Gravesham	29.8	39.4	43.9
Medway Towns	40.5	54.6	60.9
Swale	8.7	11.1	12.3
Canterbury	11.1	16.0	17.9
Shepway	3.8	6.5	7.2
Dover	5.6	8.0	8.9
Thanet	7.4	11.4	12.7
Dartford	31.2	35.5	39.6
Thurrock	17.7	24.0	26.7
Total study area	177.3	239.4	266.9
Difference (from home)		62.0	89.5

So, revisiting the scenarios outlined above:

- If all additional commuting to central London was by existing residents of the study area, there would be between £62m and £90m additional earnings per annum;
- If all additional commuting was filled by new residents there would be between £239m and £267m of additional earnings per annum; and
- If all additional commuting was filled by new residents and each four new residents add one new local job then the additional earnings of the new London working residents would be between £239m and £267m per annum as above. Assuming a rule of thumb of two residents per additional worker, this would create 15,000 new residents, which might support 3,750 new local jobs whose workers might earn £90m per annum.

The benefits to the study area under these scenarios therefore (approximately) range from between £62m and £360m additional earnings per annum.

Conclusions

In a sense the increased values of houses in and around the stations (shown on the map above) and summarised by district in Table 5.7 represents part of the capitalised amount of central London value that is being relocated. The prospect of higher house prices is more likely to encourage developers to invest in these areas and provide additional housing and employment capacity, thus supporting the potential to get closer towards the development targets set in the region.

The increases in house prices reflect the benefit to commuters but the potential to increase employment in new and expanded settlements is not fully measured here. We begin to consider the potential local employment which could result from new residents commuting to London but this only represents part of the story.

Furthermore, part of the increased central London value generated will result in higher consumer spending which in turn generates local jobs and the potential for further investment in new productive capacity in new settlements such as Ebbsfleet. This is not included at all since we essentially assume it will happen somewhere else. If however these locations can now attract investment which would otherwise go elsewhere (to France, for instance) then the benefits to UK plc will be larger.

Appendix C – Sensitivity tests

This section shows how the results change if various appraisal assumptions are altered.

Demand under High Speed 1

To estimate demand in the Do Something scenario, the approach included increases in commuting demand based on changes in the journey time to London.

A more conventional method would be to use an elasticity-based approach, taking into account changes in the generalised costs of travel between destinations as a result of High Speed 1. This would lead to a lower increase in commuting demand due to High Speed 1 compared with the assumptions used for the main results in section 5.2. Table A 16 shows the transport results for this test.

Table A 16: Transport costs and benefits in lower demand test (£m, 60-year PV, 2002 prices)

	Base results	Results with lower demand
Journey time savings	3,700	3,500
Congestion relief	100	100
TOTAL BENEFITS	3,800	3,600
Capital cost	5,700	5,700
Operating costs	1,600	1,600
Revenue	-3,400	-3,000
TOTAL COST	3,900	4,300
Net Present Value (NPV)	-100	-700
Benefit/Cost Ratio (BCR)	0.96	0.83

Table A 16 shows the transport case would be worsened if there was no change in commuting patterns as a result of HS1. The BCR would decrease from 0.96 to 0.83.

Move to more productive jobs

The M2MPJ results are based on the assumption that the number of additional central London jobs as a result of HS1 is proportional to Crossrail, when the net additional capacity provided by both schemes is taken into account. This means that 18% of the Crossrail jobs total is taken as the HS1 total.

In reality this proportion may be higher or lower than 18%. Table A 17 shows the results if a lower or higher number of jobs is assumed (a proportion of 8% or 28% respectively).

Table A 17: Transport & WEBs results under different Move to More Productive Jobs employment assumptions (£m, 60-year PV, 2002 prices)

	Base results (additional jobs = 18% of Crossrail total)	Additional jobs = 8% of Crossrail total	Additional jobs = 28% of Crossrail total
Journey time savings	3,700	3,700	3,700
Congestion relief	100	100	100
TOTAL CONVENTIONAL BENEFITS	3,800	3,800	3,800
Move to more productive jobs	1,700	1,300	2,100
Pure agglomeration	1,800	1,800	1,800
Labour force participation	50	50	50
Imperfect competition	250	250	250
TOTAL WIDER BENEFITS	3,800	3,400	4,200
Capital cost	6,100	6,100	6,100
Operating costs	1,600	1,600	1,600
Revenue	-3,400	-3,400	-3,400
TOTAL COST	4,300	4,300	4,300
Net Present Value (NPV)	3,300	2,900	3,700
Benefit/Cost Ratio (BCR)	1.76	1.67	1.86

Table A 17 shows that, even with comparatively large changes to the assumption regarding additional central London jobs, the BCR is in the range of 1.7 – 1.9.